A clinical and echocardiographic study in elderly hypertensive patients

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Abstract

Introduction: Isolated systolic hypertension is the commonest cause of raised blood pressure in the older population. As the age progresses more and more persons will be hypertensive. It is a disease, which is definitely the most prevalent, remediable risk factor for cardiovascular and cerebrovascular diseases.

Objective: To study the clinical profile of hypertension in elderly, to find out associated risk factors, especially on cardiac through echocardiography.

Materials and Methods: A total number of sixty elderly hypertensive patients of ≥60 years with systolic blood pressure ≥ 140 and diastolic blood pressure ≤ 90 mm of Hg were included in this study. A detailed history with general and systemic examination with fundus examination was carried out. Complete blood count, urine analysis, blood sugar, renal profile, lipid profile, chest x-ray, electrocardiogram, and echocardiogram were done in all patients.

Results: Sixty patients were evaluated, and the mean age was 67.72±7.004 years of which 35 (58.33%) were males and 25 (41.67%) females and the common age group was 60-65 years. Chest pain in 45% and breathlessness in 38.33% were commonest clinical presentation. Family history, smoking history and total cholesterol were associated risk factors of hypertension. Hypertensive retinopathy was observed in 38.33% patients. Ischemic changes in 31.67% followed by left ventricular hypertrophy in 20% were most common electrocardiographic findings. The echocardiographic evaluation showed left ventricular dysfunction in 63.33% was common entity in the form of left ventricular hypertrophy in 30%, left ventricular dilatation in 15% and left ventricular diastolic dysfunction in 48.33%. Ischemic heart disease was diagnosed in 55% patients. Out of these 18 (54.55%) had anterior, 4 (12.12%) lateral, 3 (9.09%) inferior and 4 (12.12%) septal infarcts. One patient had global hypokinesia, and three patients had more than one segment involvement. There was strong co-relation between left ventricular hypertrophy, ischemia and systolic blood pressure.

Conclusion: The elderly hypertensive patients tend to have isolated systolic hypertension. Smoking history, family history and dyslipidemia are important determinants of hypertension. Left ventricular hypertrophy and other associated risk factors are responsible for coronary artery disease.

Keywords: Diastolic, Echocardiography, Elderly, Hypertension, Hypertrophy, Ischemic, Systolic, Ventricular.

Introduction

Ageing is a natural process, as age progresses the blood pressure also increases gradually. Every 3 of 4 adults will be hypertensive by the age of 50 years.[1] Epidemiological studies suggest that by the age of 60 years 55% of the population will be hypertensive and 65% over age of 70 years. Out of these 65% of them are suffering from isolated systolic hypertension.[2] Biology of ageing includes age related decline in individual's capacity in various metabolic activities. Morbidity occurs due to the changes occurring during the ageing process either due to intrinsic and extrinsic or self-induced factors in the different sphere of life. Majority of the events progress rapidly due to inherited lifestyle by the individuals.[3] The increase in life expectancy and modification of lifestyle, cardiovascular disease primarily hypertension is emerging as a major health problem in elderly population.

Materials and Methods

The study was conducted on patients admitted in a tertiary care hospital and research centre. Inclusion Criteria: Patients above the age of 60 years having hypertension with systolic > 140 and diastolic < 90 mm Hg. Exclusion Criteria: Patients below the age of 60 years, diabetes mellitus, renal disorders and other causes of secondary hypertension. A detailed history and clinical examination including fundus examination was carried out in all the subjects who gave informed consent to participate in the study and necessary investigations were recorded.

The following investigations were done on all these patients: Blood examination- Hb%, TLC, DLC & ESR, fasting blood glucose, postprandial blood glucose, blood urea, serum creatinine, lipid profile and thyroid profile if necessary. Urine- Albumin, sugar, microscopic. Electrocardiogram, chest X-ray PA view, echocardiogram and other investigations as required. Statistical analysis was done using Chi-square test, Student t-test and Factor analysis.

