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Maternal and perinatal outcomes of pregnancies complicated by cardiac disease at a tertiary level hospital

Naga Veni Prapura Pulakhandam¹, Niharika Chaudhary^{1,*}, Y Annapoorna¹¹Dept. of Obstetrics & Gynecology, GSL Medical College, Rajahmundry, Andhra Pradesh, India

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ABSTRACT

Introduction: Heart disease in pregnancy is one of the leading non-obstetric causes of maternal mortality and is the leading cause of maternal intensive care unit admissions in the world.**Objective:** To study the prevalence of heart disease in antenatal mothers and fetal outcome with obstetric management.**Materials and Methods:** The presence of comorbidities and the occurrence of obstetric, fetal, and cardiovascular complications during delivery among women with heart disease hospitalized for delivery were studied in 35 women at GSL Medical College, Rajahmundry for a period of 1 year from 01/01/2019 to 1/1/2020**Results:** Over a period of 12 months, 35 subjects were recruited. During this period, there were 5005 deliveries. The majority of women were aged between 20-25yrs and were unbooked cases belonging to NYHA class I or II. Cesarean section and operative vaginal delivery were more common. Despite the multidisciplinary approach, 3 women succumbed to the disease of which one was a case of severe rheumatic heart disease with valve failure, the second was a case of postpartum cardiomyopathy and the third was a case of severe pulmonary arterial hypertension. Fetal outcome in cardiac patients is usually good and only a little different from those patients who do not suffer from heart disease.**Conclusions:** Pregnant women with heart disease were more likely to experience adverse events during delivery. These women require a multidisciplinary team for optimal maternal and foetal outcomes.This is an Open Access (OA) journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License](https://creativecommons.org/licenses/by-nc-sa/4.0/), which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.For reprints contact: reprint@ipinnovative.com

1. Introduction

Heart disease in pregnancy is one amongst the leading non-obstetric causes of maternal mortality and is the leading cause of maternal intensive care unit admissions in the world. Prevalence of heart disease in pregnancy varies from 1-4%.¹

The maternal mortality rate in women with cardiac disease is 7% and morbidity is 30% during pregnancy in India.^{2,3}

Incidence of heart disease complicating pregnancy has remained stable for many years since the significant

decrease in the occurrence of rheumatic heart disease in the last 40 years has been compensated by a significant increase of pregnancy with congenital heart disease.⁴

Diseases of the heart are broadly divided into congenital and acquired. Common congenital heart diseases include atrial septal defect and ventricular septal defect.

Acquired heart diseases include rheumatic heart disease, cardiomyopathies and ischemic heart disease.

Disease pattern varies widely when developed and underdeveloped countries are concerned. In the western world, the incidence of RHD has declined. Congenital heart disease along with ischemic heart disease have a higher prevalence. This could be due to increasing age at

* Corresponding author.

E-mail address: niharikachaudhary@gmail.com (N. Chaudhary).

marriage and an increased proportion of women with treated congenital heart disease entering reproductive age and also the near eradication of rheumatic fever and sequelae owing to improvement in living conditions and early detection of the disorder.

In India, acute and chronic RHD still constitutes a major health problem among pregnant women.⁵ Poor sanitary conditions, result in repeated childhood streptococcal infection in rural areas. In India, rheumatic heart disease contributes to approximately 69% of cardiac disorders seen in pregnancy predominant valvular lesion being mitral stenosis.⁶

Cardiomyopathies and congenital heart block are rare but represent severe causes of cardiovascular complications in pregnancy. Peripartum cardiomyopathy (PPCM) is the most common cause of severe complications.⁷

There can be an increase in the prevalence of heart disease in teaching institutes than the overall population, this can be attributed to the fact that teaching institutes are being the tertiary referral centers for high-risk pregnancies.

Physiological changes in pregnancy include an increase in blood volume, an increase in plasma volume, an increase in red blood cells, a decrease in systemic vascular resistance, myocardial contractility increases and cardiac output increases. All these can be well tolerated in normal pregnancy, but in an already diseased heart, it poses a major risk that requires close monitoring.⁸

In India, heart disease is diagnosed mostly in pregnancy for the first time, when increased demands on the heart trigger symptoms and unmask cardiac disease.^{9,10}

Any mild symptoms like chest pain, syncope, breathlessness, palpitations, pedal oedema and diastolic murmur should be considered seriously as it may be physiological in addition.

