

# Maternal and Fetal Outcome in Cardiac Patients: A Cross-Sectional Study at Tertiary Care Setting

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## ABSTRACT

**Background:** The presence of cardiac diseases in pregnancy is a high-risk condition and poses a threat to both mother and child. This study aimed to determine maternal and fetal pregnancies in women with cardiac disease at a tertiary care hospital.

**Methodology:** This was a retrospective study conducted in the Department of Obstetrics and Gynecology, Aga Khan University Hospital, Karachi, from January 2013 to December 2015. All pregnant women with cardiac diseases were enrolled in the study. Mean (SD) was used for continuous variables, while percentages were calculated for categorical variables. Chi-square test was applied to compare the maternal and fetal outcome with the severity of functional class. A p-value of less than 0.05 was considered significant.

**Results:** The average maternal age was  $29.8 \pm 5.2$  years. Rheumatic heart disease was present in 47% and congenital heart disease in 28.8% of pregnant women. Almost 80% of women belonged to NYHA functional class I and II. Overall maternal complications were GDM, Preeclampsia, pulmonary edema, PPH, CCF, Arrhythmias, Cardiogenic and septic shock. GDM, preeclampsia, pulmonary edema mainly occurred in congenital heart disease patients. Perinatal outcomes included 93.2% live births, 3% neonatal, and 3% intrauterine deaths. Significant associations were found between pulmonary edema, use of Digoxin & Diuretics, and NYHA functional class.

**Conclusion:** The current study indicates that cardiac diseases are associated with adverse maternal and fetal outcomes. These women require aggressive monitoring and time management. Therefore, such patients should be regularly followed and counseled.

**Keywords:** Cardiac disease, pregnancy, maternal complications, fetal complications.

## INTRODUCTION

Cardiac disease during pregnancy is a high-risk condition and is considered a significant public health issue. Globally, it is regarded as the leading indirect cause of maternal deaths. <sup>(4)</sup>In developing countries, one-fifth of all maternal deaths are attributed to this cause. <sup>(1, 2)</sup> In the Western world, the maternal cardiac disease accounts for 0.2% - 4% of all pregnancies. <sup>(3)</sup> Several studies have demonstrated that pregnant women having heart disease are at a greater risk for maternal and neonatal complications. <sup>(5, 6)</sup>

The normal course of pregnancy and peripartum period is usually associated with several hemodynamic and cardio-circulatory changes such as decreased peripheral vascular resistance, increased cardiac output and blood volume by 50%, raised resting pulse by 17%, with rapid alterations of intravascular pressure and plasma volume during the period of labor and delivery. <sup>(5, 7)</sup> Such changes may be poorly tolerated by the patients and may unmask or precipitate any underlying maternal cardiac de-compensation or neonatal adverse outcomes leading to increased morbidity and mortality. <sup>(6)</sup>

Pre-existing conditions like congenital, and rheumatic heart lesions and hypertensive diseases can flare up the complications during pregnancy. Eighty percent of Mitral stenosis cases are the most frequently occurring rheumatic lesion, followed by aortic stenosis in 10%, mitral regurgitation in 6.6%, and aortic regurgitation in 2.5% cases. <sup>(4)</sup> Uebing and team noted that around 15-50% of cardiac abnormalities are first picked up during routine

antenatal checkups or because of symptoms and signs secondary to physiologic changes of pregnancy. <sup>(8)</sup>

A significantly higher incidence of inevitable consequences such as arrhythmia, congestive heart failure, increase in need of cardiac medications, and hospitalization was found in pregnant women affected by Valvular heart disease <sup>(9)</sup>. A retrospective study of 90 pregnancies with cardiac heart disease (CHD) found pulmonary edema in 17% and other cardiac events in 12% of women, with no maternal death. <sup>(9)</sup>

Management of pregnancy in a woman with cardiac disease is a combined effort by obstetricians and cardiologists. With the improvement and advancement of infertility treatments and maternal medical care, an increased fraction of females suffering from congenital or acquired cardiac diseases are conceiving and delivering safely. <sup>(4)</sup> On the other hand, the most familiar clinical features of a cardiac disorder such as breathlessness, murmurs, and pedal edema mimic regular physiological changes of pregnancy. They pose a diagnostic difficulty for obstetricians. Delay in diagnosis can lead to severe maternal and fetal complications and confound the management of pregnancy. Risk stratification is a crucial step to optimize the management of a pregnant woman with cardiac disease. The purpose of our study was to determine the maternal and perinatal outcomes associated with cardiac diseases in pregnant women delivering at a tertiary care hospital.