Results

A total number of sixty elderly hypertensive patients of ≥ 60 years with systolic blood pressure ≥ 140 and diastolic blood pressure ≤ 90 mm of Hg were included in this study. A detailed history with general and systemic examination was carried out. Complete blood count, urine analysis, blood sugar, renal profile, lipid profile, chest x-ray, electrocardiogram, and echocardiogram and fundus examination were done in all patients.

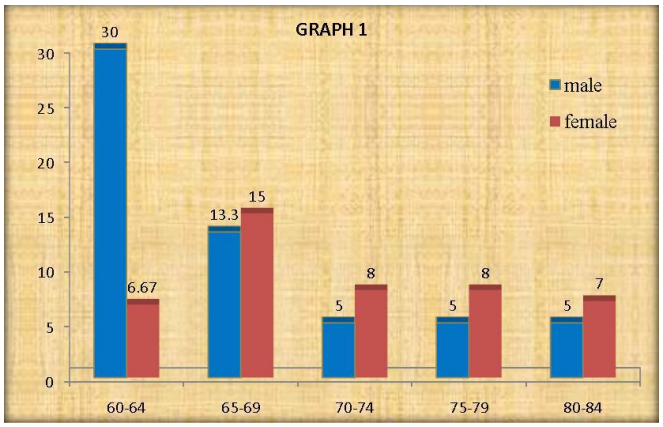

Fig 1: Age and sex distribution

It was observed that hypertension is more common in males of 35 patients (58.33%) compared to females of 25 patients (41.67). The commonest age group is 60-64 years in 22 patients (36.67%) followed by 65-69 years in 15 patients (25%). Least common age group is 80-84 in 7 patients (11.67%). Among males commonest age group was 60-64 years in 18 patients (30%), and in females 65-69 years is common in 7 patients (11.67%). (Fig. 1)

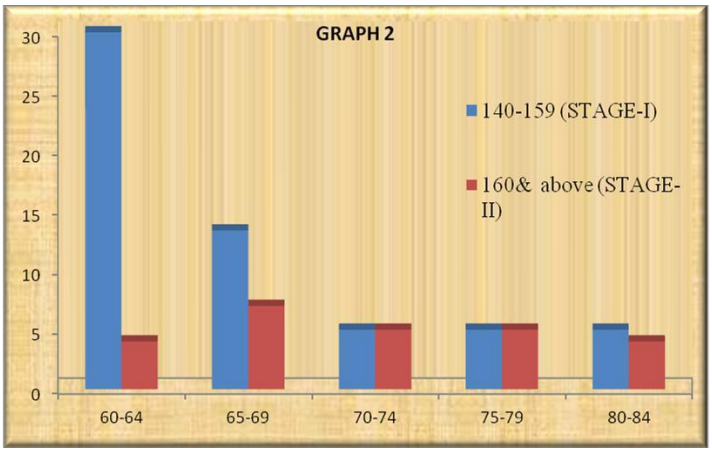

Fig. 2: Distribution of systolic blood pressure

It was also observed that stage-I systolic blood pressure was common with 37 patients (61.67%) when compared with grade-II systolic blood pressure comprising of 23 patients (38.33%). Stage-I systolic blood pressure was common in both sexes with 23 patients (38.33%) and 14 patients (23.33%) in male and females respectively. When stage-II was taken into consideration there are 12 (20%) male patients and 11(18.33%) female patients. (Fig. 2)

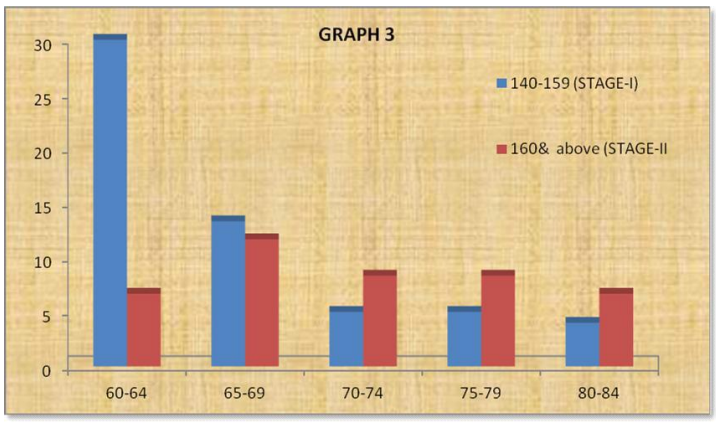

Fig. 3: Distribution of age with systolic blood pressure

It is evident that stage-I systolic blood pressure was common in 60-64 years with 18 patients (30%) and stage-II was common in 65-69 years with 7 patients (11.67%). (Fig. 3)