The functional capacity of the heart is assessed by investigations as electrocardiography (ECG), echocardiography, oxygen saturation and complete blood examination.

Maternal functional status is the most important predictor of outcome and is most often defined by NYHA functional class¹¹ Poor functional status and cyanosis are mostly associated with adverse maternal and neonatal outcomes.

Anemia and pre-eclampsia which are commonly seen comorbidities in India can precipitate heart failure leading to worsening maternal condition.

The fetus of a gravida with cardiovascular disease also has an increased risk of morbidity, including an increased risk of inherited cardiac genetic disorders, fetal growth restriction, and premature delivery.¹²

Proper screening, regular antenatal check-ups, multi-disciplinary approach and follow-up is mandatory for a better maternal and fetal outcome.

Preconception counselling: From risk stratification to contraception counselling and pursuit of the appropriate

therapeutic course prior to conception, preconception counselling has the potential to simplify the clinical course for many patients at high risk.

As part of these discussions, pregnancy-related complications should include those related to the pregnancy, as well as potential late adverse maternal cardiac outcomes, and the potential for fetal prematurity and its consequences. In addition, attention to discontinuation and possibly replacement of teratogenic medications should take place.

The present study is proposed to study the presence of comorbidities and the occurrence of obstetric, fetal, and cardiovascular complications during delivery among women with heart disease.

2. Materials and Methods

This prospective cohort study was carried out among 35 cases of cardiac disease in pregnancy receiving tertiary care in the department of Obstetrics and Gynecology in GSL General Hospital over 1 year from 01/01/2019 to 1/1/2020 including booked and unbooked emergency cases.

All pregnant women with congenital or acquired heart disease or those women diagnosed with peripartum cardiomyopathy were enrolled. Women referred for termination of pregnancy were excluded.

Data was collected from consenting females with written consent in their own language with the help of a clinical questionnaire which contains demographic characteristics, parity, gestational age, prior cardiac events, prior surgery/intervention, medication, cardiac lesions, New York Heart Association (NYHA) functional class, comorbid conditions.

Functional grading was made according to the criteria of NYHA classification.¹³

Class I: Patients with cardiac disease but without resulting limitation of physical activity. Ordinary physical activity does not cause undue fatigue, palpitation, dyspnea, or anginal pain.

Class II: Patients with cardiac disease resulting in a slight limitation of physical activity. Comfortable at rest. Ordinary physical activity results in fatigue, palpitation, dyspnea, or anginal pain.

Class III: Patients with cardiac disease resulting in marked limitation of physical activity. Comfortable at rest. Less than ordinary activity causes fatigue, palpitation, or dyspnea, or anginal pain.

Class IV: Patients with cardiac disease resulting in an inability to carry on any physical activity without discomfort. Symptoms of heart failure at rest. If any physical activity is undertaken, discomfort is increased.

A thorough clinical examination was done to find out the type of cardiac lesion and any signs of heart failure. All relevant investigations were done including ECG and echocardiography and they were evaluated clinically by both obstetricians and cardiologists. The routine obstetric

examination was done. The patients were advised regular antenatal checkups along with cardiologist consultation.

Women were advised rest, iron and folic acid supplementation, explained importance of avoidance of infections, and an early visit to the clinic if there is any deterioration of health condition. Management was planned as a joint approach by a cardiologist and obstetrician according to the condition of the patient, NYHA functional status, and type of cardiac lesion, cardiovascular stability, and duration of pregnancy and viability of the foetus.

Women with NYHA classes I and II were admitted to the hospital at 36 weeks.

Vaginal delivery was preferred. Induction of labour was considered for the most stringent obstetric indications. Cesarean section was done only for clear obstetric indications. Intramuscular syntocin was given following the completion of the second stage except in patients with heart failure.

After delivery, the patient was assessed for well-being and cardiac and obstetric complications.

All patients were given infective endocarditis prophylaxis for seven days.

All patients were hospitalized for five days post-natally for antibiotic coverage. Newborns of mothers with congenital heart disease were examined for the inheritance of the disease.

