

End Organ Damage in Essential Hypertension: An Experience at a Tertiary Level Hospital in Mumbai.

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ABSTRACT

Background: Early detection of hypertension and assessment of target organ functions is vital for maintenance of health. Associated comorbid conditions like diabetes mellitus, obesity, hyperlipidemia, smoking and old age increases the risk for early target organ involvement. Our aim was to study the prevalence of target organ damage in essential hypertension, effect of duration and severity of hypertension on target organ damage and to study the effect of comorbid conditions on target organ damage. **Methods:** We included patients with recently detected hypertension as well known cases of hypertension. Both inpatients admitted in wards as well as outpatients attending the hypertension clinic and admitted in the wards were registered for this study after taking valid informed consent. Patients underwent clinical examinations after detailed clinical, family and medication related history and followed by routine and specific investigations. **Results:** 100 patients were included in the study, of which 61 were males, mean age of 54 years (± 2.4 years). Common modes of presentation of the patients were headache, giddiness and chest discomfort. We observed that controlling hypertension in patients resulted in significant changes when investigated with fundoscopy, electrocardiogram and 2 D echocardiogram. Additionally, duration and severity of hypertension had an effect on target organ damage, which came out as statistically significant. **Conclusion:** Smoking, alcohol, obesity, diabetes mellitus and dyslipidaemia are independent risk factors for hypertension and target organ damage. As the duration and severity of hypertension increases the incidence of target organ damage increases. Hypertension along with other risk factors like smoking, alcohol, dyslipidaemia, obesity and diabetic mellitus magnifies the risk of complications.

Keywords: Hypertension, risk factors, target organ damage, dyslipidaemia, diabetes.

INTRODUCTION

Hypertension is aptly called the 'Silent killer. More often that it remains quiescent. Till the advent of routine blood pressure screening in the recent years, hypertension used to first come to light through the occurrence of myocardial infarction and strokes. Even in developed countries like the United States blood pressure is a major risk and is contributing to more than 5,000,00 strokes and 1,50,000 strokes related death annually and one of the major risk factors in approximately one million myocardial infarction and 50,000 deaths due to heart attack annually. In India, many problems still exist like awareness of hypertension, its risk factors and complications.

The disease often goes undiagnosed and untreated for a long time. Hence, the early detection of hypertension and assessment of target organ functions is vital for maintenance of health. Associated comorbid conditions like diabetes mellitus, obesity, hyperlipidemia, smoking and old age increases the risk for early target organ involvement. So early detection of target organ damage and control of co-morbid conditions improve the management of hypertension and decrease the cardiovascular and cerebrovascular morbidity and mortality. The biological aggressiveness of a given level of hypertension varies among individuals. The inherited property to induce vascular damage can also be ascertained by assessment of target organ function. The target organs often involved are the heart, eyes, kidneys and brain. Therefore, our research was aimed at studying the prevalence of target organ damage in essential hypertension, effect of duration and severity of hypertension on target organ damage and to study the effect of comorbid conditions on target organ damage.

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MATERIALS AND METHODS

Setting

Mumbai, which lies on the west coast of India, is the most populous city in the world, with an estimated 20.7 million residents.^[1] The native language of Mumbai is Marathi, but Hindi, Gujarati and English are spoken and understood as well in this city. The population mainly follows Hinduism, followed by Islam, and Buddhists, Jains, Christians, Sikhs, Parsis and Jews make up the rest of the population. Topiwala National Medical College & BYL Nair Charitable Hospital is a premier medical college in Mumbai.

Study design

The study protocol was approved by an independent ethics committee prior to beginning patient enrollment. Written, informed consent was obtained from all patients participating in the study. This was an observational, cross-sectional study evaluating patients with essential hypertension at the B.Y.L. Nair Charitable Hospital. Patients of either gender, age above 40 years and suffering from hypertension were selected for the study.

Data collection and analysis

This study describes our experience of investigating patients of essential hypertension above the age of 40 years. This study included patients with recently detected hypertension as well known cases of hypertension. Both inpatients admitted in wards as well as outpatients attending the hypertension clinic and admitted in the wards were registered for this study after taking valid informed consent. Newly detected hypertensive patients were registered for this study after documenting high blood pressure on minimum three occasions. On their first visit to the hypertension clinic or when admitted in the hospital detailed notes of their history and clinical evaluation were made. The patient's symptoms had variable presentations like headache, usually in the morning hours, dizziness, chest pain, palpitation, dyspnoea, edema feet, polyuria, oliguria, blurring of vision, epistaxis and transient ischemic attack. Details of family history of hypertension, diabetes mellitus, coronary artery disease and hyperlipidemia were noted. In addition to above, history of drug consumption was also taken (Nasal drops, NSAIDS, antidepressants) along with the compliance of antihypertensive agents. Personal history, including, history of tobacco chewing, smoking, alcohol consumption and other addiction was also taken. Special attention was also paid to emotional and psychosomatic factors in these patients like anxiety, financial insecurity, feeling of loneliness. On physical and systemic examination following things were recorded a) Height and weight, BMI of each patient ($BMI = \text{weight in Kg/ height in mtrs}^2$); b) Radial pulse was examined in detail, both radial