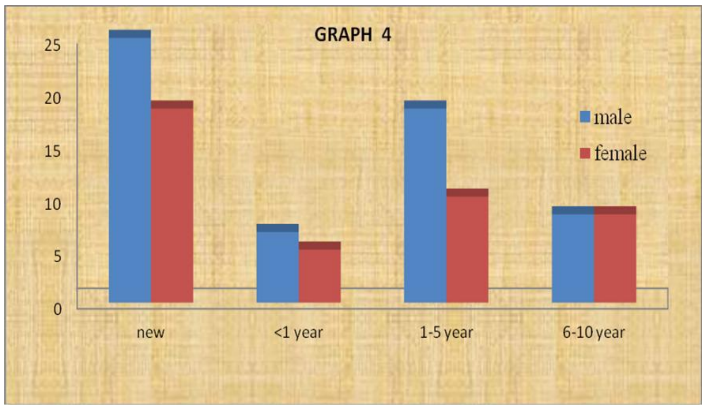

Fig. 4: Duration of hypertension

It was observed that there are 26 (43.33%) newly detected hypertensive patients. Out of them 15 (25%) were male patients and 1 (18.33%) was female patient. Newly detected hypertension was more common in males when compared to females. 7 (11.67%) patients had history of hypertension less than 1 year, out of them 5 patients were not on treatment. 17 (28.33%) patients had history of hypertension between 1-5 years, and 10 (16.67%) patients between 6-10 years. (Fig. 4)

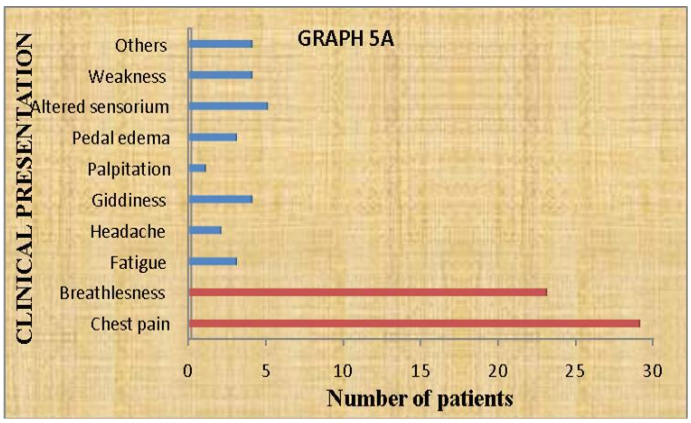

Fig. 5: Symptomatology

The most common presentation was chest pain in 29 patients (48.32%), followed by dyspnea in 23 patients (38.37%). On detailed examination 28 (46.67%) patients had ischemic heart disease; out of 33 patients 19 (57.58%) patients had the chest pain; 9 (27.27%) patients had breathlessness on exertion. (Fig. 5)

Table 1: Other relevant history

History	Number	%
Past	08	13.33
Family	22	36.67
Smoking	21	35
Alcohol consumption	16	26.67

In this study 8 (13.33%) patients had past history of ischemic heart disease and 22 patients (36.67%) had family history of hypertension in which 14 patients had family history of diabetes mellitus and hypertension in first degree relatives. 21 (35%) patients had smoking history, 16 (26.67%) patients had alcohol history and 13 (21.67%) patients had both smoking and alcohol history. (Table 1)

