



**ORIGINAL RESEARCH PAPER**

**Cardiology**

**STUDY OF AN ECHOCARDIOGRAPHIC EVALUATION OF LEFT VENTRICULAR DYSFUNCTION IN PREECLAMPSIA PATIENTS**

**KEY WORDS:** EF: Ejection Fraction  
F.S: Fractional Shortening  
LVEDD : Left Ventricular End Diastolic Dimension

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**ABSTRACT**

**Introduction:**

Preeclampsia is a pregnancy specific disorder which constitutes hypertension after 20 weeks of gestation and proteinuria. It is a multisystem disorders of unknown etiology. The aim of this study is to determine the left ventricular dysfunction in preeclampsia women by measuring the left ventricular systolic and diastolic indices using echocardiography.

**Materials and Methods:**

This study is a prospective observational study involving 50 patients who had been admitted in the antenatal ward of Govt.Mohan Kumaramangalam Medical College, Salem over the period of one year from January 2017 to January 2018. (Group 1). 50 normal normotensive pregnant patients selected at random who came to the OPD of our institute at the same period constituted (Group 2). 50 normal non pregnant patients selected at random who come to the OPD of our institute at the same period who were from 18 to 35 years of age constituted (Group 3).

**Results:**

The mean age of this study groups 1,2,3 were 23 years, 24 years, 26 years respectively. The mean EF in three groups were 60%, 58.3%, 58.8% respectively. LV systolic and diastolic function indices were compared among the three groups with significance level. There was a statistically significant LV diastolic dysfunction in the preeclampsia group (P value < 0.001)

**Conclusion:**

Our study reported that LV systolic function was within normal limits in most of the preeclampsia patients. Statistically significant LV diastolic dysfunction was seen in 15/50[30%]of the preeclamptic patients (P <0.001).

**Introduction:**

Preeclampsia and Eclampsia is still showed in a cloud of mystery. Zweisel called it a disease of theories. Bernard wrote that Eclampsia was mentioned in the ancient Egyptian, Chinese, Indian and Greek literature probably the oldest reference in the Advaita veda 200 BC.

It is one of the commonest complications of pregnancy and in a major course of maternal and foetal mortality and morbidity. In developing countries, it ranks second to anemia as a cause of maternal mortality and morbidity, complicating 7-10% of all pregnancies. Cardiac failure with pulmonary edema may occur in hypertensive patients with normal heart. It is emphasized that pregnant women particularly if pre-eclamptic developed pulmonary edema more often than non-pregnant women. Further preeclampsia is a recognized predisposing factor for peripartum cardiomyopathy and further cardiovascular disease.

Pregnancy is characterized by a number of important hemodynamic changes. Blood volume increases by about 50%. The red cell mass increases by about 40%. The resting pulse rate increases by about 10 to 15 beats per minute. Cardiac output increases beginning in early pregnancy around 5th week and confines to increase and reaches its peak between the middle of 2nd and 3rd trimester and remains elevated during the remainder of pregnancy.

Systemic arterial pressure begins to fall during the first trimester, reaches a nadir in midpregnancy and return to pregestational level before term. The pulse pressure widens as the fall of diastolic pressure is greater than the fall of systolic pressure. These changes are largely physiological in normal pregnancies. But these changes are critical in patients with Preeclampsia.

It is also been speculated that associated subliminal left ventricular dysfunction may contribute to cardiac mortality and morbidity. There are only few data available regarding left ventricular function in pregnancy. So this prospective study on left ventricular systolic and diastolic function by echocardiography was undertaken in normal and preeclampsia pregnancies.

**Materials and Methods:**

This prospective study was conducted at Department of Cardiology, GMKMCH, Salem from January 2017 to January 2018. Among them 50 patients who fulfill the study criteria were selected and they constitute Group1 of the study. The inclusion criteria are 1.Patients with mild preeclampsia which was diagnosed when there is a sustained systolic blood pressure of 140mmhg or more and or a diastolic blood pressure of 90mmHg or more pressure on two or more occasions at least six hours apart occurring after 20th week of gestation associated with a proteinuria of ≥ 0.3 gm protein in a 24 hours urine sample or ≥ 30 mgdl or ≥ 1+ on dipstick in a random urine sample 2. Patients with severe preeclampsia which was diagnosed when blood pressure was ≥ 160/110mmHg or proteinuria> 5gm/ 24 hours or 2+ or more. 3.Age 18 to 35 years 4.Gestational age 28 to 36 weeks. 5.The known period of hypertension averaged 20 days. The exclusion criteria are 1.Patients with pre existing hypertension 2.Patients with cardio respiratory disease 3. Patients with Anemic 4.Patients in labour.

