

## A study of left ventricular diastolic dysfunction in prehypertensive middle aged individuals

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### Abstract

Prehypertension is associated with excessive morbidity and mortality due to Cardiovascular diseases (CVD). Our study emphasizes the need of early diagnosis of left ventricular diastolic dysfunction in prehypertension patients and to perform echocardiogram in prehypertension middle aged patients.

**Materials and Methods:** Its hospital based cross sectional study done on 50 samples all middle aged patients of both sexes with prehypertension in the age group of 45-64years.

**Results:** The mean E value was found to be  $69.78 \pm 4.83$ , mean value of A was  $68.88 \pm 5.71$  and mean value of E/A  $1.01 \pm 0.15$ . About 17(34%) had normal diastolic function E/A Ratio between 1.0-1.5 and 33 (66%) had impaired relaxation grade 1. There is no significant difference between the smokers and non – smokers, likewise for obese and non -obese patients.

**Conclusion:** We conclude that even non obese patients and non- smokers has significant diastolic dysfunction, so prehypertension is risk factor for diastolic dysfunction.

**Keywords:** Prehypertension, Diastolic dysfunction, Echocardiogram, Cardiovascular disease.

### Introduction

Hypertension (HT) is a major global public health burden, and it is an important risk factor for cerebrovascular accident. Pre hypertensive (PreHT) subjects are at risk of progression to hypertension, and prehypertension is associated with excessive morbidity and mortality due to CVD.<sup>1</sup>

Echocardiography is an important non-invasive diagnostic tool for investigation of left ventricular function.<sup>1</sup> Left ventricular diastolic dysfunction due to various myocardial diseases occurs frequently in hypertension, and it is a common cause of heart failure in patients with hypertension.<sup>2</sup>

Prehypertension is defined as blood pressure (BP) ranging from 120 to 139 mm Hg systolic and/or from 80 to 89 mm Hg diastolic in adults not taking any BP lowering medication.<sup>3</sup> Prolonged elevation of BP commonly lead to a variety of changes in myocardial structure, coronary vasculature, and conduction system of heart, creeping into development of left ventricular hypertrophy (LVH), coronary artery disease (CAD), angina, myocardial infarction (MI), cardiac arrhythmias, congestive heart failure (CHF).<sup>4-6</sup>

Even though the pre-hypertensive do not have symptoms in daily life, because of adaptive changes yet, it is essential to diagnose the pre-hypertensive and to assess the consequent structural alterations in cardiovascular system with passage of time. Hence our study is aimed in early diagnosis of left ventricular diastolic dysfunction in prehypertension patients and to do echocardiogram in prehypertension middle aged patients.

### Materials and Methods

#### Study design & study setting

Its hospital based cross sectional study which was carried out in Department of General Medicine, Aarupadai Veedu

Medical College and Hospital, for the period 4 months from December 2018 to March 2019.

#### Sample size & sampling method

Based on the availability, Non-Probability purposive sampling was done. 50 samples of all middle aged patients of both sexes with prehypertension.

#### Inclusion criteria

The patient with pre-hypertension in the age group of 45-64years. Both in patients and out patients were included.

#### Exclusion criteria

Patients who were hypertensive or who has history of hypertension, Patients with history of coronary heart disease. Patients with congenital heart disease causing systolic and diastolic dysfunction, Thyroid disorders, Patients with cor-pulmonale, Heart failure secondary to any cause, Chronic kidney disease and Diabetes mellitus were excluded.

#### Data collection and statistical analysis

After taking the informed written consent in English and Tamil. By using the predesigned proforma, complete history and clinical examination, following investigations like done FBS, PPBS, FLP, Blood urea, serum creatinine, Thyroid profile, USG abdomen, ECG and Echocardiogram were done. The data was analysed by using Microsoft Excel 2010 software. Mean  $\pm$  SD was calculated, unpaired student's t-test and chi- square test was applied. P-value of  $\leq 0.05$  was considered as statistically significant.

#### Ethical issues

This study was approved by Institutional Ethics Committee.

## Results

**Table 1:** Demographic and Preliminary details of the patient

<b>Mean age in years</b>	54.2 ± 4.91
<b>Sex Distribution</b>	Male - 36 (72%)*
	Female -14 (28%)
<b>Smoking</b>	36.7%
<b>Diet pattern</b>	Vegetarian – 6 (12%)
	Non – Vegetarian – 44 (88%)*
<b>Residence</b>	Urban – 32(64%)*
	Rural – 18 (36%)

\*<0.005

Table 1, explains the demographic and preliminary details of the patient. The mean age in years was 54.2± 4.91. Out of 50 study participants, 36 (72%) were males which is significantly higher than the females 14 (28%). Regarding smoking about 36.7% were smokers. For the history asked about their diet pattern, 44 (88%) reported to have mixed diet which is significantly higher than the vegans 6 (12%). About 32 (64%) were residing in urban areas and remaining 18 (36%) were residing in rural areas there is a significant difference (<0.005).

