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Original Research Article

Clinical Profile of Isolated Systolic Hypertension and It's Cardiovascular and Renal Complications in RIMS, Kadapa

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ABSTRACT

Hypertension, its risk factors and complications is very poor. Hence, hypertension goes undiagnosed and untreated for a long time. Hence the present study is undertaken to study the clinical profile of isolated systolic hypertension (systolic > 140 and diastolic ≤ 90 mmHg in elderly (above the age of 60 years), to find out any other associated risk factors, any end organ complications, specially on cardia through electrocardiography and echocardiography and on kidney through creatinine clearance. The present cross-sectional study was undertaken on patients attending the Outpatient Department. The study group comprised of 75 elderly patients who had isolated systolic hypertension. Using Chi square test correlation of age with stage of BP, association of risk factors with ISH and Stage III BP and ECG changes with LVH calculated. It concluded that ISH associated with risk factors has definite effect mainly on cardia in terms of LV hypertrophy and on kidney in terms of reduced creatinine clearance is an even better predictor of morbidity and mortality than is diastolic blood pressure.

Keywords: Clinical profile, isolated systolic hypertension, cardiovascular, renal complication.

INTRODUCTION

In India awareness of hypertension, its risk factors and complications is very poor. Hence, hypertension goes undiagnosed and untreated for a long time. Indeed the JNC- 7 and JNC- 8 report states that in persons older than 60 years, systolic blood pressure is a much more important cardiovascular disease risk factor than diastolic blood pressure. [1] Hence the present study is undertaken to study the clinical profile of isolated systolic hypertension (systolic > 140 and diastolic ≤ 90 mmHg in elderly (above the age of 60 years), to find out any other associated risk factors, any end organ complications, specially on cardia through electrocardiography and echocardiography and on kidney through creatinine clearance. Hence the main aim of the study is to evaluate the clinical profile of isolated systolic hypertension (SBP> 140 mmHg and DBP ≤ 90 mmHg) in elderly patients (60 Yrs and above). Aims & Objectives: To detect left ventricular hypertrophy in such patients by electrocardiography and echocardiography. To study the effect of isolated systolic hypertension on kidney.

MATERIALS AND METHODS

The present cross-sectional study was undertaken on patients attending the Outpatient Department as well as in-patients of Rajiv Gandhi institute of Medical sciences, during the period from Jan 2016 to august 2017. The study group comprised of 75 elderly patients (Male=49, Female=26) of the age group of 60 to 89 years. All of these patients had isolated systolic hypertension i.e. (SBP> 140 mmHg and DBP ≤ 90

mmHg), first time detected. Patients above 60 years. Patients with isolated systolic hypertension (SBP >140mmHg and DBP≤ 90mmHg) were included in the study. Patients below 60 years of age. And patients with previous history of hypertension or hypertensives on medication. Patients having chronic kidney disease due to etiology other than hypertension like diabetes, glomerulonephritis, sickle cell anemia, CCF. Patients having secondary hypertension Patients on any herbal medication, HIV were excluded.

Detailed evaluation medical status of these patients was done. The evaluation comprised of detailed clinical history, thorough physical examination with relevant investigations. Blood pressure recording was done as per JNC VII recommendation. Standard mercury sphygmomanometer properly calibrated and validated instrument is used. An appropriate sized cuff (Cuff bladder encircling atleast 80% of the arm) used. Patients were seated quietly for at least 5 minutes in a chair, with feet on the floor and arm supported at heart level. Standing blood pressure was recorded. At least two measurements on each of 2 or more visits and mean of the three readings were taken. The first appearance of the sound (phase I, Korotkoff) is the SBP and the disappearance of the sound (phase V) is the DBP. Blood pressure recordings were documented and staging of ISH was done. General physical examination and systemic examination was done. Height and weight measured for each patient. Body surface area was calculated using the Dubios formula: BSA (m^2) = 0.007184 x [weight (kgs)]$^{0.425}$x [Height (cm)]$^{0.725}$ Waist and hip ratio calculated. Detailed fundoscopic examination done and hypertensive retinopathy was graded to assess target organ damage. Fundoscopic findings were confirmed by an ophthalmologist, who was blinded to clinical and echocardiographic findings. Routine investigations in Hb%, TC, DC, urine – albumin, sugar, microscopy done. Hb less than 12 gm were excluded. Blood test, FBS, PPBS, urea creatinine and lipid profile was done. Creatinine above 1.4 mg% was excluded. Electrocardiography: ECG was recorded at 25 mm/sec speed and 10 mm/mv standardization.

