

## Screening of Cardiac Status in Asymptomatic Antenatal Mothers to Detect Undiagnosed Heart Disease

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### Abstract:

**Introduction:** Heart disease is the leading cause of death during pregnancy in developed countries, and cardiovascular complications may develop in 0.2%–4% of pregnancies, even if no prior cardiac disease is known.

**Aim and Objective:** To determine the prevalence and distribution of CVD and its potential risks among asymptomatic pregnant women.

**Result:** Out of 200 sample that was studied, 8 (4%) had h/o heart disease and remaining 192 cases had (96%) had no h/o of heart disease. Only 45 (22.5%) had heart disease detected by ECHO and remaining 155 cases had (77.5%) no heart disease. Out of the 45 cases of heart disease, 13 cases had CHD, 5 cases each moderate MR and MS and 4 cases each had TR and severe MS.

**Conclusion:** Cardiac screening during pregnancy may seem to be an expensive process. However, the detection of cardiac diseases during pregnancy can be lifesaving, due to the fact that CVD is the major cause of maternal death. Conducting a systematic, accurate and realistic risk assessment for potential maternal and foetal complications and anticipated adverse outcomes, both during pregnancy and postpartum is vital to the success and safety of the pregnancy. Hence it advisable to subject all pregnant women to echocardiographic examination at least one time during pregnancy.

**Keywords:** Pregnancy, Heart disease, cardiac screening, Echocardiography.

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### Introduction

Heart disease is the leading cause of death during pregnancy in developed countries, and cardiovascular complications may develop in 0.2%–4% of pregnancies, even if no prior cardiac disease is known [1, 2].

The rate of CVD in pregnant women is rising, primarily due to an increased number of women with congenital heart disease (CHD) reaching child-bearing age and the alterations in demographics associated with advancing maternal age [3]. As specified in the European Society of Cardiology (ESC) and American

College of Cardiology/American Heart Association (ACC/AHA) guidelines, the spectrum of CVD among pregnant woman changes among countries [4].

Major changes happen in the cardiovascular system during pregnancy. The blood volume increases up to 50%, the heart rate increases for approximately 20%, the stroke volume increases for approximately 30%, and cardiac output increases for approximately 50% when compared to non-pregnant levels [5]. A routine cardiac screening during pregnancy

is not recommended in the guidelines; however, an early diagnosis of CVD is important to decrease maternal morbidity and mortality. In pregnant women, routine complaints such as dyspnea, palpitation, and loss in the effort capacity can mimic heart diseases, so it may be difficult to suspect a CVD during pregnancy [6]. Therefore, a cardiovascular risk assessment at the beginning of pregnancy gains importance

In the present study, by performing routine cardiac screening among pregnant women

Source of data	Antenatal mother attending OPD, admitted in antenatal ward, in Department of obstetrics and Gynaecology at GRH affiliated to Madurai medical college
Study design	Study open label, prospective
Study period	12 months(Jan 2022 to Jan 2023)
Sample design	Simple random sampling
Sample size	200
Inclusion criteria	All antenatal patients attending OPD
Exclusion criteria	Patients with known heart disease

These patients were grouped according to the trimester of pregnancy. Most of the patients in our study were in the first trimester. Those with known heart disease were excluded from this study. Detailed history and clinical examination were done in all the patients before echocardiographic evaluation.

Electrocardiogram was taken for all the patients. Echocardiogram was done in all patients using Phillips Echo machine. M mode, 2D, Doppler and colour flow mapping was done by standard methods. Careful examination was done to rule out any congenital or acquired heart disease. Urine routine and microscopy with urine albumin.

Renal function tests – Urea, Creatinine, and Uric acid. Liver function tests- SGOT, SGPT, LDH, serum bilirubin and total protein 2D ECHO parameters studied are,

in the first trimester, we aimed to diagnose CVD and analyze a CVD spectrum among first-trimester healthy pregnant women who visited the antenatal outpatient clinics for routine examination.

### Aim and Objective

To determine the prevalence and distribution of CVD and its potential risks among asymptomatic pregnant women

### Materials and Method

Left ventricle internal diameter – end diastole & end systole (LVIDd, LVIDs), Left atrial mass, IVSD, E/A ratio across mitral valve, Left ventricular ejection fraction (LVEF). Based on the above parameters, structural & functional (both systolic & diastolic) cardiac abnormalities identified in the study groups.

### Statistical Analysis

Data was described as mean +/- SD and percentage. Metric data was compared by Student's t test, whereas Non-metric data was compared by Chi square test and Mann-Whitney U test.

The Kolmogorov-smirnov test was used to assess normality of the distribution of the data  $P < 0.05$  was considered as significant p value.

### Observation and Results

**Table 1: Age Distribution**

Age	No. of Cases	Percentage
20 - 24	109	54.5
25 - 29	82	41
30 - 34	9	4.5
Total	200	100
Mean Age	24.42	

Out of 200 cases, 109 (54.5%) of the cases from the age group of 20-24 years. Mean age of the study patient is 24.42 years.