Out of 50 patients studied 20 patients fulfilled the criteria for severe preeclampsia. 30 patients fulfilled the criteria for mild preeclampsia. All the patients were put on anti hypertensive drugs. All the cases of mild preeclampsia were put only on tablet alpha methyl dopa 250 mg 8th hourly. The severe cases of preeclampsia were put on tablet alpha methyl dopa 250mg 8th hourly and tablet Nifidipine 10mg 8th hourly. None of the patients were studied during labour. Mean age is 23 years

50 normal normotensive pregnant patients selected at random who come to OPD of our institute at the same period constituted group 2. Their gestational age ranged from 18 to 35 years. Mean age 24 years. 50 normal non pregnant patients selected at random who come to the OPD of our institute at the same period who were from 18 to 35 years of age constituted group 3. Mean age is 26 years.

**The mean blood pressure of these three groups is given in below table.**

Group	Systolic	Diastolic
Group 1	156	100
Group 2	116	72
Group 3	118	78

All the patients were examined by us using Philips IE33 echo machine with 2.5 mHz transducer at the Department of cardiology, GMKMCH, Salem. Echocardiography of left ventricle was obtained under standard conditions during quiet expiration with patients in the left lateral recumbent positions after the patients remained undisturbed in this position for 15 minutes. M-mode 2D and Doppler echocardiographic evaluation were performed in all patients in the standard left parasternal axis view with continuous ECG gating according to the ASE guidelines. LV dimension like EF, ESD and EDD are measured by 2D and M-mode. Interventricular septum and posterior wall diameter are also measured in M-mode using pulse Doppler echocardiography mitral flow velocities IVRT and DT are measured. The normal EF is 50 to 75% and normal FS is 25 to 46%. The normal E/A ratio is 0.8 to 2. The normal IVRT is 73 to 110 ms, more than 110ms is considered as prolonged IVRT indicative of diastolic dysfunction. The normal deceleration time is 160 to 230 ms and it is prolonged in diastolic dysfunction.

**Results:**

The mean left ventricular end diastolic diameter in group 1, 2 and 3 were 4.82, 4.86 and 4.55 respectively. The mean and systolic dimension of group 1, 2 and 3 were 3.1, 3.73 and 3.04 respectively. There were no significant differences in the mean and diastolic and end systolic dimension between preeclamptic and normotensive pregnant women, although the mean end diastolic and end systolic dimension in the two groups of pregnant women were significantly greater than in the non-pregnant group.

The mean EF in the three groups were 62%, 58.4% and 58.6% respectively. They were comparable and there is no statistical significance. 5 patients in group one showed EF <50% that defines left ventricle systolic dysfunction. Mean FS in the three groups were 30.2%, 31.4% and 32.8% respectively. Only 5 patients in group1 showed FS <25% that defines left ventricular systolic dysfunction.

The mean E/A ratio in the three groups were 1.09, 1.20 and 1.21 respectively. 15 patients in group 1 had E/A ratio <1 indicative of diastolic dysfunction. Mean IVRT in the three groups were 110, 90 and 88 respectively. The mean DT in the three groups were 210, 184 and 188 respectively. The same 15 patients who showed reversed E/A ratio also had prolonged IVRT and DT confirming the diagnosis of diastolic dysfunction LV systolic and diastolic function indices were compared among the three groups using Tulkey-HSD test with significance level 0.051. There was a statistically significant LV diastolic dysfunction in the preeclampsia group. (P value <0.001).

