



“ A STUDY OF CARDIOVASCULAR ABNORMALITY IN HYPERTENSIVE PATIENTS”

General Medicine

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ABSTRACT

Introduction: Hypertension is a common health problem in developed countries and a major risk factor for cardiovascular diseases. Hypertension exhibits an iceberg phenomenon where unknown morbidity exceeds the known morbidity. Genetic and environmental factors are also reported to play a key role in hypertension, 90% of which are better classified as idiopathic. The cause of cardiovascular diseases in the hypertensive patient is blood pressure raised which is present chronically however the cause of elevated BP are different. In adults, 90% of hypertension cases are of essential hypertension. The Remaining 10% of hypertension cases with chronically elevated BP accounts for secondary cause. In hypertensive patient, the risk of cardiovascular disease is increases in men and women. Hypertension and diabetes mellitus are among the most common chronic non-communicable diseases and multifactorial disorders affecting both developed and developing countries and occur at a higher prevalence in the older age group and result from both genetic and environmental etiological factors. The aim of Study of Cardiovascular Abnormality in the Hypertension Patient. **Methods:** A prospective observational study consists of 95 cases of hypertension is undertaken to study the cardiovascular abnormality by ECG and ECHO. The study will be conducted on patients suffering from hypertension. A written informed consent will be taken from all the patients who are included in study group. All the data of the patients will be recorded on a pretested Performa. Preliminary data like name, age, sex, occupation, residence, date will be recorded. Detailed lipid profile study will be done to find the correlation in patients with hypertension. All data will be statistically analyzed. **Results:** Out of 95 cases in the study group, 51 were female cases and 44 were males, 31 cases (7th decade), 40 cases (6th decade), 14 cases (5th decade), 8 cases (4th decade), 2 cases (< 3rd decade). Abnormal ECG changes which constitutes 85 patients, ST elevation was present in 12 patients and T-wave inversion was present in 47 patients, followed by 16 patients were shows left ventricular hypertrophy, 8 cases of cardiomyopathy which shows low voltage complexes. Coronary artery disease was predominant finding in the patients of hypertensive cardiovascular disease which was present in 54 cases out of 95 cases, of which 31 were male patients and 23 were female patients. CAD in hypertension (57%), the incidence of CAD was more in elderly and other abnormalities in hypertensive patients were left ventricular hypertrophy (11.6%), heart failure {due to cardiomyopathy (8.2%) and CAD} and valvular heart disease (4.2%). **Conclusion:** Cardiovascular abnormality in hypertensive patients encompasses a broad spectrum including coronary artery disease, asymptomatic LVH (either a concentric or an eccentric pattern) and clinical heart failure (with either a preserved or a reduced LVEF) stroke, heart failure, cardiomyopathy, arrhythmia, aortic aneurysms, peripheral artery disease, thromboembolic disease, and venous thrombosis. Elderly age, smoking habits, chronic alcoholism and long standing history of DM have emerged as important risk factor for cardiovascular disease in hypertensive patients.

KEYWORDS

Hypertension, Cardiovascular, LVH, DM, CAD.

INTRODUCTION

Hypertension is considered to be one of the most common causes of morbidity and mortality affecting human. Hypertension is a common health problem in developed countries and a major risk factor for cardiovascular diseases.¹ Hypertension exhibits an iceberg phenomenon where unknown morbidity exceeds the known morbidity. The prevalence of Hypertension is rapidly increasing in developing countries and is said to be one of the leading causes of death and disability among the elderly.² High blood pressure in adults has a high impact on the economy and on the quality of life of individuals with important implications for resource expenditures.³

The cause of cardiovascular diseases in the hypertensive patient is blood pressure raised which is present chronically however the cause of elevated BP are different. In adults, 90% of hypertension cases are of essential hypertension. The Remaining 10% of hypertension cases with chronically elevated BP accounts for secondary cause.

According to Framingham study hypertension accounts for about one quarter case of heart failure⁴. In several studies the elderly population as many as 68% of heart failure cases are attributed to hypertension⁵ and several community based studies have demonstrated that 50-60% of patients with hypertension may contribute to the development of the cardiovascular disease such as coronary artery disease, heart failure. In hypertensive patient, the risk of cardiovascular disease is increases in men and women. Uncontrolled and prolonged elevation of BP can lead to variety of changes in the cardiovascular disease like myocardial structure, coronary vasculature in the conduction system of heart.