Adverse outcomes during the antepartum, peripartum and postpartum period were classified as:

1. Maternal (obstetric),
2. Cardiac and
3. Perinatal complications.
4. Maternal complications were:
5. Anemia.
6. Pregnancy-induced hypertension.
7. Postpartum haemorrhage.
8. Cardiac complications were defined as:
9. Pulmonary edema.
10. Sustained symptomatic tachyarrhythmia requiring treatment.
11. Cardiac arrest or cardiac death.
12. Perinatal complications were defined as:
13. Preterm birth.
14. Small for gestational age
15. Stillbirth
16. Intrauterine demise.

2.1. Statistical analysis

Collected data were entered into a Microsoft Excel spreadsheet and were analyzed. Comparison of the maternal outcome amongst NYHA functional class, and according to booking status and prior surgical intervention for heart disease was made by applying chi-square test. P-value < 0.05 was considered as significant.

3. Results

Over 12 months, a total of 35 pregnant women complicated by heart disease were studied. During this period, there were 5005 deliveries. The prevalence of heart disease among pregnant women in our institute was 0.7%.

The mean age was 23years. (Range: 20-33years)

The mean BMI of the cases was 25.07 kg/m²

Table 1: Depicting the demographic details

Age	Number	Percentage
20-25years	29	82.85%
26-30	4	11.42%
>30years	2	5.7%
Parity		
1	24	68.57%
2	5	14.2%
3 OR>3	6	17.14%
Antenatal Care		
Booked	5	15%
Unbooked	30	85%
Residence		
Rural	30	85%
Urban	5	5%

Of the total cases, eleven (31.42%) were multipara, remaining were primigravida.

Most patients were unbooked, 30(85%)and 5(15%) were booked. This indicates the lower awareness and non-compliance with medical treatment even with existing heart disease. The majority of patients did not have regular antenatal checkups and cardiology OPD visits.

Maximum number of patients belonged to NYHA functional classes I and II 90(%), and only10(%) from classes III and IV.

The mean gestation age of terminating pregnancy was found to be 36wks ±5 days.

Among the heart diseases, rheumatic heart disease constitutes 51.4%, congenital heart disease 37.14%, miscellaneous accounts for about 11.4%.

MS-mitral stenosis, MR- mitral regurgitation, TR-tricuspid regurgitation, ASD- atrial septal defect, VSD-ventricular septal defect, PDA- patent ductus arteriosus, PPCM- peripartum cardiomyopathy.

Among rheumatic heart diseases, mitral regurgitation 9(50%) was most common. Multiple cardiac lesions were present in 8(22.8%) pregnancies. Among women with congenital heart disease, atrial septal defect 7(53.8%) was the most common lesion.

During pregnancy, cardiac surgery was performed on two women. Both suffered from symptoms not controlled by medical management. Balloon valvuloplasty was done for both with uneventful surgical outcomes.

Another 5(14%) entered pregnancy with prior mitral valve replacement. All of them had anti-coagulant therapy.

Table 2: Depicting the distribution of heart disease.

Type of cardiac lesion	No. of cases	Percentage
Rheumatic	18	51.42%
MR	9	
MS	4	
TR	2	
MS+MR	1	
MS+MR+TR	2	
Congenital	13	37.14%
ASD	5	
Post ASD Closure	2	
VSD	2	
POST VSD Closure	3	
PDA	1	
Miscellaneous	4	11.42%
PPCM	3	
Sinus Arrythmia	1	

About 34.2% of the cardiac lesions were surgically corrected.

Table 3: Depicting the surgically corrected heart diseases

	No of cases	Percentage
Surgically corrected CHD	6	17.14%
Surgically corrected RHD	6	17.14%

Among obstetrics co-morbidities hypertensive disorders of pregnancy 5(gestational hypertension 3, preeclampsia 2(14%) were most commonly seen. Gestational diabetes was seen in 2(5.7%),

Polyhydramnios was seen in 2 (5.7%) and Oligohydramnios in 1 (2.8%) cases.

Table 4: Depicting the obstetric comorbidities

Obstetric Co-Morbidities	Number (percentage)
Gestational Hypertension	3(8.5%)
Pre-eclapsmia	2(5.7%)
Gestational Diabetes Mellitus	2(5.7%)
Prior LSCS	7(20%)
PPROM	1(2.8%)
Cephalopelvic Disproportion	1(2.8%)
Oligohydromnios	1(2.8%)
Polyhydromnios	2(5.7%)
IUGR	3(8.5%)
Malpresentation	1(2.8%)

Anemia 7(20%) and hypothyroidism 2 (8.5%) were most common medical co-morbidities seen.

