

FREQUENCY OF LEFT VENTRICULAR DIASTOLIC DYSFUNCTION IN HYPERTENSIVE PATIENTS VIA ECHOCARDIOGRAPHY

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Background

Hypertension is the major cause of congestive cardiac failure all over the world. Diastolic dysfunction is an early poor prognostic factor in hypertension and is a reversible condition. Diastolic dysfunction is very frequent and is actually sign of manifest heart weakness. Early detection and treatment is necessary to avoid cardiac complications.

Objective

The objective of this study is to determine the frequency of left ventricular diastolic dysfunction in hypertensive patients via echocardiography.

Methods

Patients underwent echocardiography and were assessed using 2-D and M-Mode echocardiography.

Results

97 hypertensive patients were included in my study, among these 65 (67%) were suffering from diastolic dysfunction and 32 (33%) were not suffering from diastolic dysfunction. Among 65 males, 42 were diagnosed with diastolic dysfunction and 23 were normal, among 32 females, 23 were diagnosed with diastolic dysfunction and 09 were not showing the disease.

Conclusion

According to age and gender it is concluded that diastolic dysfunction is higher in older adults, age between 45 to 55 and in males and female its ratio is almost same.

Key Words

Hypertension, Diastolic dysfunction, left ventricle.

Introduction

Left ventricular diastolic dysfunction (DD) is defined as the inability of the ventricle to fill to a normal end-diastolic volume, both during exercise as well as at rest, while left atrial pressure does not exceed 12 mm Hg.¹ It has been shown that several patients with left ventricular diastolic dysfunction are suffering from paroxysmal dyspnoea and "unexplained" pulmonary edema with a normal ejection fraction. The significance and the severity of left ventricular diastolic dysfunction among these patients are not well elucidated. On the other hand, estimation of the degree of DD peri-operatively, is difficult in up to 20% of cardiac-surgery patients for several reasons including rhythm abnormality, preload and after-load alterations, coexistence of valvular disease, age related changes, and inability to obtain proper Doppler images.²

Diastolic dysfunction is present when an elevated filling pressure is necessary to achieve normal ventricular filling. So, DD is related to abnormal left ventricular relaxation and filling during diastolic phase of cardiac cycle.³ during this phase there are four timely and sequential events: Iso-volemic relaxation, Rapid (early) LV filling, Slow LV filling (diastasis), atrial contraction.⁴ Hypertension may cause LV hypertrophy which may be the early prognostic factor of LV diastolic dysfunction or LV heart failure. Diastolic heart failure should be suspected in patients with symptoms of heart failure with normal size hearts and ventricular hypertrophy and myocardial ischemia. In these conditions stiffness of the LV wall increases resulting abnormal LV relaxation which causes impairment of diastolic flow from LA into LV. To assess the LV diastolic dysfunction, there is no good single echo measure. 2-D echo also doesn't help us to make a direct assessment of LV diastolic dysfunction but can detect associated abnormalities such as: LV hypertrophy, Myocardium filtration, Pericardial effusion, Ischemic heart disease, Dilated IV. However Doppler echocardiography can be useful in providing information regarding LV diastolic dysfunction.⁵

Diastolic dysfunction with elevated left ventricular end-diastolic pressure can predispose to increased preoperative mortality and morbidity. Furthermore, diastolic dysfunction is often

associated with systolic dysfunction, left ventricular hypertrophy or indeed pulmonary hypertension. The mainstay of management of diastolic dysfunction starts with the prompt recognition and diagnosis of this entity and relies on the aggressive management of the underlying etiology of this insidious disease.⁶

The cardiac cycle is the sequence of events of each heart beat:

- **Diastole:** During this process, the ventricles fill with blood from the atria. The atrioventricular valves are open, and the pulmonary and aortic valves are closed.
- **Systole:** In this process, the ventricles empty into the aorta and pulmonary arteries. The atrioventricular valves are closed, and the pulmonary and aortic valves are open.

(terferu and jegtivg).