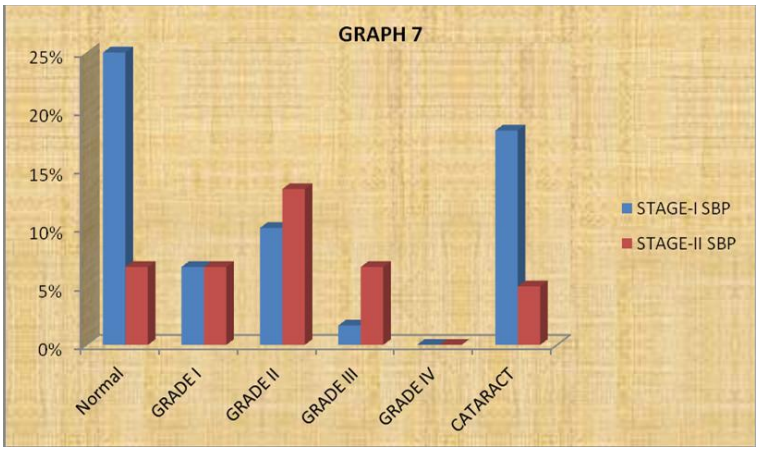

Fig. 6: Fundus examination

Ophthalmic and fundus examination was done for all the patients. Keith Wagner Barker classification was used. 19 patients (31.67%) had normal fundus; 14 patients (23.33%) had cataract; 8 patients (13.33%) had Grade I hypertensive retinopathy; 14 patients (23.33%) had Grade II hypertensive retinopathy; 5 patients (8.33%) had Grade III hypertensive retinopathy. Grade II hypertensive retinopathy was more common in both stage I and II SBP. Hypertensive retinopathy changes were more common in Stage II hypertension. (Fig. 6)

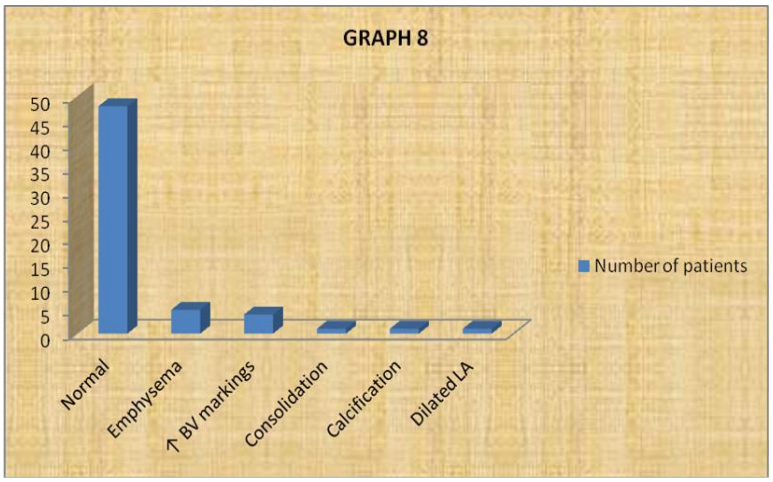

Fig. 7: Chest x-ray findings

In this study, 48 patients had normal chest X-ray, 12 patients had abnormal chest x-ray in the form of emphysematous changes in 5, increased bronchovesicular markings in 4 and consolidation, calcification and dilated left atrium in one patient each respectively. (Fig.7)

Table 2: Electrocardiographic findings

ECG findings	Number	%
Normal	28	46.67
Left ventricular hypertrophy	11	18.33
ST-T changes without LVH	18	30
ST-T changes with LVH	01	1.67
LBBB	02	3.33
RBBB	01	1.67
Atrial fibrillation	01	1.67

From above table it was evident that ischemic changes (31.67%) were most common electrocardiographic findings followed by left ventricular hypertrophy (18.33%). (Table 2)