pulses were compared with respect to volume, equally or absence of pulsations all peripheral pulses were felt to rule out peripheral vascular disease. c) Blood pressure was measured in all four extremities and also in supine, sitting and standing positions; d) Raised jugular venous pulsation and oedema feet were also looked for to rule out congestive cardiac failure; e) Fundoscopy was done on each and every patient and was graded I to IV or normal depending on Keith-Wagners-Braker classification. f) On examination of heart, the evidence of Cardiomegaly, signs of heart failure, such as 3rd and 4th heart sounds were looking for; g) in respiratory system lung bases were auscultated for basal crepitations to rule out left ventricular failure. h) On abdominal system examination, palpation of liver, spleen and kidneys were done auscultation in the epigastrium and both hypochondrium to hear renal bruit and to rule out renal artery stenosis were done; i) detail neurological examination was done to rule out neurological deficit due to stroke.

After the history and detailed examination following investigations were done. 1) Urine analysis: routine, microscopic, 24 hrs urinary protein and sugars to rule out nephropathy and urinary tract infection. 2) Haemogram. 3) BUN, serum creatinine and electrolytes to assess renal function 4) Fasting and post prandial blood sugars to rule out diabetes mellitus. 5) Serum uric acid. 6) Serum calcium and phosphorus. 7) Lipid profile: which included total cholesterol, total triglycerides and HDL. 8) Electrocardiogram: To look for evidence of ischaemic head disease or left ventricular hypertrophy. 9) X-ray chest PA view to look for cardiomegaly and to determine the extent and severity of atherosclerotic lesions and calcifications respectively. 10) 2D echocardiography To assess heart function (LVEF, regional wall motion abnormalities, concentric left ventricular hypertrophy and diastolic dysfunction). 11) Ultrasonography of abdomen for mainly to assess kidney sizes. 12) CT scan head (P+C) if the patient had evidence of focal neurological deficit.

RESULTS

100 patients were included in the study, of which 61 were males, mean age of 54 years (± 2.4 years). Common modes of presentation of the patients were headache, giddiness and chest discomfort. 74 patients were stage 2 hypertensive according to JNC 7. The majority of the patients (38) had a duration of hypertension ranging from 1 to 5 years [Table 1]. We observed that controlling hypertension in patients on follow up, resulted in significant good changes on fundoscopy, electrocardiogram and 2 D echocardiogram [Table 2]. Additionally, duration and severity of hypertension had an effect on target organ damage [Table 3].

Table 1: Baseline characteristics of patients involved in the study.

<i>n</i>	100
Males	61
Mean age	54 years (± 2.4)
Mode of presentation	
Headache	62
Giddiness	53
Chest discomfort	40
Dyspnea	36
Edema	31
Visual disturbances	28
Hypertension according to JNC 7	
Prehypertension	5
Stage 1 Hypertension	21
Stage 2 Hypertension	74
Duration of hypertension	
Freshly detected	6
1 month to 1 year	23
1 year to 5 years	38
5 years to 10 years	26
More than 10 years	7
Determinants of hypertension	
Diabetes mellitus	43
Obesity	29
Dyslipidaemia	66
Smoking	25
Alcohol	11
Tobacco	48
Family history	73

Table 2: Effect of control of hypertension.

Investigation performed	Chi-square	Degrees of freedom	p-value
Fundoscopy	11.998	3	0.0074
Electrocardiogram	15.267	5	0.0093
2-dimensional echocardiogram	29.434	2	<0.0001

Table 3: Effect on target organ damage.

Variable	Chi-square	Degrees of freedom	p-value
Duration of Hypertension	8.036	4	0.090
Severity of Hypertension	9.208	2	0.010

DISCUSSION

In the present study, 72% patients were in the age group of 50-59 years, of which males were 43% and female was 29%. As the age increases the blood pressure, also increases this can be proved by Framingham Study, which used the WHO definition and found that the annual incidence in men increased from 3.3% at age 30-39 years to 6.2% of age 60-69 years.^[2] Among women the incidence increases from 1.5% at age 30-39 years to 8.6% in postmenopausal age group i.e. 60-69 years. One Indian study comparing rural and urban population showed that the prevalence of hypertension was 59.9 and 69.9 per 1000 in males and females, respectively in urban population and 35.5 and 35.9 per 1000 in males and females respectively in the rural population.^[3] However, our study showed a male predominance.

This could be because of male dominance in our society. This could also to be confirmed by the fact that the percentage of males coming out as patients or indoor patients in any general hospital are 4 to 5 times than that of female patients.

A large number of hypertensive patients in early stages have no symptoms. That is why it is called 'SILENT KILLER'. In our study most common presentation was headache 62% and giddiness. The duration of hypertension is directly related to end organ damage and complications. If the duration of hypertension is accompanied by uncontrolled hypertension the risk is doubled.^[4] In our study, 38% were known hypertensives since Last 1.5 years and 23% of the patients were hypertensive since 1 month to 1 year. 26% are hypertensive since 5 years to 10 years. 7% are more than 10 years duration. 6% of the patients were freshly diagnosed to be hypertensive of which 4% were males and 2% were females. Framingham study found out an independent association between hyperlipidemia and hypertension. Our study has also confirmed it. 66% of the patients had an abnormal lipid profile associated with hypertension of which 37% were males and 29% were females: 44% had normal lipid profiles.