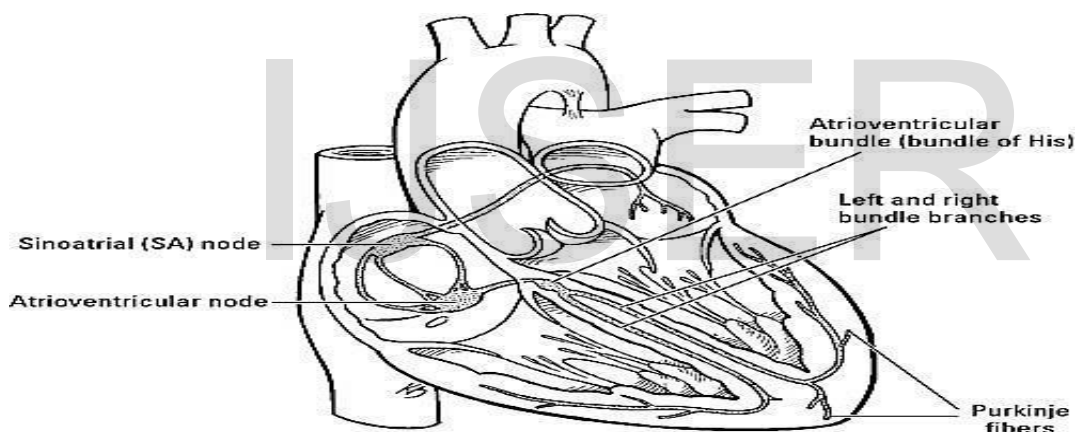


Fig 1.1: Nerve Supply of Heart

Arterial hypertension is the most common risk factor for heart failure in the general population. The progression of hypertensive left ventricular (LV) involvement toward heart failure includes several structural abnormalities (mainly myocardial fibrosis) and geometric changes of the left ventricle. LV concentric remodeling and LV hypertrophy (LVH) with high LV mass/volume ratio, whose prognostic role is known.⁷

Based on recommendations of the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure, the classification of BP for adults aged 18 years or older has been as follows;

- Normal: Systolic lower than 120 mm Hg, diastolic lower than 80 mm Hg
- Prehypertension: Systolic 120-139 mm Hg, diastolic 80-89 mm Hg
- Stage 1: Systolic 140-159 mm Hg, diastolic 90-99 mm Hg
- Stage 2: Systolic 160 mm Hg or greater, diastolic 100 mm Hg or greater

Hypertension may be primary, which may develop as a result of environmental or genetic causes, or secondary, which has multiple etiologies, including renal, vascular, and endocrine causes. Primary or essential hypertension accounts for 90-95% of adult cases, and secondary hypertension accounts for 2-10% of cases. (Alexander and Yang 2017).

Hypertension is the most common risk factor and the principal precursor of heart failure. The risk for developing heart failure in hypertensive compared with normotensive individuals is about twofold in men and threefold in women. (Lalande and Johnson, 2008)

Methods

Study Design: Cross-sectional descriptive.

Settings: Fatima memorial hospital and Al-razi Health Care Lahore.

Study Duration: 3 months (subject to approval of synopsis).

Sample Size: Sample size was calculated with statistical power analysis formula

$$n = \frac{z_{1-\alpha/2}^2 p(1-p)}{d^2}$$

While prevalence is 25 % and calculated sample size was 288.

Sampling Technique: Convenient sampling

Sample Selection:

Inclusion Criteria:

Patient with known history of hypertension referred to echocardiography department for evaluation of left ventricular diastolic dysfunction.

Exclusion Criteria:

Patients with known heart disease.

Equipment(s):