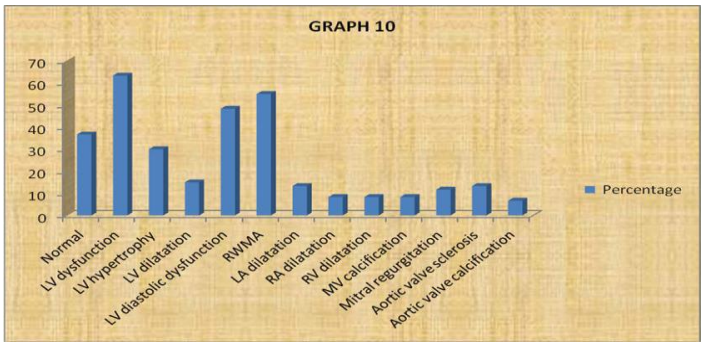

Fig. 8: Echocardiography findings

In this study, echocardiography showed left ventricular dysfunction in 38 patients (63.33%) in the form of left ventricular hypertrophy in 18 patients (30%), of left ventricular dilatation in 09 (15%), of left ventricular diastolic dysfunction in 29 (48.33%). Another common finding was 33 (55%) patients had regional wall motion abnormality. The regional wall motion abnormality were anterior in 18 patients (54.55%), lateral in 4 patients (12.12%), inferior in 3 patients (9.09%), septal in 4 patients (12.12%) and global hypokinesia in 1patient. (Table 10)

Statistical analysis was done. Student T-test was applied for above variables and mean age, mean cholesterol total and mean LV mass was found statistically significant between Stage I and II systolic blood pressure. (Table 3)

Table 3: Student T-test analysis

Variable	P-Value	Significance
Age	<0.05	Significant
Creatinine	>0.05	Not significant
Cholesterol total	<0.05	Significant
Serum triglyceride	>0.05	Not significant
High density lipoprotein	>0.05	Not significant
Low density lipoprotein	>0.05	Not significant
Left ventricular mass	<0.05	Significant
Ejection fraction	>0.05	Not significant

Chi-square was applied to the above variables and P value less than 0.05 was considered significant. The following variables were found to have association with systolic blood pressure in both stage I and II - symptom, chest pain, breathlessness, fatigue, smoking, proteinuria, electrocardiographic changes, of left ventricular hypertrophy and ischemia. (Table 4)

Table 4: Chi-square analysis

Variable	P-Value	Significance
Sex	>0.05	Not significant
Symptom	<0.05	Significant
Chest pain	<0.05	Significant
Breathlessness	<0.05	Significant
Fatigue	<0.05	Significant
Giddiness	>0.05	Not significant
Palpitation	>0.05	Not significant
Pedal edema	>0.05	Not significant
Altered sensorium	>0.05	Not significant
Weakness	>0.05	Not significant
Smoking	<0.05	Significant
Alcohol	>0.05	Not significant
Proteinuria	<0.05	Significant
ECG	<0.05	Significant
LV hypertrophy	<0.05	Significant
LVDD	>0.05	Not significant
Ischemia	<0.05	Significant

Factorial analysis was done for important variables, 64.62% of the problem were explained by first 6 variables only. The variables (1, 2, 5, 7 and15) are the significant clinical findings, the variables (08, 10) are the chief complaints of the patients (3, 9, 11, 12, 13) have the negative values indicating buckling load has exceeded. (Table 5)

Table 5: Factorial analysis

S. No.	Variable	Factor loading	Communalities
1	ST	+0.872	0.676
2	CT	+0.814	0.453
3	LVIDS	-0.077	0.809
4	LVM	+0.240	0.705
5	Ischemic	+0159	0.574
6	IVSD	+0.071	0.883
7	LV	+0.073	0.599
8	Chest pain	-0.148	0.418
9	LVIDD	-0.004	0.593
10	Dyspnea	-0.401	0.733
11	Palpitation	+0.016	0.767
12	Giddiness	-0.111	0.441
13	Fatigue	-0.005	0.722
14	LVPWD	+0.241	0.591
15	ECG	+0.095	0.729

Discussion

Isolated systolic hypertension is the commonest cause of raised blood pressure in older population. A common misconception among patients and practitioners is that elevated diastolic blood pressure is more important than elevated systolic pressure. In fact one of the key messages is in persons older than 50 years; systolic blood pressure of more than 140 mm of Hg is a much more cardiovascular risk factor than diastolic blood pressure. The present study aimed at detecting end organ complications of isolated systolic hypertension mainly on heart through electrocardiography and echocardiography in term of left ventricular hypertrophy, regional wall abnormalities, reduced ejection fraction, which may result /manifest as coronary artery disease, acute myocardial infarction and congestive cardiac failure.