Hypertension and diabetes mellitus are among the most common

chronic non-communicable diseases and multifactorial disorders affecting both developed and developing countries and occur at a higher prevalence in the older age group and result from both genetic and environmental etiological factors.⁶ When hypertension coexists with diabetes mellitus, the risk of cardiovascular disease is increased by 75%, which further contributes to the overall morbidity and mortality of already high risk population.

AIMS AND OBJECTIVES-

A Study of Cardiovascular Abnormality in the Hypertension Patient.

MATERIAL AND METHODS

The study will be carried out at R.D. GARDI MEDICAL COLLEGE and C R GARDI HOSPITAL, UJJAIN subject to approval by ethical committee, in the department of General Medicine. The study will be conducted on patients suffering from hypertension. A written informed consent will be taken from all the patients who are included in study group. All the data of the patients will be recorded on a pretested Performa. Preliminary data like name, age, sex, occupation, residence, date will be recorded. Detailed lipid profile study will be done to find the correlation in patients with hypertension. All data will be statistically analyzed.

Study Design:-

A prospective observational study consist of 95 cases of hypertension is undertaken to study the cardiovascular abnormality by ECG and ECHO.

INCLUSION CRITERIA:-

A. Diagnosed having as hypertension by physician/cardiologist or

being on antihypertensive treatment B. Patients providing written informed consent C. Age from 18 and above D. Sex: Both male and female

EXCLUSION CRITERIA:-

A. Age less than 18. B. Unwilling or unable to give informed consent for the study. C. Congenital heart disease. D. Patient with renal disease or impair renal parameters. E. Other causes of secondary hypertension.

Investigation details:-

CBC, Serum creatinine, Urine routine microscopy, ECG, Ultrasonography KUB, Chest X-ray, 2D Echocardiography, Renal color Doppler. An electrocardiogram is a simple, painless test that measures your heart's electrical activity. It's also known as an ECG or EKG. A 12 lead ECG with 25mm per sec speed with 10mv standardization was taken of every patient diagnosed with hypertension. 2D Echo is a procedure in which sound waves are directed to heart from a small hand held device called a transducer, which sends and receive signals. Heart wall and valves reflect part of the sound waves back to the transducer to produces real time picture of the heart on the screen which can be recorded or printed for future reference. It can provide a wealth of helpful information, including the size and shape of the heart (internal chamber size quantification), pumping capacity, and the location and extent of any tissue damage. All the patient diagnosed with hypertension were subjected to 2D Echo.

Data Collection and Statistical Analysis

The data regarding history, clinical examination, routine and special investigations of study cases entered in pretested proforma and observations were tabulated. Statistical software namely SPSS 17.0 was used for the analysis of data mean value of the findings were compared among and between groups. Analysis of variance (ANOVA) test and Unpaired 't' test were done to assess the significance among the groups and between groups respectively. 'p' value <0.5 were considered significant. Microsoft word and excel have been used to generate graphs, tables and descriptive statistics.

Results Table 1 - Clinical Profile Of Patients

Age	No. of cases	%
≤30	2	2.1
30-40	8	8.4
41-50	14	14.7
51-60	40	42.1
61-70	31	32.6
DM		
Absent	76	80.0
Present	19	20.0
CAD		
Absent	41	43.2
Present	54	56.8
ECG		
Normal	10	10.5
Abnormal	85	89.5
CXR		
Normal	86	90.5
Abnormal	9	9.5
USG - KUB		
Normal	94	98.9
Abnormal	1	1.1
2D-ECHO		
Normal	18	18.9
Abnormal	77	81.1