Table 5: Depicting the medical comorbidities

Medical Co-Morbidities	Number (percentage)
Anemia	7(20%)
Hypothyroidism	3(8.5%)

The majority of the cases were delivered through caesarean section(40%) due to obstetric causes.

Among the 21(60%) vaginally delivered cases, eight were spontaneous, remaining were operative vaginal deliveries.

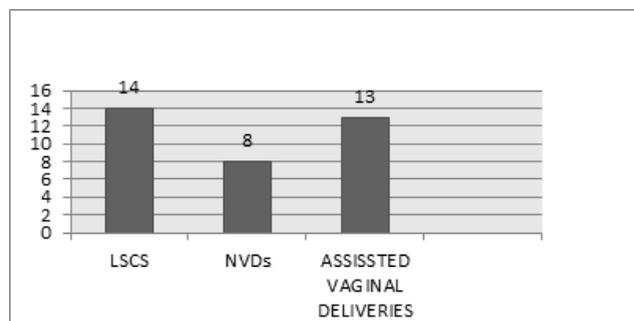


Fig. 1: Depicting the mode of delivery

Table 6: Depicting the indications of LSCS

Indications for LSCS	Number	Percentage
Previous LSCS	7	50%
Fetal distress	2	14.2%
Cephalopelvic disproportion	1	7.14%
Failed induction	3	21.4%
Malpresentation	1	7.14%

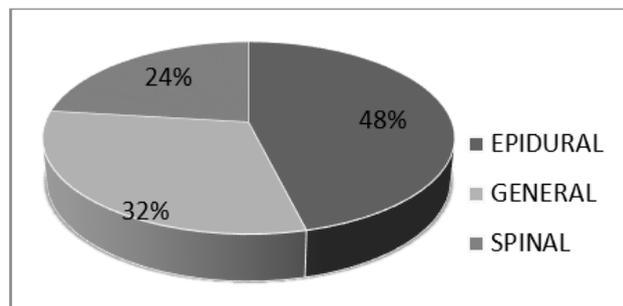


Fig. 2: Showing the type of anaesthesia

Cardiac failure is a major complication during pregnancy and is often associated with maternal death.

There were three maternal deaths that occurred during the study period.

1. One was a case of primigravida with term gestation with post mitral valve replacement, developed acute onset of dyspnea, flash pulmonary edema in the antenatal period. The patient was delivered immediately by emergency caesarean section, died due to struck valve in the immediate postpartum period in spite of multidisciplinary treatment in a cardiac intensive care unit.

- Next was a case of primigravida delivered vaginally, later developed postpartum cardiomyopathy, diagnosed on postoperative day 2 [postpartum period]. The patient developed sudden breathlessness & landed in cardiac failure in spite of multidisciplinary treatment in a cardiac intensive care unit.
- Last was a case of the second gravida with term gestation with severe PAH with EF 40%, delivered spontaneously, developed acute onset of dyspnea immediately after the delivery and died due to cardiac arrest in spite of multidisciplinary treatment in a cardiac intensive care unit.

Perinatal outcome: Most of the babies, 27(77%) were delivered as term and healthy. Only 8 babies(23%) were preterm.

Mean birth weight was 2.56Kg, 24(68.5%) babies were of average birth weight and 8(22.8%) babies were low birth weight. 3 Babies were IUGR 1 baby died in utero.

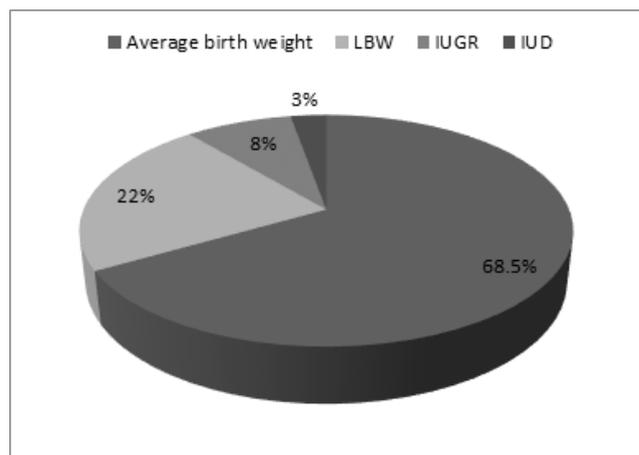


Fig. 3: Showing the perinatal outcome

4. Discussion

In the present study prevalence of heart disease is 0.7%. Cardiac disease continues to be a risk factor for maternal morbidity and mortality.