The following were analyzed for LVH:

1. Sokolow-Lyon criteria (SLC): SV1+RV5 or V6 (whichever is greater) ≥ 35 mm
2. Modified Romhilt-Estes point score system.

These criteria were selected since they are most commonly used in diagnosis of LVH.

Echocardiography: 2-D guided M-mode echocardiography was done by an experienced echocardiographer on a Hewlett Packard Color Doppler machine using 3.5 MHz phased array sector transducer. The echocardiographer was blinded to ECG results." M-mode echocardiographic measurements were obtained using parasternal long axis view, at the mid cavity level as defined by the tip of papillary muscle. The measurements of Left Ventricular Internal Dimension (LVIDd), Inter-Ventricular Septal Thickness (IVSTd) and Posterior Wall Thickness (LVPwd) were made at the end. Diastole is defined by the peak of R-wave on a simultaneously recorded ECG.

Measurements were done using the ASE convention (Standard convention). In ASE convention, the thickness of the endocardial surfaces is excluded from the measurement of LVIDd and included in the measurement of interventricular septum and posterior wall thickness. The mean measurement of three consecutive beats was taken. ASE cube LV mass was calculated by the formula.

ASE Cube LV mass = 1.04 (LVIDd + IVSTd + LVPWD)^3-(LVIDd)^3

Since this method overestimates the LV mass by a mean of 25%,correction of the overestimation is done by using the equation:

LV mass = 0.80 (ASE-cube LV mass) + 0.6 gms. The LV mass was indexed to body surface area.

LVMI = LV mass/BSA and expressed as gms/m^2.

All the values were expressed as mean±SD. Sex specific partition values were defined based on the normal values suggested for Indian population. Echocardiographically determined LV mass was taken as the gold standard and each electrocardiographic criteria were correlated with the echo LV mass.

The ejection fraction is a global index of left ventricular fibre shortening and is generally considered as one of the most meaningful measures of LV pump function. Angiographic studies have shown that the normal ejection fraction averages 72%-8% and ranges from 56% to 78%. Ejection fraction, which is the ratio of the stroke volume to the end diastolic volume noted for each patient

EF =EDV-ESV X 100 EDV

Regional wall motion abnormality, if present was noted.

Normal range
LVIDd = 3.6 to 5.4cms
LVPWD = 0.6 to 1.1cms
IVSTd = 0.6 to 1.1cms
LVDs = 2.4 to 4.2 cms

LV dilatation: Cavity volume ≥ 90 ml/m^2

Patients having cavity volume > 90 ml/m^2 were noted.

Statistical Analysis:

Chi square and Fisher exact test have used to find the significance of proportion of risk factors between increased LVMI and Normal LVMI.

RESULTS

- 53.33% of the patients are in the age group of 66-75 years.
- Females are more in the age group of < 70 years than males with p=0.063.
- Correlation of age with stage of blood pressure

Table 1

Age in years	Stage 1 (140-159)		Stage II (160-179)		Stage III (>180)	
≤ 60 years	1	3.70	-	-	-	-
61-65	12	44.44	1	3.70	2	9.52
66-70	11	40.74	8	29.63	3	14.29
71-75	1	3.70	13	48.15	4	19.05
76-80	1	3.70	5	18.52	8	38.10
>80	1	3.70	-	-	4	19.05
Total	27	36.00	27	36.00	21	28.0
Mean ± SD	66.67 ± 5.56		72.56 ± 4.01		± 6.72	

57.3% are asymptomatic, 42.7% are symptomatic. Symptomatic patients are more in the stage III BP group with p<0.001. Symptoms include breathlessness, swelling of lower limbs, dizziness, headache, headache, blurred vision, palpitations, motor weakness.

Associated risk factors with ISH:

Table 2

Associated Risk factors (n=75)	Number	%
BMI (>25)	23	30.7
Waist/Hip Ratio (Males >0.9, Females>0.8)	33	44.0
DM +	31	41.3
Smoke +	20	26.7
Dyslipidemia	29	38.7

Patients with stage III BP are more likely to develop abnormal retinal changes with p=0.087. Electrocardiographic changes regarding LVH:

Table 3

ECG (n=75)	Number	%
Sokolow-Lyons Positive (≥35 mm)	27	36.0
Romhilt-Estes scores (≥5 points)	21	28.0

- It is observed in the present study, female patients are more likely to develop increased LVMI compared to male counterparts with p=0.028.
- Comparison SLC and RES with Echo LVH

Table 4

Diagnosticstatistics	SLC as compared to echo LVH	RES ascompared to echo LVH
Sensitivity	47.22	41.67
Specificity	62.96	84.62
PPV	74.36	71.43
NPV	60.42	61.11
Accuracy	61.33	64.00
Kappa	0.22	0.27

Both SLC and RES are having less diagnostic value in comparison to Echo LVH, however the RES is better than SLC in term of Accuracy and Kappa co- efficient of agreement.