**Table 2: Parity Distribution**

Parity	No. of Cases	Percentage
Primi	123	61.5
Multi	77	38.5
Total	200	100

Out of 200 cases, 123 (61.5%) of the cases are Primi and remaining 77 cases (38.5%) are multi.

**Table 3: BMI Distribution**

BMI	No. of Cases	Percentage
≤23	93	46.5
23.1 - 26.0	83	41.5
> 26.0	24	12
Total	200	100

Out of 200 cases, 93 (46.5%) of the cases are from <23 BMI, 41.5% of the cases from 23 to 26 BMI and remaining 24 cases (12%) had >26 BMI.

**Table 4: Distribution of Family History**

Family History	No. of Cases	Percentage
Yes	8	4
No	192	96
Total	200	100

Out of 200 cases, only 8 (4%) had h/o heart disease and remaining 192 cases had (96%) had no h/o of heart disease.

**Table 5: Distribution of Heart Disease Detected by Echo**

Heart Disease Detected By Echo	No. of Cases	Percentage
Yes	45	22.5
No	155	77.5
Total	200	100

Out of 200 cases, only 45 (22.5%) had heart disease detected by ECHO and remaining 155 cases had (77.5%) no heart disease.

**Table 6: Distribution of Heart Disease**

Heart Disease Type (Rheumatic)	No. of Cases	Percentage
CHD	13	6.5
TR	4	2
Severe Pulmonary HTN	3	1.5
Moderate MR	5	2.5
SEVERE MR	2	1
Mild AR	2	1
MILD MS	3	1.5

Moderate MS	5	2.5
Severe MS	4	2
MILD PR	3	1.5
Moderate PS	1	0.5
Total	45	22.5

Out of 200 cases, 45 cases had heart disease. From these 45 cases, 13 cases had CHD, 5 cases each moderate MR and MS and 4 cases each had TR and severe MS.

**Table 7: Mode of Delivery Distribution**

Mode Of Delivery	No. of Cases	Percentage
Normal	123	61.5
C Section	77	38.5
Total	200	100

Out of 200 cases, 123 (61.5%) of the cases are normal delivery and remaining 77 cases (38.5%) are went to caesarean section.

**Table 8: Comparison of Vitals Vs Heart Disease**

Vitals	Heart Disease (45)		Normal (155)		P Value	
	Mean	SD	Mean	SD		
Systolic BP	149.178	6.903	119.258	11.349	< 0.001	Significant
Diastolic BP	94.222	6.512	77.303	7.863	< 0.001	Significant
SPO2	98.733	1.136	98.471	1.136	0.174	Not Sig
Pulse RATE	95.644	6.82	74.581	7.64	< 0.001	Significant

Systolic BP is significantly higher in heart disease cases ie. 149.2 for heart disease cases and 119 for normal cases. P value < 0.001 significant.

Diastolic BP is significantly higher in heart disease cases ie. 94.2 for heart disease cases and 77.3 for normal cases. P value < 0.001 significant.

Pulse rate also significantly higher in heart disease cases ie. 95.6 for heart disease cases and 74.6 for normal cases. P value < 0.001 significant.

**Table 9: Comparison of LVEF%**

Heart Disease	No. of Cases	Mean	Std Dev
Rheumatic disease			
Mild MR	15	45.07	2.82
Moderate MR	5	35.2	2.28
SEVERE MR	2	29	1.41
Mild AR	2	47	4.24
MILD MS	3	44	1.73
MILD PR	3	47.33	1.53
MODERATE PS	1	34	0.00
TR	4	27	2.58
CHD	10	29.4	1.90
Total	45	< 0.001 Significant	

The above table describes the LVEF% of different stages of heart disease cases. Severe MR and TR cases had very low LVEF%.

**Table 10: Comparison of LVEF% Heart Disease Vs Normal Cases**

LVEF %	Mean	SD
Heart Disease (45)	38.09	8.168
Normal (155)	66.99	5.282
P Value	< 0.001 Significant	

LVEF% is significantly low (38.09) in heart disease cases when compared with normal cases (66.99). p value highly significant.  $< 0.001$ .

**Table 11: Comparison of LVEDD Heart Disease Vs Normal Cases**

LVEDD (Cm)	Mean	SD
Heart Disease (45)	4.773	0.522
Normal (155)	4.156	0.302
P Value	$< 0.001$ Significant	

LVEDD is significantly high (4.77) for heart disease cases when compared with normal cases (4.16). p value highly significant.  $< 0.001$ .

**Table 12: Comparison of RAEDD Heart Disease Vs Normal Cases**

RAEDD (Cm)	Mean	SD
Heart Disease (45)	2.849	0.667
Normal (155)	2.654	0.489
P Value	0.032 Significant	

RAEDD is significantly high (2.85) for heart disease cases when compared with normal cases (2.65). p value is significant.  $p=0.032$

**Table 13: Comparison of RVEDD Heart Disease Vs Normal Cases**

RVEDD (Cm)	Mean	SD
Heart Disease (45)	2.253	0.486
Normal (155)	2.466	0.423
P Value	0.005 Significant	

RVEDD is significantly low (2.25) for heart disease cases when compared with normal cases (2.47). p value highly significant.  $p= 0.005$ .