Age is the important risk factor for development of complications in elderly hypertensive patients. Isolated systolic hypertension is strongly age dependent. Increased frequency of isolated systolic hypertension in elderly hypertensive patients has been reported in the age group of 65-74 years[4] and 87% in the age group of 60-69 years.[5] Similar studies have considered 60 years and above as a cut off point for studying isolated systolic hypertension in elderly.[3,6,7] In this study 60 patients with hypertension were studied with mean age 67.72+/-7.004 years which is similar to studies done earlier.[3,6,8]

In this study of 60 patients, there were 35 males and 25 females, similar to a study comparing rural and urban population showed that prevalence of isolated systolic hypertension was 59.9 per 1000 males and 69.9 per 1000 females, respectively in urban population and 35.5 and 35.9 per 1000 in males and females respectively in rural population.[9] Studies have shown female predominant of isolated systolic hypertension[10] and detected isolated systolic hypertension in 13.2% males and 10.31% females among elderly hypertensives.[3] It has observed male to female ratio of 1.3:1[6] and 1.6:1[8], which correlates with this study. This could be due to male dominance in our society. This could also be confirmed by the fact that the percentage of males coming as outpatients and inpatients are higher than that of female.

In this study, the most common clinical presentation was chest pain 48.33%, followed by breathlessness 38.37%. On detailed examination 33 (55%) patients had ischemic heart disease; out of 33 patients 16 (48.48) patients had the classical angina; 8 (25%) patients had breathlessness on exertion. Both these symptoms were statistically significant and were important predictors of cardiovascular complications. Hypertension is directly responsible for 57% of all stroke deaths and 24% of all coronary heart disease deaths in India.[9] In a study it was observed that atypical chest pain, sweating, breathlessness and giddiness were common presentation in the elderly group.[11] In contrast to this study others found headache as common symptom.[6] Brisighella Heart study also concluded that there was increased cardiovascular risk as systolic blood pressure increases.[12]

In this study, 22 patients had family history of hypertension and this confirms family history of hypertension as important risk factor of hypertension. Recent studies have shown family history of hypertension as an important determinant of

hypertension and reported 55.4% patients having family history of hypertension.[6]

In this study 32 patients had hypertension history less than 1 year, out of them 26 were newly detected and 7 were having histories less than 1 year, out of 7 patients 5 were not taking treatment.17 patients had hypertension since 1-5 years and 11 patients had hypertension since 6-10 years. From the above study it was evident that there is lack of knowledge in patients about hypertension and its complications.

Increasing severity of hypertension is associated with focal spasm and progressive general narrowing of arterioles as well as the appearance of hemorrhages, exudates and papilloedema. In this study, 8 patients had Grade I hypertensive retinopathy; 14 patients had Grade II hypertensive retinopathy; 5 patients had Grade III hypertensive retinopathy, 14 patients had cataract changes, 19 patients had normal fundus. Out of 27 patients, 16 of them were of Stage-2 systolic blood pressure. This shows that increasing systolic blood pressure also increases retinopathy along with cardiovascular risks and cerebrovascular risks and found Grade II hypertensive retinopathy in 50.5% patients.[6] It has been demonstrated that hypertension seldom occurs in isolation of other atherogenic risk factors with which it tend to cluster. This clustering with other metabolically linked risk factors has been shown to reflect, insulin resistance promoted by weight gain and abdominal obesity which was shown to be the major determinant of hypertension in general population.