## MATERIAL AND METHODS

This study was a retrospective study which was conducted in the Department of Obstetrics and Gynecology, Aga Khan University Hospital (AKUH), Karachi, during the period of January 2013 to December 2015. After approval from the Ethical Review Committee (ERC) of AKUH Karachi, the hospital medical record of all pregnant women with a known or newly diagnosed (congenital or acquired) cardiac lesion was reviewed. A total of 214 women with cardiac disease and a singleton pregnancy were identified to be included in this study. Baseline data at the first antenatal visit was collected, including maternal age, parity, nature of the underlying cardiac lesion, New York Heart Association (NYHA) functional class, cardiac intervention before or during pregnancy, use of cardiac medications, and anti-coagulant therapy, if any. According to the signs and symptoms at initial presentation, patients were categorized into functional class I - IV, according to the New York Heart Association classification (NYHA). This functional class was reviewed at each antenatal visit. Maternal outcomes were noted for a mode of delivery, obstetric and medical complications, need to initiate or enhance the drug dose, hospitalization not related to delivery, and maternal death. Perinatal outcomes were recorded for Apgar score at one and five minutes, low birth weight (<2.5kg), prematurity (<37 weeks), perinatal death, and congenital disabilities.

**Data Analysis:** Data was entered and analyzed through SPSS version-24. Age and parity were measured by mean  $\pm$  Standard Deviation. Percentages were calculated for cardiac disease in pregnancy, and 95% CI (confidence interval) was used to report the findings. Chi-square test was also applied to compare the maternal and fetal outcome with the severity of functional class. A p-value of less than 0.05 was considered significant.

## RESULTS

A total of 214 pregnant women with cardiac disease were included. Mean maternal age was  $29.8 \pm 5.2$  years (range 19-42 years). More than half, 129 (60.28%) women were multigravida, while about a quarter, 48(22%), had a history of spontaneous abortion. The mean gestational age at delivery was  $36.6 \pm 3.1$  weeks. Among cardiac lesions, 47% had rheumatic, and 29% had congenital heart disease, whereas the remaining 23% had cardiomyopathy. Almost 80% belonged to NYHA functional class I and II at presentation. Cardiac medications included Diuretics; furosemide (24%), Digoxin (8 %) and Anticoagulants (5%). Other underlying medical comorbid were chronic hypertension (4%), Hypothyroidism (2%), and pre-gestational diabetes mellitus (2%). (Table I)

The majority of women with rheumatic heart disease experienced complications like GDM, preeclampsia, postpartum hemorrhage, arrhythmias, cardiogenic, and septic shock. (Table II)

Perinatal outcomes included 201 live births (93.9%), early neonatal deaths 6 (2.8%), and intrauterine fetal demise 7 (3.3%). See figure 1.

It was noted that perinatal outcome was significantly associated with NYHA class. The intrauterine device (IUD) placement rate was significantly higher in women with functional class NYHA III/IV. The majority of women who

underwent cesarean section belonged to NYHA class III/IV. The PPH rate was 5% in NYHA class III/IV compared to 1.2% in NYHA class I/II. See table 3 for details. (Table III)

In women with severe cardiac disease (NYHA class III/IV), the incidence of preeclampsia was twice as much as those with functional class I&II (20.0% vs. 10.3%). The majority of women in NYHA class III/IV developed pulmonary edema. In short, maternal outcomes worsened with the severity of the underlying cardiac disease. See table IV for details.

Table I: Maternal socio demographic and clinical characteristics (n=214)

Maternal characteristics	n (%)
Age Mean $\pm$ SD	29.8 $\pm$ 5.2
Age range(years)	19-42
Obstetric history	
Primigravida	86 (40.19%)
Multigravida	128 (60.28%)
Previous abortion	48 (22.43%)
Mean Gestational Age in months	36.56 $\pm$ 3.05
Type of cardiac disease	
Congenital heart disease	62 (28.97%)
Rheumatic heart disease	101 (47.20%)
Others	51 (23.83%)
NYHA functional class	
Class I	88 (41.12%)
Class II	86 (40.19%)
Class III	23 (10.75%)
Class IV	17 (7.94%)
Medications	
Diuretics	49 (22.90%)
Digoxin	16 (7.48%)
Anticoagulant	12 (5.61%)
Other Comorbid	
Chronic hypertension	9 (4.21%)
Diabetes	4 (1.87%)
Hypothyroidism	5 (2.34%)