Association of GFR with stage of blood pressure

Table 5

Stage of blood Pressure	GFR ≤60	GFR > 60
Stage I	5	22
Stage II	8	19
Stage III	14	7

The P value is 0.00181, which is statistically significant.

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 of JNC VII is in persons older than 50 years, systolic blood pressure of more than 140 mmHg is a much more cardiovascular risk factor than DBP.

The present study aims at detecting end organ complications of ISH mainly on cardia through ECG & ECHO in term of left ventricular hypertrophy, regional wall abnormalities, reduced ejection fraction, which may result /manifest as CAD, MI & CCF, and on kidney by measuring creatinine clearance.

Study comprised of 75 patients out which 49 were males and 26 females. Male constituted 65.33% females constituted 34.67%. Mean age was 71.236. 47%, with male to female ratio 1.91: 1. 53.33% of the patients presented were in the age group of 66-75 years.

Comparing the present study with other studies Dwivedi S., et al (2000) found mean age 67.36±6.23 years (60-90 years) and male to female ratio 1.44:1. [2]

Systolic hypertension in elderly programme (SHEP) trial found mean age 72 years and mean blood pressure 170/77 mmHg. Michael A. Colandrea et al found mean age 69.7 years. [16] Thomas Kuruvilla et al found the proportion of hypertensives suffering from ISH, increases with age in those more than 70 years. [4] 75.6% of men and 82.1% of women with hypertension had ISH. ISH is significantly more in women than in men. In the present study also females are more prone for ISH.

Symptomatology: In the present study 57.5%of the patient's were asymptomatic. Breathlessness was the major symptom (34.7%) followed by swelling of the limbs, (25.3%) chest pain (20%) headache (14.7%), blurred vision giddiness constituted (5.3%), palpitation motor weakness (2.7%). Stage III blood pressure group constituted more of the symptomatic patients (7.6 times significantly more).

Vrinda et al. [5] found (32%) were asymptomatic among the symptomatic headache was common presentation (77.9%). However the age group in this study ranged from 60- 65 yrs, whereas in present study it ranges from 60-89 yrs.

Anthropometry: In the present study average weight for females was 58.08 8.74, average BMI was 25.99+5.06 compared to male (Weight 61.98 10.92 and BMI 23.17 5.09. Average waist/hip ratio for females was 0.92+0.15 compared to males 0.82+0.16 BMI and waist hip ratio were significantly more in the females.

Wilking et al found that age and obesity in women are significant variables in the evolution of ISH. [6]

Associated Risk Factors: 30.7% of the patients had BMI more than 25 (overweight). 44% of the patients had waist by hip ratio more than (0.9) in males and 0.8 in females41.3% of the patients had diabetes mellitus. Dwivedi S et al found that 31.41% of the patients had diabetes mellitus. [2]

N. C., Hazarika et al found that age, BMI, waist/hip ratio are associated significant risk

factors. However smoking is negatively associated. [7]

Dyslipidaemia: 38.7% of the patients had dyslipidaemia. Among these patients, 28% of the patients had isolated low HDLC (normal HDLC >50 mg/dl for females & ≥40mg/dl for males). 20% had high isolated triglycerides (>150 mg/dl) remaining patients had combined low HDLC and high triglycerides and LDL >100mg/dl. P. Malhothra [8] et al found that prevalence of dyslipidaemia was 46.8%, prevalence of isolated HDLC was 23.7% and high triglycerides 11.8-18.8%. However the study group consisted of hypertensive in all age groups.

Association of risk factors with increased left ventricular mass index: In the present study waist/hip ratio was positively related with the increased LVMI, with p= 0.004. The patients with DM were 4.06 times more likely to develop increased LVMI, with p=0.150.