In the present study, this is total 95 hypertensive cases, out of ninety five (95), maximum forty(42.1%) cases were in the sixth decade and minimum two (2.1%)cases were in the below thirty years of age followed by thirty one(32.6%) in the seventh decade, fourteen were in fifth decade and eight were in fourth decade. hypertension is associated with diabetes, out of 95 cases nineteen (20%)cases were diabetic. fifty four(56.8%) cases with CAD and forty one (43.2%) cases with non CAD. In the present study, there is ECG finding, out of 95 cases eighty five (89.5%) were found abnormal and ten (10.5%) were normal. Insignificant relation with CXR, only nine(9.5%) were abnormal out of 95 cases, rare finding in USG-KUB, only one(1.1%) case were abnormal out of 95 cases. In the present study, there were 2D ECHO finding very significant, out of 95 cases seventy seven(81.1%) were abnormal. (Table-1)

Table -2 Distribution of DM in different causes

DM	CAD		Total
	Absent	Present	
No	37	39	76
Yes	4	15	19
DM	ECG		Total
	Absent	Present	
No	9	67	76
Yes	1	18	19
CXR			
No	69	7	76
Yes	17	2	19
2D ECHO			
No	15	61	76
Yes	3	16	19
Sex	CAD		Total
	Absent	Present	
Male	13	31	44
Female	28	23	51
ECG			
Male	4	40	44
Female	6	45	51
2D-ECHO			
Male	5	39	44
Female	13	38	51

In the present study, out of 95 cases, nineteen cases were found diabetes and out of 19 diabetes cases 15 cases were associated with CAD. of 95 cases, nineteen cases was found diabetes and out of 19 diabetes cases 18 cases were shows abnormal ECG. 16 cases were shows abnormal 2D-ECHO and 3 were normal.(Table-2) In the present study, there were thirty one male cases with CAD while twenty three female cases with CAD. Out of 95 cases, 85 cases were with abnormal ECG, among them there were forty male cases and forty five female cases. seven cases were with abnormal 2D echo, among them there were thirty nine male cases and thirty eight female cases. (Table-2)

Table 3- Distribution of hypertensive cardiovascular Abnormalities according to electrocardiographic Changes

ECG Changes	Frequency	%	Cummulative %
AWMI	29	30.6	30.6
IRREGULAR RATE	2	2.1	31.6
IWMI	18	18.9	50.5
LOW VOLTAGE	6	6.3	56.8
LOW VOLTAGE TWAVE INVERSION IN LATERAL LEAD	2	2.1	57.9
LVH	16	16.8	75.8
LWMI	8	8.4	84.2
NORMAL	10	10.5	94.7
NSTEMI-AWMI	1	1.1	95.8
NSTEMI-IWMI	1	1.1	96.8
NSTEMI-LWMI	2	2.1	98.9

In the present study, the predominant electro-cardio-graphic changes in the hypertensive cardiovascular abnormalities was includes CAD(total fifty nine (63.5%) cases out of 95 cases) which further includes anterior wall myocardial infarction twenty nine(30.6%), inferior wall myocardial infarction eighteen (18.9%), lateral wall myocardial infarction eight(8.4%),some cases of non ST elevation myocardial infarction were also found which include anterior wall myocardial infarction one(1.1%), inferior wall myocardial infarction one(1.1%), lateral wall myocardial infarction two(2.1%), followed by sixteen(16.8%) patient were shows left ventricular hypertrophy, eight(8.4%) cases of cardiomyopathy which shows low voltage complexes, two (2.1%) cases of irregular heart rate and ten(10.5%) patients were shows normal electro-cardio-graphic. (Table 3).

DISCUSSION

Hypertension is estimated to cause 4.5% of current global disease burden and is as prevalent in many developing countries, as in the developed world. Blood pressure-induced cardiovascular risk rises continuously across the whole blood pressure range.

Age and Gender Distribution

In the present study, out of 95 cases in the study group, 51 were female cases and 44 were males, 31(male-14, female-17) – 7th decade,

40(male-15, female-25) – 6th decade, 14(male-10, female-4) – 5th decade and 8(male-4, female-4) – 4th decade, 2(male-1, female-1) - <3rd decade.

