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ORIGINAL ARTICLE

Left Ventricular diastolic dysfunction among hypertensive patients.

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ABSTRACT… Objectives: To assess the occurrence of left ventricular diastolic dysfunction among hypertensive patients on echocardiography. **Study Design:** Cross Sectional study. **Setting:** South East Hospital and Research Center, Islamabad. **Period:** August 2021 to January 2022. **Material & Methods:** By using non probability convenient sampling method technique through pre-structured Performa. We enrolled a two hundred (n=200) patients in our study. Ethical consideration was taken from hospital ethical review board committee. **Result:** Thirty Six percent respondents were at the age of < 60 years and 64% were at the of > 60 years. Detection of left ventricular diastolic dysfunction shows, 44% had grade I, 40% grade II and 16% grade III. Association of variables towards detection of diastolic dysfunction, Systolic BP, duration of hypertension, EF%, Left ventricular hypertrophy and co-morbidities shows good association towards the detection of diastolic dysfunction at (p-value≤0.01). **Conclusion:** It is concluded that, Diastolic dysfunction is most common left ventricular functional abnormality in hypertensive patients. Doppler echocardiography is the most important investigational method for the detection of LV diastolic dysfunction. Not only more than 60 years old patients detect left ventricular diastolic dysfunction but less than 60 years old can also develop diastolic dysfunction.

Key words: Assessment, Ejection Fraction, Echocardiography, Hypertension, Left Ventricular Diastolic Dysfunction, Prognosis.

INTRODUCTION

The earliest and most continuous result of decreased left ventricular consistence actuated by hypertension is diastolic dysfunction. As a rule, changes in echocardiography records of diastolic function become clear before left ventricular hypertrophy sets in and have as their substrate expanded interstitial fibrosis. Diastolic dysfunction accordingly relies upon the expanded end-diastolic pressure coming about because of disabled left ventricular relaxation. Abnormalities of left ventricular (LV) diastolic filling have much of the time been portrayed in patients with hypertension even without even a trace of LV hypertrophy.[1] Doppler imaging of the mitral inflow has procured wide affirmation for the assessment of hypertensive patients, as a basic, painless and adequately repeatable strategy for assessing LV diastolic filling.[2] Diastolic dysfunction in hypertensive patients is portrayed basically by impeded isovolumic relaxation.[3]

As a result, the velocity of early diastolic filling decreases and the late atrio-ventricular gradient increase, yielding a reduced early/atrial (E/A) velocity ratio.[4] Regardless of the way that they are simply approximate and indirect measure of LV diastolic function flow velocity determined files of diastolic filling are generally suggested for the finding of diastolic dysfunction[5], and they give free prognostic data in different clinical settings and population, including congestive cardiovascular failure the beginning stages of myocardial localized necrosis[6] and the older.[7]

Hypertension is the most well-known risk factor for congestive heart failure in overall public and is an constant initiator of diastolic heart failure.[8] Regardless, it is as yet discussed whether an autonomous prognostic worth of LV diastolic

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Dysfunction exists in hypertensive patients.[9] especially, it is right now obscure whether appraisal of the LV inflow velocity configuration adds to the prognostic information given by LV mass.[10]

The left ventricle (LV) has two consecutive functions: systolic contraction and diastolic filling: both ought to be adequate to give perfusion to the organs through forward cardiac output.[11] inability to stay aware of forward output and the subsequent assessment of ventricular filling pressures are connected with results of heart failure.[12] While systolic capacity is generally surveyed by assessing parameters of pump dysfunction, conventionally LV ejection fraction (LVEF), the assessment of diastolic capacity stays testing. Best quality levels for diagnosing DD are assessments of LV diastolic tension volume relations and the pace of LV strain fall during isovolumetric relaxation, for the most part recorded during cardiovascular catheterization.[13] Be that as it may, intrusive procedures are not achievable for each every day clinical practice and Doppler echocardiography is consistently used hence since Doppler assessments balance well with obtrusive estimation.[14]

Doppler echocardiography is now commonly applied and accepted in a wide variety of settings as a reliable non-invasive tool to evaluate LV filling pressures and diastolic proprieties. Present study aims to access the occurrence of diastolic dysfunction among hypertensive patients. Hypertension is the main cause of leading left ventricular diastolic dysfunction in most patients. Most of the patients at the age of 60 years or more then >60 years develop diastolic dysfunction but it was assessed in our study that not only above age 60 years develops diastolic dysfunction but less than <60 years also develop this. The reason was that, individuals had the history of hypertension. We assessed this on echocardiography Doppler study on continuous wave Doppler, pulse wave and Tissue Doppler Imaging. Mostly patients show Diastolic dysfunction of continuous wave Doppler study.

MATERIAL & METHODS

This study was conducted at South east Hospital and Research center, Islamabad, Pakistan over a period of six months from August 2021 to January 2022. Data was collected by using Non probability convenient sampling methods technique through pre-structured Performa which contain both open and close ended question. Two hundred (n=200) participant were included in our study. Ethical consideration was taken from the ethical review board committee of South East Hospital and Research center Islamabad (003-ERC-SEH). A written informed consent was also taken from the participant. Sample size was calculated by Epi info at 95% C.I. The trail was conducted in compliance with the international on harmonization guidelines for good clinical practices and according to the declaration of Helsinki.[8]

Inclusion Criteria

Individuals already diagnosed with hypertension and developed diastolic dysfunction at the age of more than 60 and less than 60 years on echocardiography were included.