**Table 2:** Mean values of clinical parameters

<b>Systolic Blood Pressure</b>	134.2±2.71
<b>Diastolic Blood Pressure</b>	86.7±3.18
<b>BMI</b>	24.5±2.5
<b>Pulse rate</b>	62 ± 9

As seen in the table 2, the mean values of the clinical investigations were the mean systolic and diastolic blood pressure were 134.2± 2.71 and 86.7±3.18. The mean BMI of the participants was 24.5 ±2.5. The pulse rate of the patients was 62±9.

**Table 3:** Echo Investigation

<b>E</b>	69.78±4.83
<b>A</b>	68.88±5.71
<b>E/A</b>	1.01±0.15
<b>Normal Diastolic function</b>	17 (34%)
<b>Impaired relaxation Grade 1</b>	33 (66%)

From the above table, the mean E value was found to be 69.78±4.83, mean value of A was 68.88±5.71 and mean value of E/A 1.01±0.15. About 17(34%) had normal diastolic function E/A Ratio between 1.0-1.5 and 33 (66%) had impaired relaxation grade 1.

**Table 4:** Confounding factors for Diastolic dysfunction N=33

<b>Smokers</b>	19
<b>Non smokers</b>	14
<b>Obese patients</b>	12
<b>Non Obese patients</b>	21

As seen in the above table, the confounding factors for diastolic dysfunction. Out of 50 patients, 33 had diastolic dysfunction. In that 33 patients, 19 were smokers and 14 were non -smokers. Regarding BMI, the obese patients were 12 and non-obese patients were 21. There is no significant difference between the smokers and non – smokers, likewise for obese and non -obese patients.

## Discussion

There is a continuous association between the deterioration of diastolic function, BP levels including SBP, DBP, and PR. More importantly, we observed that although diastolic function impairment is more pronounced in hypertensive individuals, these changes were already present in pre-hypertensive individuals, reflecting subclinical organ damage in this population.

In our study the mean age in years in the range of 54.2 ± 4.91. Nearly 72% were males which is significantly higher than the females 28%. Regarding smoking about 36.7% were smokers. Our results are in accordance with other studies demonstrating that smoking has acute effects on the diastolic function in healthy individuals, causing impaired endothelial relaxation resulting in diastolic dysfunction.<sup>7,8</sup> For the history asked about their diet pattern, 88% reported to have mixed diet which is significant higher than the vegans 12%. In this study, about 64% were residing in urban areas and remaining 36% were residing in rural areas there is a significant difference (<0.005). Urbanisation and occupational changes also plays major role in the cardiovascular diseases.

In the present study, the mean systolic and diastolic blood pressure were 134.2± 2.71 and 86.7±3.18. The mean BMI of the participants was 24.5 ±2.5. The pulse rate of the patients was 62±9. The mean E value was found to be 69.78±4.83, mean value of A was 68.88±5.71 and mean value of E/A 1.01±0.15. About 17(34%) had normal diastolic function E/A Ratio between 1.0-1.5 and 33 (66%) had impaired relaxation grade 1. In the present study, visual assessment of active (E) and passive (A) transmitral peak velocities and their ratio (E/A ratio) during echocardiography is used as a routine procedure and had shown a decrease indicating compensatory diastolic dysfunction in prehypertensive group.<sup>9,10</sup> Prehypertensive stage when detected early, the preventive and curative aspects of treatment therefore, might be initiated to reduce the cardiovascular risk factors.<sup>11</sup>

In this current study, 33 had diastolic dysfunction. In that 33 patients, 19 were smokers and 14 were non -smokers. Regarding BMI, the obese patients were 12 and non-obese patients were 21. There is no significant difference between the smokers and non – smokers, likewise for obese and non -obese patients. Results of the present study correspond well with those in a previous study, which showed that preHT was associated with LV diastolic function.<sup>12</sup> The results of the present study are also consistent with another report on diastolic dysfunction and blood pressure classification in healthy Turkish adults, which showed that diastolic function was slightly impaired in prehypertensive subjects.<sup>13</sup> In other reports, blood pressure control is known to improve diastolic

dysfunction in hypertensive subjects.<sup>14</sup> The association between diastolic dysfunction and HT has been reported previously.<sup>15</sup>

This study was carried out on subjects who willingly attended our OPD in AVMCH. We were not able to find the temporality and the causal relationship. However, selection bias in this study could be low because we excluded patients with previous history of HT, diabetes mellitus, or malignancy based on medical history and those with proven coronary artery disease or valvular heart disease.

### Conclusion

We conclude that even non obese patients and non-smokers has significant diastolic dysfunction, so prehypertension is risk factor for diastolic dysfunction. Knowledge, Awareness and Practices about the early detection and prompt treatment for the blood pressure among the General Population is needed. It would be useful if we conduct routine echocardiography after the age of 40 years.

### Source of Funding

None.

### Conflict of Interest

None.

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