The retina is the only tissue in which arteries and arterioles can be examined directly. Repeated ophthalmic examination provides the opportunity to observe the progress of the vascular effect of hypertension. In our study, 10% revealed normal fundus examination, 66% and 14% had grade II and III retinopathy respectively, while 7% and 3% had grade I and IV retinopathy. Patients with uncontrolled hypertension had a higher grade of retinopathy. Thus, control of hypertension can halt the progression of retinopathy due to hypertension.^[5] Patients with uncontrolled hypertension had a higher grade of retinopathy as 30% and 15% had grade II and III changes while 2% had grade IV as compared to just 22% and 2% of grade II and III changes in the controlled group. This study is of significance (P=0.0074).

In our study, 52% of the patients had left ventricular hypertrophy with strain 8% had left bundle branch block. 10% had a myocardial infarction while 10% ST-T changes and 18% had a normal ECG. All these abnormalities were higher in the uncontrolled hypertensive as compared to controlled hypertensive i.e. 27% of uncontrolled hypertensive had LVH with strain as compared to 6% of controlled hypertensive. 12% of uncontrolled hypertensive had ST-T wave changes as compared to 5% of controlled hypertensive. Similarly, 21% of controlled hypertensive had a normal ECG as compared to 4% in uncontrolled patients. This study (P=0.0093) is of significance that cardiovascular manifestations are the form of ECG changes are more in uncontrolled hypertensive. In essential hypertension a continuously increased after load on the left ventricle

produce LVH ventricular hypertrophy and consequently increases LV mass. This LVH represents the remodelling of the heart architecture to maximize wall stress. Echocardiography is more sensitive and specific than ECG in detecting LVH by measurement of LV mass.^[6] LVH detected by echocardiography was 12% to 20% of patients with mild hypertension in a worksite study^[7], in 50% of asymptomatic subjects with mild to moderate hypertension at a referral centre and in almost 90% of hospitalized hypertensive patients^[8]. ECG examination can identify LVH in only less than 3% of cases of mild hypertension and overall sensitivity is only 8-19%. Our study shows a significance with $P=0.0001$. Thus, early detection of LVH on 2D-echo and control of hypertension by treatment decreases the incidence of cardiovascular complications.

In our study, 7% of patients had deranged renal biochemical parameters and USG abdomen showing bilateral small contracted kidneys: while renal parameters are normal in 93% patients. Atherosclerotic lesions of the afferent and efferent arterioles and glomerular capillary tuft are the most common renal vascular lesion in hypertension and result in decrease glomerular filtration rate and tubular dysfunction.^[9]

In our study, 33% of patients had cardiovascular complications of which male was 15% and female was 18%. Those complications were ischemic heart disease, angina or left ventricular hypertrophy. 31% of the patients had cerebrovascular complications 18% of males and 13% of the females had a stroke. These complications were in the form of infarcts or intracerebral bleeding. 7% of the patients had renal damage: 5% of males and 2% of females respectively. 5% of the patients presented with hypertensive encephalopathy, of these all were males. Patients with hypertension have increased incidence of heart disease, strokes, renal failure and encephalopathy. Hypertension causes increased work load on the heart, which is compensated by concentric LVH.^[10]

The majority of deaths in hypertensive patients results from myocardial infarction and congestive cardiac failure. The prevalence rate of ischemic heart disease as defined by joint national committee varies from 9.2% among 18-24 years of age to 64.3% among 65.74 years of age. In our study, 26% of uncontrolled hypertensives had cerebrovascular accidents as compared to 5% of a controlled group. A similar risk of ischemic heart disease is much more in uncontrolled group: 25% as compared to 8% in the controlled group. 6% of the patients with uncontrolled hypertension had renal damage as compared to 1% in the controlled group. 1% of the patient with uncontrolled hypertension had hypertensive encephalopathy.

Dyslipidaemia is the most important predictor of morbidity and mortality associated with hypertension. 21% and 13% of the patient with

dyslipidaemia had cardiovascular and cerebrovascular complications, while 13% and 11% of the patients with diabetes mellitus had cardiovascular and cerebrovascular complications: and 10% and 4% of the patients with obesity had cardiovascular and cerebrovascular complications.

CONCLUSION

Uncontrolled hypertension can cause progressive risk of developing severe grades of retinopathy, cardiovascular, cerebrovascular and renal complications. As the duration and severity of hypertension increases the incidence of target organ damage increases. Isolated systolic hypertension is an important predictor of cardiovascular and cerebrovascular complications. Smoking, alcohol, obesity, diabetes mellitus and dyslipidaemia are independent risk factors for hypertension and target organ damage. Hypertension along with other risk factors like smoking, alcohol, dyslipidaemia, obesity and diabetic mellitus magnifies the risk of complications.

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