Exclusion Criteria

Individuals having hypotension and those who were not detected diastolic dysfunction on echocardiography were excluded.

Data Analysis

The data was entered and analyzed in SPSS version 22. Descriptive statistics was used to calculated mean and SD for quantitative variables i.e. age, BP, SPO2, EF and pulse level. Frequencies with percentage were calculated for quantitative variables i.e. gender, marital status, education level etc. Chi square was used to assess the association among Hypertension and diastolic dysfunction.

RESULTS

A total of two hundred patients (n=200) were included in our study and assessed on echocardiography.

Characteristics	Frequency (%)
Age of the respondents (years)	
< 60 years	72 (36%)
> 60 years	128 (64%)
Gender of the respondents	
Male	92 (46%)
Female	108 (54%)
Marital status of the respondents	
Unmarried	69 (34.5%)
Married	18 (9%)
Divorced	54 (27%)
Widow	59 (29.5%)
Education level	
Uneducated	31 (15.5%)
Primary Level	75 (37.5%)
Secondary Level	55 (27.5%)
Higher Education	39 (19.5%)
Co-Morbidity	
CAD	67 (33.5%)
Heart Failure	24 (12%)
Cancer	25 (12.5%)
Renal Failure	37 (18.5%)
Respiratory Failure	32 (16%)
Rheumatic Fever	15 (7.5%)
Presence of hypertension	
Yes	45 (22.5%)
No	155 (77.5%)
Smoking history	
Yes	67 (33.5%)
No	133 (66.5%)
Detection of LVH	
Yes	62 (31%)
No	138 (69%)
Diastolic dysfunction detection	
Grade I	88 (44%)
Grade II	80 (40%)
Grade III	32 (16%)
Detection of DD mode	
Continuous Wave Doppler	88 (44%)
Pulse Wave Doppler	84 (42%)
Tissue Doppler Imaging	28 (14%)

Table-I. Demographics of the respondents (n=200)

Table-I illustrate that 36% respondents were at the age of < 60 years and 64% were at the of > 60 years. It also shows that 46% males and 54% females were included. Thirty seven percent respondents at primary level and 19.5% were educated at higher level. 33.5% were co-morbid of coronary artery diseases, 12% heart failure, 12.5% cancers, 18.5% with respiratory failure and 12% were with renal failure. Seventy seven percent respondents were detected with the history of hypertension, 66.5% smokers and 69.5% respondents had LVH. If we discuss about the grades of left ventricular diastolic dysfunction, 44% had grade I, 40% grade II and 16% grade III. Grade detection modes show that 44% with CW, 42% PW and 14% were with TDI.

Characteristics	Mean	±SD
Systolic BP	162.17	±16.918
Diastolic BP	88.19	±7.390
SPO2 Level	96.95	±1.746
Pulse Level	86.71	±1.984
Duration of BP	16.26	±8.534
Diameter of LV	46.35	±5.199
EF%	57.56	±7.458

Table-II. Clinical presentations of the respondent (n=200):

Table-II Illustrate that the mean systolic BP (162.17±16.918), mean diastolic BP (88.19±7.390), mean SPO2 level (96.95±1.746), mean pulse level (86.71±1.984), mean duration of BP (16.26±8.534), mean LV diameter (46.35±5.199) and mean EF were (57.56±7.458).

Characteristics	p-value
Systolic BP (mmHg)	58.110[a](df=13, p value=.000)
Diastolic BP (mmHg)	25.800[a](df=20, p value=.173)
Duration of Hypertension	68.478[a](df=38, p value=.002)
LV diameter(mm)	58.026[a] (df=34, p value=.006)
Age (years)	59.235[a](df=17, p value=.000)
EF%	72.090[a] (df= 28, p value=.000)
Co-morbidities	68.478[a](df=38, p value=.002)
LVH detection	40.686[a] (df=14, p value=.000)

Table-III. Effect of Hypertension and other variables towards diastolic dysfunction: (n=200)

Table-III illustrate the association of variables towards detection of diastolic dysfunction, which shows that Systolic BP, duration of hypertension, EF%, Left ventricular hypertrophy and co-morbidities shows good association towards the detection of diastolic dysfunction at (p-value≤0.01).