In this study of cardiovascular abnormality in hypertensive patients, 54 cases were found CAD, among them male were 31 while female 23, 14 male and 12 female (7th decade), 6 male and 6 female(6th decade), 6 male and 3 female(5th decade), 4 male and 1 female(4th decade), 1 male and 1 female(<3rd decade). Age is the important risk factor for development of George Fodor, Ottawa. The Canadian heart survey, Dr.W. S. Aronow, New York. World Health Organization (WHO)/International society of hypertension (ISH) statement on management of hypertension ; all the above mention studies reported increased frequency of ISH in elderly hypertensive patients in the age group of 60-70 years Prevalence of cardiovascular disease in hypertension in different age groups (51-60) > (61-70) > (41-50) > (31-40) > (<30). Most of the studies agree with the fact that prevalence of hypertensive cardiovascular disease increased with age. In a study in France, Marre et al⁷, reported HT is associated with diabetic cases. The occurrence of HT in diabetic patients increases significantly the risk of coronary artery disease, mortality and nephropathy. Physiological maneuvers, such as calorie and salt restriction and regular physical exercise, are shown to improve tissue sensitivity to insulin and hence lower blood pressure both complications in elderly hypertensive patients. Isolated systolic hypertension is strongly age dependent. This age dependent pattern of increasing rates of ISH is observed in Framingham heart study. Roger Y.M. Wong⁸, university of British Columbia, Anne-Sophie Rigaud, Bernard Forette⁹, France. J. in normotensive and hypertensive diabetics. Hence, control of DM and HT by appropriate methods, particularly dietary restriction of calories and sodium, and regular physical exercise, must be highlighted in order to decrease both the prevalence of HT and NIDDM. Today, DM and HT no longer remain a disease of the high socioeconomic status or confined to urban area.

Several trials have demonstration a significant reduction in morbidity from cardiovascular disease with the treatment of hypertension in elderly persons. The pilot trial of the hypertension in the elderly patient study showed a reduction in morbidity and mortality from stroke with less of a reduction in death from cardiac condition in elderly patients who are treated. Hypertension in elderly persons has a particularly hazardous connection with morbidity and mortality from cardiovascular disease and stroke. The mechanism of hypertension are different if not greatly so, in the elderly population. Peripheral vascular resistance play a major role.

In Framingham heart study 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 factor 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.

Prevalence of cardiovascular disease (CAD)

Coronary artery disease is a major cause of morbidity and mortality in both elderly men and women. In present study CAD was diagnosed in 54 cases out of 95 cases, among them male were 31 and female were 23, there were 33 old cases and 21 new cases. Past history of CAD was present in 33 patients out of which, 15 had ischemic heart disease, 11 had old anterior wall myocardial infarction, 7 had old inferior wall myocardial infarction. Presently, the CAD is seen in 21 patients out of which 9 had presented with Ischemic heart disease, 12 had presented with myocardial infarction (5-AWMI, 7- IWMI). Sandhya Kamath et al¹⁰ reported 32.3% incidence of CAD. Cloudio Borbhi et al¹¹ reported 22.82% incidence of CAD. Kannel WB et al¹² and Neaton et al¹³ indicated the importance of hypertension in the development of CAD.

LVH

Left ventricular hypertrophy was the commonest ECG manifestation. LVH was observed in 16 cases. Welfred S. Hessen et al¹⁴ found LVH IN 47% cases. Krumholz et al¹⁵, pasty et al¹⁶ have shown higher LV mass index in ISH individual compared with normotensive control subjects. In present study 11 cases had evidence of concentric LVH in Echocardiography, while 16 patient had evidence of LVH in ECG. There was discrepancy in the incidence of LVH by ECG and 2D echo in our study. This was due to the fact that echocardiography is the most sensitive predictor of LVH. This observation is concurrent with Vijan SG. et al¹⁷ and sandhya Kamath et al¹⁰. Jagdish butany, observed with

advancing age, the cardiovascular system undergoes subtle but progressive changes that result in altered function. The endocardium becomes thicker and opaque, left ventricular wall thickness increases and there is increased interstitial fibrosis in the myocardium.

Although myocyte size increases, the number of myocytes decreases, as does the number of cells in the conduction system. The decrease in the filling rate of LV in early diastole augmented by atrial contraction. Maximum achievable heart rate and ejection fraction (with exercise) decreases. All these changes make increasing age a significant independent risk factor for heart failure, the most common reason for hospitalization in patient older than 65 years.