Dunn FG, et al and Frohlich ED et al found above risk factors in association with increased Left Ventricular Mass Index [9,10]

Retinal Changes: Out of 75 patients, 30 patients had developed retinal changes. 13.3% for focal arteriolar narrowing, 12% had arteriovenous nipping and about 8% for retinopathy. Patients with stage III blood pressure were found to be 3.06 times more likely to develop abnormal retinal changes.

Wong TY et al in his study found that retinal micro vascular abnormality was 8.3% for retinopathy, 9.6% for focal arteriolar narrowing and 7.7% for arteriovenous nipping. [11]

Renal changes: Out of 75 patients, 27 patients had GFR <60ml/min/1.73m^2. Prevalence of CKD in present study was 36%, out of which 6.6% of patients were in stage 1,10.6% in stage 2 and 18.6% in stage 3 hypertension group. A study done by Nwachukwu et al [12] in southeast Nigeria found that prevalence of CKD in hypertensive group was around 29.8% but the age group included in this study was <30yrs to >70 yrs and both systolic and diastolic blood pressures are taken .SHEP trial done by J Hunter Young et al [13] shown that systolic BP is independent risk factor for a decline in kidney function among older persons with isolated systolic hypertension. The adjusted relative risk (95% confidence interval) with the highest compared with the lowest quartile of BP was 2.44 (1.67 to 3.56) for systolic

Echocardiographic changes: In the present study echocardiographic changes seen are, increased Left Ventricular Mass Index in 48%, among them 16% had LV volume >90ml/m2.28% of the patients had regional wall motion abnormalities. 26.7% of the patients had reduced ejection fraction (< 56%). [10] Devereux RB et al found echocardiographic evidence of LVH in the general population. Left ventricular mass indexed to body surface area gives left ventricular mass index [14]

Overall sensitivity of echo is nearly 100%: specificity is 86% contrasting with ECG sensitivity of 20-50%. In Penn convention the thickness of endocardial surfaces is excluded from measurement of septal and posterior wall thickness and is included in measurement of LVID. In ASE convention, the thickness of endocardial surface is included in the measurement of septal and posterior wall thickness and is excluded from the measurement of LVID. By Penn Convention - left ventricular mass is calculated by

Left Ventricular Mass =1.04 [(LVIDD+LVPWTD+IVSTD)3 -(LVIDD) 3] – 13.6
ASE-Cube Left Ventricular Mass= 1.04 [(LVIDD+LVPWTD+IVSTD)3 -(LVIDD) 3]

The constant 13.6 is subtracted to correct for absence of myocardium at the base. Penn-cube left ventricular mass correlated closely with necropsy left ventricular mass and over-estimated it by only 6%; sensitivity of l00% and specificity of 86%. ASE-Cube left ventricular mass correlates similarly to necropsy left ventricular mass, but over estimates it by 25%. The over estimation can be corrected by the equation. [5] Left Ventricular Mass = 0.80 (ASE-Cube Left Ventricular Mass) + 0.6 g. Use of ASE measurements in the

volume correction formula underestimates necropsy left ventricular mass by a mean of 30%.

Association of stage of blood pressure with increased LVMI: It is observed in the present study that 19.4% of the patients in stage I blood pressure were having increased LV mass, 41.7% of the patients in stage II and 38.9% in stage III blood pressure. It is observed that as the stage of blood pressure increases, incidence of increased LV mass also increases significantly with p=0.044. It is also observed that female patients were more likely to develop increased LVMI compared to male counter parts with p=0.028. [15]

Comparing the present study with various other studies:

Study	ECG LVH	ECHO LVH	Cardiovascular Complications
Vrinda et al	36.8%	46.4%	19.1%
Present Study	36%	48%	26.7%

STUDY	MI & ANGINA	CHF	DM	STROKE
Michael A. Colandrea et al [16]	30.6%	8.3%	26.9%	8.3%
Present Study	28%	12%	41.3%	2%

CONCLUSION

ISH is the commonest cause of high blood pressure in the elderly. The incidence increases with age advancement. It is more risky in nonwhite population. Waist/hip ratios, DM, dyslipidaemia are significant associated risk factors. ISH associated with risk factors has definite effect mainly on cardia in terms of LV hypertrophy. And on kidney in terms of reduced creatinine clearance is an even better predictor of morbidity and mortality than is diastolic blood pressure. Several large trials have documented a clear benefit to treating ISH. Even small reductions in BP have a substantial impact on patient outcome. Hence, ISH in elderly to be detected early, treated promptly so as to prevent / reduce cardiovascular, renal morbidity and mortality in our growing elderly population

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