**Statistical Analysis**

	Group 1		Group 2		Group 3		Statistical Analysis		
	Mean	SD	Mean	SD	Mean	SD	1VS 2	1VS 3	2VS 3
End Diastolic dimension (EM)	4.82	0.5	4.86	0.42	4.55	0.28	NS	<0.001	<0.001
End Systolic dimension (CM)	3.1	0.36	3.33	0.32	3.04	0.24	NS	<0.001	<0.001

FS	30.28	7.24	31.4	5.10	32.8	4.60	NS	NS	NS
EF	62	4.19	58.4	4.72	58.6	3.20	NS	NS	NS
Mitral inflow velocity E/A	1.09	0.19	1.20	0.14	1.21	0.12	<0.001	<0.001	NS
IVRT (m sec)	110	15.68	90	10.52	88	10.64	<0.001	<0.001	NS
DT (m sec)	24.0	31.36	184	20.79	188	22.92	<0.001	<0.001	NS

**Discussion**

In normal pregnancies, there is marked increase in the blood volume that lead to significant volume overload of the heart. In preeclampsia, there is an alteration in this hemodynamic pattern whether these hemodynamic changes influence the left ventricular functions in preeclampsia remain unclear.

J.Kuznier. et al4 1983 in their study by echocardiography found that the mean end diastolic dimension and mean end systolic dimension were significantly elevated in pregnant patients above the mean of non-pregnant patients. In this respect, our data is comparable with the former study, though there is no significant difference of values between the preeclampsia and normotensive pregnant group.

The left ventricular performance during normal pregnancy was studied by Rubler and Colleagues<sup>12</sup>, Katz and associates<sup>5</sup> using echocardiography. They did not find significant differences in percentage of FS between the subjects in the control group and these who are pregnant at term J. Kuzniar et al4 reported that left ventricular function as expressed by echocardiographic ejection phase indices did not differ substantially between the non pregnant patients and normal pregnant patients in the third trimester. In our study, the indices of left ventricular function were consistent with the above study showing no significant difference between the subjects in the control group and normaltensive pregnant group.

Larkin and Coworkers<sup>7</sup> did not find significantly differences in the functional status of the left ventricle, as evidenced by echocardiographically derived EF between normotensive and hypertensive pregnant patients. J.Kuzniar et al4 reported that the left ventricular systolic function was well preserved in most of the preeclamptic women. Only 7% of them showed depressed left ventricular performance as evidenced by percentage fractional shortening. In our study it is found that in most of the preeclampsia patients the indices of left ventricular systolic function fell within normal range. These observations indicate good cardiac contractile function. Even though the left ventricle operate on the ascending limb of the left ventricle function curve only 5 out of 50 patients of this group had depressed LV systolic function. These findings correlate well with the J.Kuzniar at el4 study.

Williams C medie<sup>14</sup> et al found that among the 25 preeclampsia women who developed pulmonary edema during ante Partum and Post partum period, 12 (48%) showed diastolic dysfunction as evidenced by reversed E/A ratio with normal LV systolic function. Desai DC<sup>3</sup> et al reported that among the 16 preeclampsia patients who developed pulmonary edema in the antenatal period. 12 (75%) patients showed LV diastolic filling abnormalities in significant proportion with preserved systolic function compared to control normotensive group LV diastolic dysfunction as evidenced by reversal E/A ratio and prolonged IVRT and DT occurred in 15/50 (30%) of our preeclampsia patients. In our study, it is interesting to note that only 3 out of 15 patients had LV hypertrophy.

Among the 17 patients with LV dysfunction, 12 patients had mild preeclampsia and 3 patients had severe preeclampsia. Among the 12 mild preeclampsia patients with LV dysfunction 8 patients had

normal vaginal deliveries. 4 patients went in for LSCS. Among the 3 patients with severe preeclampsia, 2 patients had normal vaginal deliveries. One patient had LSCS for fetal distress. None of the 15 patients developed complications like pulmonary edema or cardiac failure. Their B returned to normal within 15 days of postpartum.

#### Conclusion:

This single center prospective observational study showed that LV systolic function was within normal limits in most of the preeclamptic patients. It was noted that statistically significant LV diastolic dysfunction was seen in 15/50 (30%) of preeclampsia patients ( $P < 0.001$ ) LV hypertrophy was a rare finding occurring only in the three patients of the study group. It was observed that, appropriate management of the patients who showed LV dysfunction prevented pulmonary edema and cardiac failure.

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