1. SonoscapeS6, 2014
2. Siemens color S9

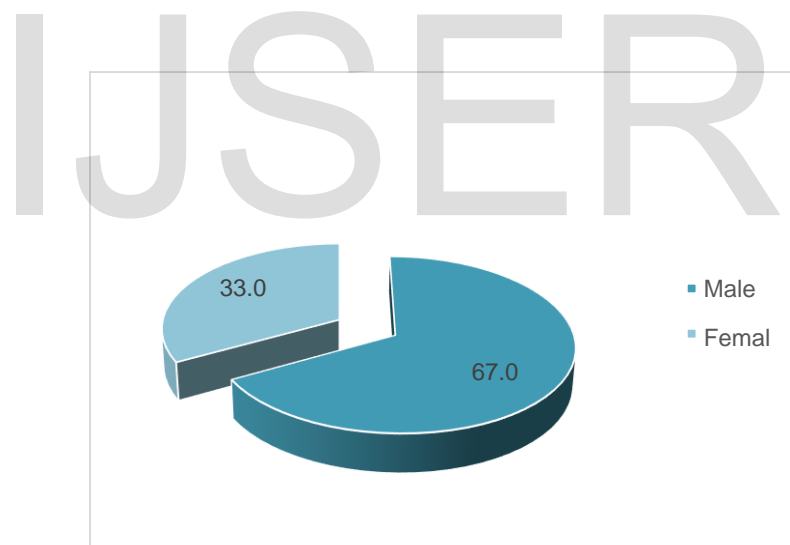
High frequency probe of 7 MHz

Results

A total of ninety-seven hypertensive patients were enrolled in this study with Male: Female=2:1. Of them 67% were male and 33% were female as shown in Table 4.1.

Table 4.1: Frequency distribution of enrolled patients

Gender	Frequency
Male	65(67%)
Female	32(33%)



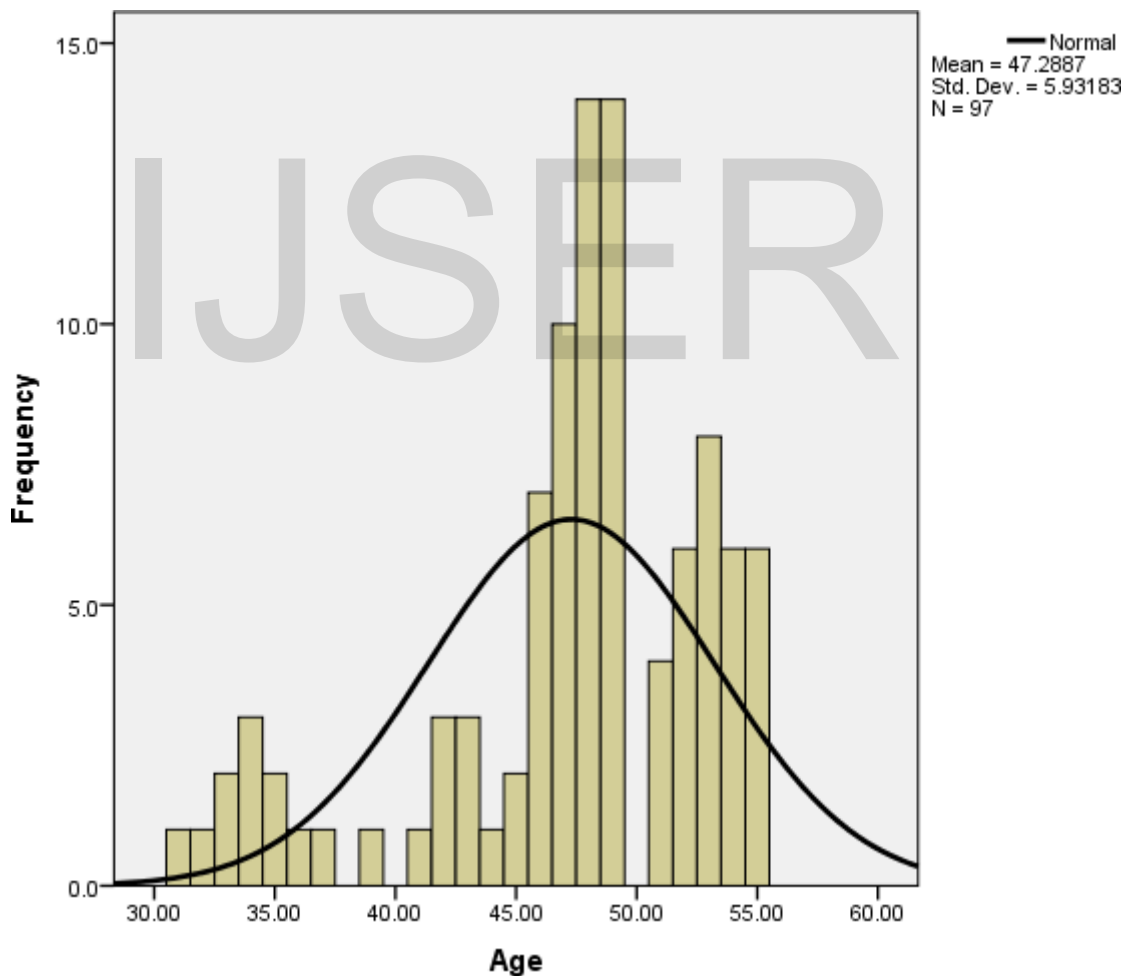
Graph-4.1: Frequency distribution of the enrolled patients

Age distribution:

The mean age of study participants is 47.29 ± 5.93 years with age range 31 to 55 years as shown in Table 4.2.