DISCUSSION

The earliest and most continuous result of decreased left ventricular consistence actuated by hypertension is diastolic dysfunction. As a rule, changes in echocardiography records of diastolic function become clear before left ventricular hypertrophy sets in and have as their substrate expanded interstitial fibrosis. Diastolic dysfunction accordingly relies upon the expanded end-diastolic pressure coming about because of disabled left ventricular relaxation. Abnormalities of left ventricular (LV) diastolic filling have much of the time been portrayed in patients with hypertension even without even a trace of LV hypertrophy.[1] Doppler imaging of the mitral inflow has procured wide affirmation for the assessment of hypertensive patients, as a basic, painless and adequately repeatable strategy for assessing LV diastolic filling.[2] Diastolic dysfunction in hypertensive patients is portrayed basically by impeded isovolumic relaxation.[3]

The assessment of LVF was at first accomplished using cardiovascular catheterization and radionuclide angiography.[15] These previous techniques have the hindrance of being invasive and as such not reseaonable for exceptionally sick patients. There is additionally the risk of radiation exposure with the radionuclide procedure. Regardless, with the ascent of Doppler echocardiography, a noninvasive assessment of LVF can now expeditiously be possible.[16] It is easy to perform, results are reproducible, and the methodology differentiates well and various techniques for cardiovascular limit assessment.[17] Because of the massive cost of echocardiographic evaluation and the poor condition of our economy, the workplaces for this significant appraisal are at this point ailing around here of the planet. These records for the shortage of broad composing in regards to this matter in our space of clinical practice.[18]

We characterized the patients in two age group, >60 and < 60 years. We assessed that 36% were patients were lying at the age of <60 years and 64% were >60 years. Left ventricular diastolic dysfunction usually assessed in those patients who were above 60 years old but according to the result of our study it is stated that 30% patients were those who were <60 years and detected with left ventricular diastolic dysfunction. The basic reason was that those patients were also chronic hypertensive and other co-morbidities. Echocardiography is the non invasive method, through which LV diastolic dysfunction can be detected through continuous wave Doppler, Pulse wave Doppler and tissue Doppler imaging. We have assessed patients by these three techniques. Those who did not detected by pulse wave Doppler can be detected by other two techniques.

We also categorized the patients in grades of diastolic dysfunction, I, II, III and pseudo. Although majority of the patients were with grade I and II only 44 and 40%, 16% patients detected with grade III and 0% with pseudo. These grades were assessed through reversal of E:A. Hypertension is the basic reason through which most the patients can detect LV diastolic dysfunction in early age. In our study mean systolic BP (162.17±16.918), mean diastolic BP (88.19±7.390), mean LV diameter (46.35±5.199) and mean EF (57.56±7.458) were assessed. If we discuss about the association of variables towards detection of diastolic dysfunction, which shows that Systolic BP, duration of hypertension, EF%, Left ventricular hypertrophy and co-morbidities shows good association towards the detection of diastolic dysfunction at (p-value≤0.01).

A review conducted by Albert Oyati, which communicated that diastolic dysfunction is a continuum. It begins with weakened unwinding and advances through pseudo normalization to the restrictive pattern, which should be the most extremely awful type of diastolic dysfunction.[19] This example is clearly shown in this review with all structured tended to in various extents. A high extent of the patients was in the restrictive example group. This is to some degree in light of late emergency clinic attendance of these patients who when seen were in New York Heart Association III or IV.[20] A combination of ignorance and poverty makes them look for clinical thought extraordinarily late. As found in this review, joined diastolic dysfunction was connected with diastolic

dysfunction 12.6%/of patients, consolidated diastolic and systolic dysfunction in 24.2%, pseudo normalization in 6.3%, and restrictive pattern example in 26.3% of the patients.[21]

This brings the overall prevalence of diastolic dysfunction to 69.4%. A comparative report in Ife, western Nigeria including 30 patients put the prevalence of separated diastolic dysfunction at 30%, turned around E/A ratio at 53% and restrictive example at I%.[21] The reversed around E/A ratio in their review were 36.8%, and the distinctions in these figures may be an impression of the distinction in the scope of test and size.[22] The restrictive pattern is seen more in their patients than others, while impaired relaxation was higher in their subjects than their own an impression of the situation of emergency facility support.[22] Balogun et al. revealed a prevalence of 46% in both hypertensive and hypertensive heart failure. Prevalence of diastolic dysfunction in adults hypertensive Nigerians announced by Ike et al. from the eastern piece of Nigeria was over 80%, while that of Kingue et al. from Cameroon was 67% in dark African hypertensive.[23]

Our study also shows those patients who are unaware and also had lack of knowledge regarding hypertension's leading causes. It may be because of lack of resources and poverty they did not seek medical care. This is an important dilemma that peoples did not go to the hospital for treatment and do self medication. Hypertension should be treated timely and secondary prevention plays important role for the development of other complications. Age related factors are not mentioned in our study group.

CONCLUSION

According to the result of our study it is concluded that, Diastolic dysfunction is most common left ventricular functional abnormality in hypertensive patients. Doppler echocardiography is the most important investigational method for the detection of LV diastolic dysfunction. Not only more than 60 years old patients detect diastolic dysfunction but less than 60 years old can also develop diastolic dysfunction. The reason is that they also have chronic hypertensive history. Most of the patients have grade I and II left ventricular diastolic dysfunction with the history of hypertension.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

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2	Attiya Hameed Khan	Wrote first draft and data analysis.	
3	Akhtar Ali Bandeshah	Data collection.	
4	Wajid Hussain	Data collection.	
5	Adnan Shah	Editing and formatting.	
6	Abdul Samad Abbasi	Editing.	