**Table 14: Comparison of LAEDD Heart Disease Vs Normal Cases**

LAEDD (Cm)	Mean	SD
Heart Disease (45)	3.28	0.981
Normal (155)	3.05	0.884
P Value	0.136 Not Significant	

Mean LAEDD is 3.28 for heart disease cases and 3.05 for normal cases There is no significant difference between normal and heart disease cases regarding LAEDD.  $p= 0.136$  Not significant.

**Table 15: Comparison of Mode of Delivery Heart Disease Vs Normal Cases**

Mode of Delivery	C Section	Normal
Heart Disease (45)	25	20
Normal (155)	52	103
P Value	$< 0.001$ Significant	

Out of 45 heart disease cases, their 25 babies delivered by caesarean and 20 cases by normal delivery. There is a significant difference between mode of delivery and heart disease cases.

**Table 16: Comparison of Birth Weight Heart Disease Vs Normal Cases**

B. WT (In Kg)	Mean	SD
Heart Disease (45)	2.72	0.388
Normal (155)	2.80	0.389
P Value	0.195 Not Significant	

Mean Birth weight of heart disease cases are 2.72 kgs and 2.80 for normal cases. There is no significant difference between

normal and heart disease cases regarding birth weight  $p= 0.195$  Not significant.

## Discussion

In this study we have assessed the role of echocardiography and found it to be a useful technique for evaluation of maternal cardiac function in asymptomatic women.

If any cardiovascular dysfunction can be picked by an echocardiography in asymptomatic women, it may be possible to reduce the risk of heart failure and development of future CVD by early intervention.

In our study, Out of 200 cases, 109 (54.5%) of the cases from the age group of 20-24 years. Mean age of the heart disease patient is 24.6 years and normal patients is 24.3. 123 (61.5%) of the cases are Primi and remaining 77 cases (38.5%) are multi. majority of subjects were primigravida in both Heart disease and Normal women group, 57.7% & 43.3% respectively.

### Comparison of Mode of delivery:

In our study, Out of 200 cases, 123 (61.5%) of the cases normal delivery and remaining 77 cases (38.5%) are went to caesarean section.

### Comparison of ECHO abnormality:

LVEF% is significantly low (38.09) in heart disease cases when compared with normal cases (66.99). p value highly significant. < 0.001.

LVEDD is significantly high (4.77) for heart disease cases when compared with normal cases (4.16). p value highly significant. < 0.001.

RAEDD is significantly high (2.85) for heart disease cases when compared with normal cases (2.65). p value is significant. p=0.032

RVEDD is significantly low (2.25) for heart disease cases when compared with normal cases (2.47). p value highly significant. p= 0.005.

### Study of ECHO Parameters:

LVIDd, IVSD, LPWD, LA dimension, E/A ratio & E/E' ratio shows statistically

significant changes in Heart disease women compared to Normal women.

### Comparison of Ejection fraction:

All Normal women study subjects had normal LVEF > 60%. Among Heart disease group significant reduction in LVEF (<50%) was noted in 2.5% subjects. LVEF% is significantly low (38.09) in heart disease cases when compared with normal cases (66.99). p value highly significant. < 0.001.

Comparison of birth weight of babies: Mean Birth weight of heart disease cases are 2.72 kgs and 2.80 for normal cases. There is no significant difference between normal and heart disease cases regarding birth weight p= 0.195 Not significant. Majority of women belonging to Heart disease group delivered LBW babies when compared to Normal women.

### Conclusion

Cardiac screening during pregnancy may seem to be an expensive process. However, the detection of cardiac diseases during pregnancy can be lifesaving, due to the fact that CVD is the major cause of maternal death. In our study, the CVD rate of 5.2% among healthy pregnant women in the first trimester shows that the clinicians must keep in mind that during pregnancy, physiological changes in the cardiovascular system may aggravate an undiagnosed disease, and they should be alert even in the case of mild cardiac symptoms that may interfere with pregnancy complaints.

Identification of heart disease helps us for making necessary arrangements for the delivery and follow up during postpartum period. Ideally baseline evaluation of cardiac function and heart disease before conception will provide an opportunity for the relevant counseling. Physiological changes that occur during pregnancy may precipitate decompensation in those with previously well tolerated lesions. The care of pregnant patients with heart disease

requires special attention to diagnosis, treatment and continuous follow-up. Conducting a systematic, accurate and realistic risk assessment for potential maternal and foetal complications and anticipated adverse outcomes, both during pregnancy and postpartum is vital to the success and safety of the pregnancy. Hence it is advisable to subject all pregnant women to echocardiographic examination at least one time during pregnancy.

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