Table-4.2: Descriptive statistics of Age distribution

	Mean	SD	Minimum	Maximum
Age	47.29	5.93	31.00	55.00



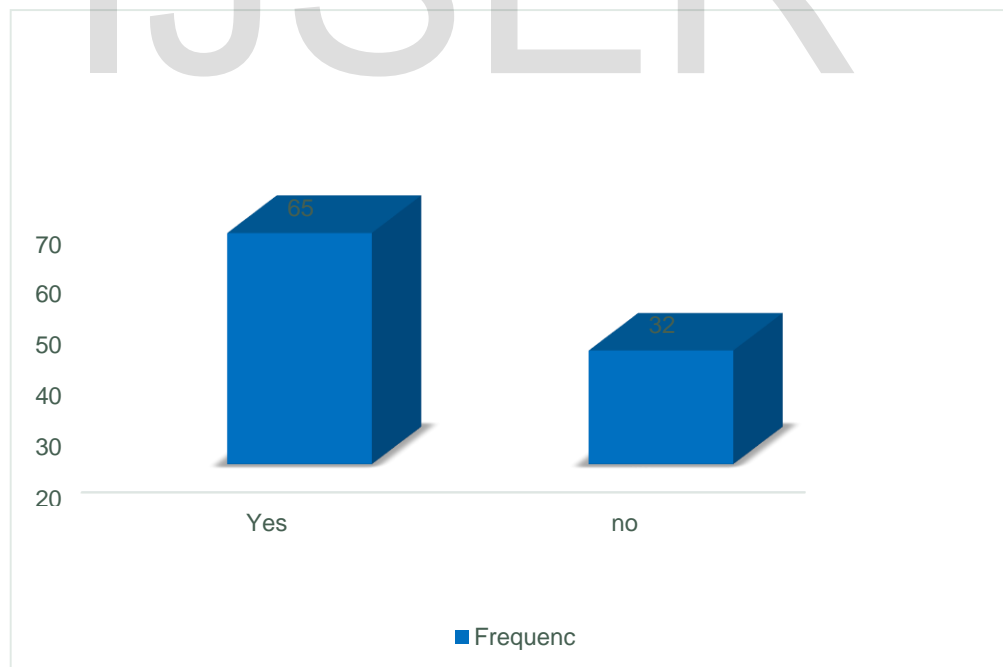
Graph-4.2: Age distribution

Frequency of Diastolic dysfunction:

There were 97 patients taken, among them 65 (67%) were suffering from diastolic dysfunction and 32 (33%) were not suffering from diastolic dysfunction.

Table-4.3: Descriptive Statistics of Diastolic dysfunction.

	Frequency	Percentage
Yes	65	67.0
no	32	33.0
Total	97	100.0



Graph-4.3: Frequency of Diastolic dysfunction.

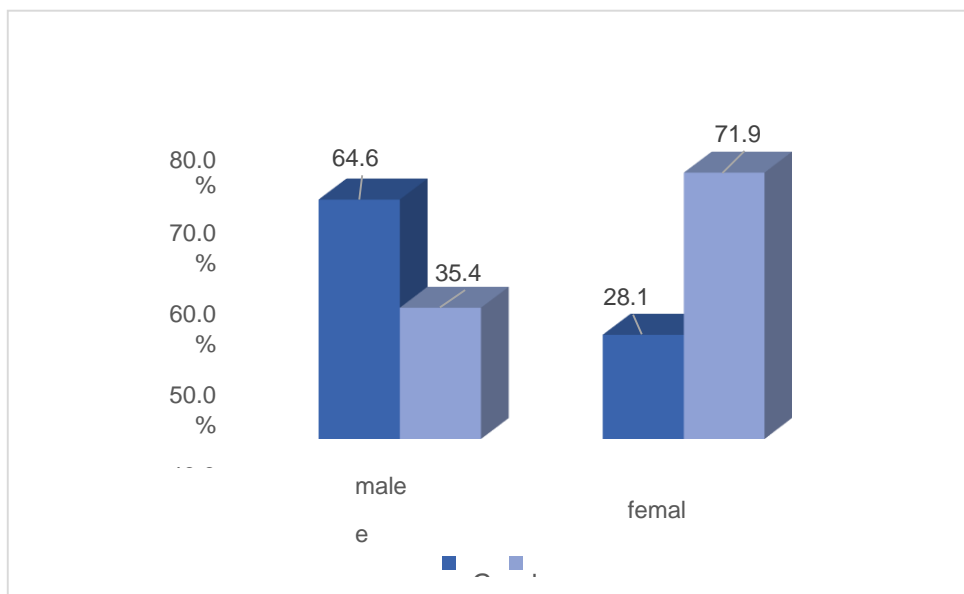
Association of gender and diastolic dysfunction:

To test the association between gender and diastolic dysfunction, chi square was applied results showed that gender is not associated with diastolic dysfunction with p value .47 as shown in table 4.4.

Table 4.4: Association of gender and diastolic dysfunction.

		Diastolic dysfunction		Total	P-Value
		Yes	no		
Gender	Male	42	23	65	0.475*
	Female	23	9	32	
Total		65	32	97	

Insignificant



Graph-4.4: Association of gender and diastolic dysfunction.

Association of age and diastolic dysfunction:

To test the association between age and diastolic dysfunction, chi square was applied. Results showed that age is significantly associated with diastolic dysfunction with p value .001 as shown in table 4.5. older adults were found to have diastolic dysfunction in 60(77.9 %) patients and 5 (25%) younger adults had disease.

Table 4.5: Association of age and diastolic dysfunction.

		Diastolic dysfunction		Total	P-Value
		Yes	No		
Age	Greater and equal to 45	60	17	77	0.001*
	Less than 45	5	15	20	
	Total	65	32	97	

DISCUSSION:

One of the very early prognostic factors of diastolic dysfunction is hypertension and is a reversible condition. Early detection and treatment is necessary to avoid cardiac complications. Diastolic dysfunction refers to the decline in performance of one (usually the left ventricle) or both (left and right) ventricles during diastole. Diastolic dysfunction is very frequent and is actually sign of manifest heart weakness and heart failure. Heart failure is one of the most common causes of cardiovascular morbidity and mortality (Charlat et al., 2003).

In the present study, only hypertensive patients were assessed by using echocardiography to find diastolic dysfunction. Among them (67%) were noted to have developed diastolic dysfunction, while the remaining (33%) showed normal on echocardiogram which are almost in accordance with the results obtained by the Abdul Latif Mohamed, Jun Yong, Jamil Masiyati, Lee Lim, and Sze Chec Tee working on the Malaysian peoples (Mohamed et al., 2004b). A little different results were observed by the Avdic S and other workers in Bosnia and Herzegovina. They took a sample of 64 patients with essential hypertension. Left ventricular hypertrophy (lvh) was verified for 57 patients. Seven hypertensive patients didn't have verified lvh (Morales et al., 2007). They used only Doppler echocardiography to assess left ventricular diastolic dysfunction. The difference in results may be due to the use of a single modality by them and other factors like age, gender, diet, ethnic background and geographic variations.

In my study, it was observed that diastolic dysfunction is slightly higher in females (71.9%) than males (64.62%) and on the basis of age groups, results showed that probability of diastolic dysfunction is higher in older adults than younger ones by three folds while the previous studies were generally based on other factors like duration of hypertension, transmitral flow pattern, heart rate, loading conditions and filling pressures.

CONCLUSION:

The study demonstrated that age of patients is important prognostic indicators in predicting the development of diastolic dysfunction in hypertensive patients and those older persons are at higher risk of developing diastolic dysfunction by three folds. Males and females have almost equal chances (females slightly higher) to have diastolic dysfunction. It is concluded that precautionary measurements and proper diet plan should be maintained in older age groups.

RECOMMENDATION:

It is vital to have a great knowledge on frequency of hypertensive patients and left ventricular diastolic dysfunction (DD) because it is associated with adverse cardiovascular outcomes. Full grasp on echocardiography is required to overcome cardiac issues.

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LIMITATION

It should be multiple centered with more inclusion and resources.

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