The incidence of registered patients is 15% and emergency cases referred from outside were 85%. Thus, being a tertiary care center, most of the cases were referred from outside.

The incidence of cardiac abnormalities in pregnancy has remained more or less unchanged, but the relative contribution of type of heart disease varies with study population and study period.

Our study shows that RHD is still a major group of heart disease in pregnancy among which mitral valve disease is the commonest. RHD constituted 51.4% of cases of all cardiac diseases during the present study. These

observations are in agreement with other Indian studies. Various authors have reported proportion of RHD from 54% by Chaudhari P et al¹⁴ to 73% by Sengodan SS et al.¹⁵

In the present study, 30 (85.7%) cases belonged to NYHA functional class I - II and 5 (14.28%) cases belonged to Class III-IV and is correlating with the studies done by Chaudhari P et al.

Murmurs heard during pregnancy are almost always benign. Echocardiography is therefore rarely necessary in pregnancy. However, echocardiography was done routinely in our study. Multiple cardiac lesions were present in 8(22.8%) pregnancies. Echocardiography was therefore helpful for early and accurate diagnosis of cardiac status.

In this study, all women received prophylactic antibiotics against bacterial endocarditis. However, the ACOG practice bulletin recommends prophylaxis only in very high-risk women as with prosthetic heart valves or previous endocarditis.¹⁶ We feel that in the Indian setup, prophylaxis for bacterial endocarditis should be given to all pregnant women with heart disease.

MODE OF DELIVERY: The type of delivery mainly depends on the hemodynamic status of the patient as well as obstetric indications.¹⁷ Deliveries in women with cardiac disease are best accomplished in a tertiary care hospital.

Vaginal delivery is the preferred mode of delivery in most women, even in those with established cardiovascular disease. Ideally all pregnant women with cardiac disease should expect an attempt at vaginal delivery unless obstetric contraindications exist.

In the present study, 22.8% of patients had normal vaginal deliveries and 40% had LSCS for obstetric and cardiac indications while 37.14% underwent instrumental (ventouse/forceps) vaginal deliveries. There is an increased incidence of LSCS in our study which is in disagreement with other recent studies as we had more women with prior cesarean section.

Fetal outcome in cardiac patients is usually good and only a little different from those patients who do not suffer from heart disease. 31.4% of the babies were of low birth weight and most of the babies weighed between 2.0-2.5 kg and there were 3 IUGR (8.5%) babies. 1 baby died in utero.

The neonates also have the risk of inheriting congenital heart disease. In our study, we have not observed any neonatal heart disease.

Throughout the study 3 maternal mortalities occurred. Thus, making a case fatality ratio of 8.5%. This is slightly more than that in studies done by Nagamani G et al¹⁸ and Devabhaktuni P et al.¹⁹

Contraceptive Choices: There is no single best method for contraception and it should be individualized in each case after extensive counselling of the couple. Combined oral contraceptives are not preferred in women with cardiac disease due to the increased risk of thrombotic complications.

The conventional barrier form of contraception like condoms, diaphragms and foam is safe in all patients however their low efficiency must be considered while recommending them. Barrier contraception with levonorgestrel containing intrauterine device or a dermal implant seems to be the best available option for long term reversible contraception.²⁰

In our study, concurrent bilateral tubal ligation was done for consenting patients, others were advised barrier contraceptives and hormonal IUCD. Vasectomy was also offered to male partners.

5. Conclusion

The management of a pregnant woman with heart disease requires a multidisciplinary team for optimal maternal and fetal outcomes. But the majority of pregnancies complicated by heart disease are uneventful with a favourably good outcome for both the mother and the fetus.

Rheumatic valvular heart disease is still the most commonly encountered pathology and imposes a huge burden on limited healthcare resources.

The management includes intensive care throughout pregnancy and also during labor and postpartum. Counselling and management of women of childbearing age with suspected cardiac disease should start before pregnancy occurs.

Counselling for contraception and family planning and follow up during subsequent pregnancies is mandatory.

6. Source of Funding

None.

7. Conflict of Interest

The authors declare no conflict of interest.

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Author biography

Naga Veni Prapurna Pulakhandam, Resident

Niharika Chaudhary, Resident

Y Annapoorna, Professor

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