Table II. Maternal Complications and its association with type of cardiac lesion

Maternal complications	Congenital heart disease n (%)	Rheumatic heart disease n (%)	Others n (%)	p-value
GDM	11 (35.5)	13 (41.9)	7 (22.6)	0.681
Preeclampsia	7 (22.6)	10 (32.3)	12 (45.2)	0.056
Pulmonary edema	2 (9.1)	8 (36.4)	12 (54.5)	0.001
PPH	0 (0.0)	3 (100.0)	0 (0.0)	0.182
Arrhythmias	0 (0.0)	2 (100.0)	0 (0.0)	0.323
Cardiogenic shock	0 (0.0)	2 (100.0)	0 (0.0)	0.323
CCF	0 (0.0)	1 (25.0)	3 (75.0)	0.048
Septic shock	0 (0.0)	0 (0.0)	2 (100.0)	0.040

GDM = Gestational Diabetes Mellitus

PPH=postpartum hemorrhage

CCF =Congestive Cardiac Failure

Figure 1: Frequency and type of perinatal Outcomes

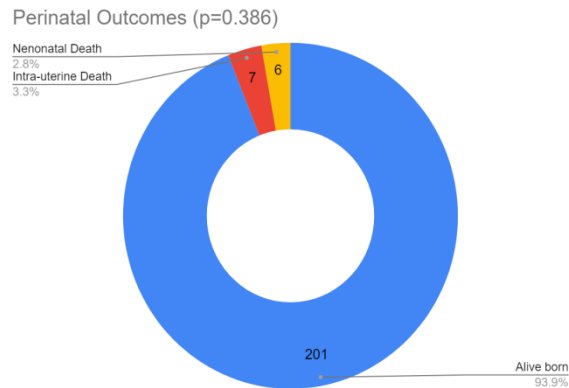


Table III: Pregnancy outcome according to NYHA functional class (n=214)

Variable	NYHA I/II n=174 n(%)	NYHA III/IV n=40 n(%)	p-value
Perinatal Outcome			
Alive	169 (97.13%)	31 (77.50%)	<0.005
IUD	2 (1.15%)	5 (12.50%)	
NND	3 (1.72%)	4 (10.00%)	
Mode of delivery			
Vaginal	65 (37.36%)	8 (20.00%)	0.036
Cesarean	109 (62.64%)	32 (80.00%)	
Postpartum complications			
Postpartum hemorrhage	2 (1.15%)	2 (5.00%)	0.212
Pulmonary edema	5 (2.87%)	19 (47.50%)	
Medication			
Digoxin	6 (3.45%)	11 (27.50%)	0.558
Diuretics	26 (14.94%)	21 (52.50%)	
Anticoagulants	7 (4.02%)	6 (15.00%)	
Maternal mortality	2 (1.15%)	2 (5.00%)	

Table IV: Association of Severity of disease and maternal outcomes

Maternal Outcomes	NYHA I/II n=174 n(%)	NYHA III/IV n=40 n(%)	p-value
GDM	29 (16.7)	4 (10.0)	<0.005
Preeclampsia	18 (10.3)	8 (20.0)	
Pulmonary edema	6 (3.5)	19 (47.5)	
PPH	1 (0.6)	2 (5.0)	
Cardiogenic shock	2 (1.2)	2 (5.0)	
CCF	2 (1.2)	3 (7.5)	
Septic shock	0 (0.0)	2 (5.0)	

## DISCUSSION

Our findings show that rheumatic heart disease continues to be the commonest cardiac problem during pregnancy in

developing countries;<sup>(14, 15)</sup>. Likewise, a five-year longitudinal study from Pakistan by Wasim et al.<sup>(7)</sup> showed a 1% prevalence of pregnant women suffering from cardiac disease in their cohort, with 36% women already having cardiac problems during the current pregnancy.<sup>(7)</sup> Another tertiary care hospital study found an incidence of 0.15%, where 68% had rheumatic heart diseases.<sup>(10)</sup> Similarly, Witcher and team found that 65% of their study patients were diagnosed with cardiac lesions during pregnancy.<sup>(16)</sup> Three studies also observed that around 82% of their study participants had acquired Valvular or rheumatic heart lesions, while others had congenital cardiac issues.<sup>(7, 13, 16)</sup> A literature review incorporating more than 2000 pregnancies having structural congenital cardiac lesions reported 11% of the mothers to have cardiac complications.<sup>(17)</sup> The mean age of pregnant women with the cardiac disease was less than 30 years and comparable to other literature studies.<sup>(10-13)</sup>