Heart Failure

In present study, the prevalence of heart failure was : 10 cases of CCF and 4 cases of LVF were found. The prevention of CCF and progression from less severe to more severe hypertension is probably more significant in the elderly. Moser M. et al demonstrated a highly statistically significant reduction (48%) in the occurrence of CCF as a result of treatment in elderly hypertensive patients. A study of Ramakrishnan et al^{18,19}, observed increase prevalence of heart failure in hypertension.

ECG Changes In Hypertensive Patients With Cardiovascular Abnormality

ECG was abnormal in 85 patients and normal in 10 patients out of 95 patients of hypertensive cardiovascular abnormalities. Among abnormal ECG which constitutes 85 patients, ST-T changes in the form of ST elevation was present in 12 patients and T-wave inversion was present in 47 patients. T-wave abnormalities were noticed in maximum in anterior leads followed by inferior and lateral leads, followed by 16 patients were shows left ventricular hypertrophy, 8 cases of cardiomyopathy which shows low voltage complexes. Douglas et al, observed ST-T changes and low voltage complexes.

2D Echo Changes In Hypertensive Patients With Cardiovascular Abnormality

As a non-invasive method echocardiography can play important role in recognizing the cardiac pathology as well as to follow up the effect of the therapy. In the present study echocardiography findings were abnormal in 76 patients, Coronary artery disease was predominant finding, which was present in 54 cases of which 31 were male patients and 23 were female patients. Other 2D echo findings were left ventricular hypertrophy which was present in 11 patients, cardiomyopathy in eight (8.2%) patients, valvular heart disease in four (4.2%) patients and in four (4.2%) patients 2D echo was normal. A study by Alex Sagie et al showed high prevalence of CAD in hypertensive patients. Douglas et al also showed high prevalence of CAD. Psaty et al showed that hypertension is strongly related to some measure of sub-clinical cardiovascular disease.

LIMITATION

This study was conducted on 95 patients at tertiary care hospital. The finding of the study cannot be extrapolated to the general population which requires larger study. The limitation of our study was patient with poor follow up. Lipid profile and serum uric acid are the important risk factors of cardiovascular abnormality which could not be done in present study.

SUMMARY

It was an observational study which constituted a total number of 95 patients which were divided on the basis of ECG and Echocardiography.

Out of 95 cases in the study group, 51 were female cases and 44 were males, 31 cases (7th decade), 40 cases (6th decade), 14 cases (5th decade), 8 cases(4th decade), 2 cases (< 3rd decade). In 95 cases it is observed that according to habits, 32 cases were found smoker and alcoholic and 8 cases were smoker and nonalcoholic and 55 cases were nonsmoker and nonalcoholic. Abnormal ECG changes which constitutes 85 patients, ST elevation was present in 12 patients and T-wave inversion was present in 47 patients, followed by 16 patients were shows left ventricular hypertrophy, 8 cases of cardiomyopathy which shows low voltage complexes. Echocardiography findings were abnormal in 76 patients, Coronary artery disease was predominant finding, which was present in 54 cases of which 31 were male patients and 23 were female patients. Other 2D echo findings were left ventricular hypertrophy which was present in 11 patients,

cardiomyopathy in 8 patients, valvular heart disease in 4 patients coronary artery disease was predominant finding in the patients of hypertensive cardiovascular disease which was present in 54 cases out of 95 cases, of which 31 were male patients and 23 were female patients. CAD in hypertension (57%), the incidence of CAD was more in elderly and other abnormalities in hypertensive patients were left ventricular hypertrophy(11.6%), heart failure {due to cardiomyopathy (8.2%) and CAD} and valvular heart disease(4.2%).

CONCLUSION

In this study of cardiovascular abnormality in hypertensive patients, incidence increases with age, male were commonly affected and however, female were commonly affected during postmenopausal. Elderly age, smoking habits, chronic alcoholism and long standing history of DM have emerged as important risk factor for cardiovascular disease in hypertensive patients. Risk factor stratification, screening of patient with ECG and Echocardiography should be advice in all hypertensive patient to reduce the morbidity and mortality associated with cardiovascular diseases.

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