Dyslipidemia is as important factor for atherogenesis. Accelerated atherosclerosis is an invariable companion of hypertension. In this study 36 patients (60%) had dyslipidemia and total cholesterol was found statistically significant and was similar to a study done where dyslipidemia was seen in 55.9%.[6] In Framingham study incidence of myocardial infarction was directly related with increase in total cholesterol levels and inversely related to low high density lipoprotein levels in women. Similar results were obtained for men in Copenhagen male study which supports this present study.[13] According to American Heart Association guidelines for hypertension in elderly, it is observed that dyslipidemia is concomitant in elderly patients and it was observed in PROSPER and HYVET trial dyslipidemia was common.[14]

Systolic blood pressure is a continuous variable and its associated risks increases from the lowest to the highest values. This had been shown by the analysis of data from multiple risk factor intervention trial.[15] In this study 37 patients had systolic blood pressure between 140-159 mm of Hg and 23 patients had systolic blood pressure 160 mm of Hg and above. Stage I systolic blood pressure was common and male predominance was seen in our study. Common age group was between 60 to 70 years. Systolic blood pressure was associated with complaints like chest pain and breathlessness, smoking history, proteinuria, hypertensive retinopathy, dyslipidemia, left ventricular hypertrophy and ischemia. Alex Sagie et al, found that patients with borderline isolated systolic hypertension were at an increased risk of cardiovascular disease.[16] The increased frequency of cardiovascular risk was even more striking when compared with those with optimal blood pressure. Brisighella Heart study and a similar study pointed that systolic blood pressure as a key determinant of mortality.[12,15] However; another study done using multivariant analysis demonstrated that there is no evidence that liability of pressure independently influences cardiovascular risk in subjects with isolated systolic hypertension.[2]

Coronary artery disease is the major cause of morbidity and mortality in both elderly men and women. Hypertension either systolic/diastolic or isolated systolic hypertension is considered as a major risk factor for Coronary heart disease. In this study ischemic heart disease was diagnosed in 55% patients. The clinical profile of these patients was 60 patients out of 48.33% had chest pain and 38.33% of them also had breathlessness. Out of these 33 (55%) patients, 18 (54.55%) had anterior, 4 (12.12%) lateral, 3 (9.09%) inferior, and 4 (12.12%) septal infarcts. 1 patient had global hypokinesia and 3 patients had more than one segment involvement. And similar study reported 32.3% incidence of ischemic heart disease.[6] Brisighella heart study reported 22.82% incidence of ischemic heart disease.[12] Studies done previously indicated the importance of isolated systolic hypertension in the development of coronary artery disease and prevention of congestive heart failure and progression from less severe to more severe hypertension is probably more significant in the elderly.[2, 15] One of the study demonstrated a highly statistically significant reduction (48%) in the occurrence of congestive heart failure as a result of treatment for relatively short period in elderly hypertensive.[17]

ST-T changes suggesting myocardial ischemia was the commonest electrocardiographic manifestation seen in this study. Among 60 patients, 32 patients had abnormal findings. Out of these 18 (30%) had ischemic changes, 11(18.33) had left ventricular hypertrophy changes, one had both ischemia and left ventricular hypertrophy. Many studies observed cardiovascular complications 19%, left ventricular hypertrophy in electrocardiogram in 36.8% patients[6] and 47% patients.[7] Hypertension is directly responsible for 57% of all stroke deaths and 24% of all coronary heart disease deaths in India.[9] The incidence of cardiac disease was 15.7% out of which incidence of left ventricular failure -59.7% myocardial infarction -24.3%, angina pectoris was 16.2%.[18] Sensitivity to detect left ventricular hypertrophy by electrocardiography was 37%. In our study Echocardiogram was done for all 60 patients. Out of 60 patients, 60% had left ventricular dysfunction in the form of left ventricular hypertrophy in 18 (30%)

patients. Left ventricular dilatation in 9 (15%) patients. Left ventricular diastolic dysfunction in 29 (48.33%) patients and regional wall motion abnormality in 33 (55%) patients.

Conclusion

In this study of elderly patients of 60 years and above, mean systolic blood pressure increases with age until the 8th decade and may be beyond. Chest pain and breathlessness were the commonest clinical presentations. Smoking, family history and dyslipidemia are associated risk factors. Electrocardiographic and echocardiographic evidence of significant left ventricular hypertrophy and left ventricular dysfunction and ischemia respectively, are the commonest investigative findings. So the goal of treatment of hypertension in geriatric patients should be to reduce the blood pressure to less than 140/90 mm of Hg and to maintain at the level, 120-139 of systolic blood pressure and 80-89 of diastolic blood pressure.

Acknowledgment

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