NYHA functional class deterioration was observed in 21.4% of women with already diagnosed cardiac disease before their pregnancy compared to 100% of women who developed cardiac events during pregnancy.<sup>(13)</sup> In our study, the majority, i.e., 80%, were in NYHA class I and II, although these were already diagnosed with cardiac disease pre-pregnancy. A study considering rheumatic heart disease in pregnant women described no difference in having medical problems, including chronic hypertension, anemia, seizures, arthritis, and being a primigravida and NYHA class. However, a significant difference was obtained in cardiac issues like congestive heart failure, arrhythmias, restenosis occurring during pregnancy in their two study groups.<sup>(11)</sup> In another study, most of the women had acquired valvular heart disease out of which 43% were in NYHA class III and IV during pregnancy. The poor functional class was the primary determinant of adverse Feto-maternal outcomes.<sup>(7)</sup> We observed similar findings with NYHA class III and IV being a substantial risk factor for the woman and her baby. In contrast, women in NYHA class I and II experienced an uncomplicated pregnancy.

Regarding the obstetric outcomes of cardiac patients, according to a Pakistani study, the majority had delivered vaginally, 29% had a cesarean section, and 9% had therapeutic termination of pregnancy.<sup>(12)</sup> Ten babies died, and the prevalence of low birth weight was 45% ( $2.4 \pm 601.8$  grams), which was even lesser than our study. In another study, 45 percent of neonates born to women in NYHA class III and IV had low birth weights than children born to women in NYHA class I and II. This low birth weight can be attributed to certain maternal causes such as low oxygen saturation, cardiac drugs, and early induction of delivery due to fetal or maternal distress. Other perinatal outcomes included prematurity (14%), Low APGAR at 5 minutes <7 (10.5%), fetal death, fetal growth restriction and fetal distress (7%), and 3.5% of fetal cardiac lesions, i.e., some of which were also obtained from the present study.<sup>(12)</sup> Perinatal morbidities also included prematurity; 5 (22.7%), small for gestational age; 12 (54.2%), birth asphyxia in 6 (27.2%) and neonatal intensive care unit (NICU) admissions; 14 (63.6%).<sup>(10)</sup>

Stangl and colleagues identified obstetric complications included severe conditions in 12.9% of all

mothers, which were 6.5% heart failure, 3.2% had arrhythmias, and 2.2% suffered from thrombotic problems.<sup>(13)</sup> Maternal mortality was 1.1%. Mothers having high-risk pregnancies (24.7%) were six times more prone to higher maternal complication rates and a similar fetal and neonatal event rate, i.e., abortion and stillbirth. In contrast to 16.4% in the low-risk group, 64.7% high-risk women had a premature delivery before 37 weeks of gestation. Other consequences determined by Doabbagaet al.<sup>(12)</sup> were anesthetic complications (12.5%), termination of pregnancy (9.4%), postpartum hemorrhage (8.8%), and maternal deaths (3.8%), although 65.6% of mothers did not suffer from any complication.<sup>(12)</sup> Our study found that three women had a postpartum hemorrhage, pulmonary edema was found in 29 (13.5%) patients, and preeclampsia was also found in 29 (13.5%).

Our results suggest successful pregnancy outcomes among cardiac women can be challenging. Thus, every effort should be made to stabilize the cardiac problem pre-pregnancy. Preconception counseling remains the hallmark of managing cardiac disease in pregnancy. Women with cardiac disease planning to get pregnant should clearly understand the severe implications of conceiving with the uncontrolled disease and be educated on red flags associated with perinatal and maternal morbidity and mortality. The role of maternal medicine consultants cannot be undermined, and a multi-disciplinary approach with a cardiologist, obstetrician, neonatologist, and anesthetist should manage these women. Regular antenatal checkups with detailed obstetric and cardiac assessments at each visit are essential throughout pregnancy. Early identification of complications, timely management, and referral can improve pregnancy outcomes. There is a need to conduct longitudinal studies to understand better potential risk factors contributing to the worsening of the disease and develop preventive strategies for adverse pregnancy outcomes.

## CONCLUSION

The present study indicates that cardiac diseases carry a significant impact on maternal and perinatal outcome. Many cardiac disease-related symptoms mimic common symptoms of late pregnancy. A close collaboration between maternal-fetal medicine with other specialists and cardiologists is essential to optimize pregnancy outcomes in women with cardiac diseases.

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