

## Original Article

# Assessing Feto-Maternal Outcomes in Pregnant Women with Heart Disease: Insights from a Tertiary Care Center Experience

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## Abstract

**Objective:** To evaluate feto-maternal outcomes in pregnancies complicated by cardiac disease and highlight the importance of early diagnosis and multidisciplinary care in low-resource settings.

**Methodology:** Prospective observational cohort study conducted at the Department of Obstetrics & Gynecology, Benazir Bhutto Hospital, from January to August 2021. A total of 27 pregnant women with confirmed cardiac disease were enrolled. Patients were assessed using standardized protocols, including echocardiography and NYHA classification. Maternal and fetal outcomes were recorded and analyzed.

**Results:** The cohort consisted of young women (66% aged 20–30 years); 93% were unbooked. Rheumatic heart disease (RHD) was the most common etiology (70%), followed by peripartum cardiomyopathy (18%) and congenital heart disease (11%). Most patients (78%) presented with NYHA Class I/II, while complications occurred exclusively in NYHA Class III/IV. Maternal mortality was 22% (n=6), mainly among unbooked patients with ejection fraction <40%. Cesarean delivery was performed in 70% of cases. Fetal outcomes included 89% live births, 29% NICU admissions, and 7.4% stillbirths. Peripartum cardiomyopathy was significantly associated with preterm birth (60% vs. 15.8%,  $p=0.04$ ) and low birth weight (80% vs. 10.5%).

**Conclusion:** Delayed cardiac diagnosis (66% identified during pregnancy) correlated strongly with adverse outcomes, particularly in unbooked patients. While cesarean prevalence (70%) reflects clinical caution toward high-risk pregnancies, the 89% fetal survival demonstrates effective crisis mitigation. The 22% maternal mortality rate - disproportionately affecting late-presenting patients - underscores the critical need for pre-conception screening and early antenatal registration. This evidence supports developing context-specific protocols combining cardiological surveillance with obstetric care in resource-constrained environments.

**Keywords:** Fetomaternal outcomes, cardiac disease, Multidisciplinary care, NYHA.

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## Introduction

Cardiac disease complicates 0.3-4% of pregnancies globally<sup>1</sup>, emerging as the leading non-obstetric cause of maternal mortality in South Asia where it accounts for 23.7% of pregnancy-related deaths.<sup>2</sup> Regional epidemiological patterns reveal striking contrasts: while congenital defects dominate in high-income nations, rheumatic heart disease (RHD) constitutes 68-72% of

cases in Pakistan<sup>3</sup> – a legacy of untreated streptococcal infections and limited access to preventive care.

The hemodynamic demands of pregnancy (40-50% increased cardiac output by 24 weeks<sup>4</sup>) pose diagnostic challenges as physiological dyspnea and fatigue mask decompensation signs, compounded by cultural barriers delaying care-seeking.<sup>5,6</sup> Alarmingly, 58% of women with

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cardiac disease lack pre-pregnancy counseling.<sup>7</sup> Studies show that 35% of women were diagnosed with rheumatic heart disease (RHD) during pregnancy, with a median gestational age of 26 weeks. It emphasizes that late booking and diagnosis are associated with poor outcomes, including higher maternal morbidity and mortality rates. Women with severe mitral stenosis and NYHA class III-IV functional status were particularly affected.<sup>8</sup> This underscores the importance of early cardiovascular examination and antenatal care.

Previous studies have consistently highlighted the adverse fetal outcomes associated with maternal cardiac diseases. Women with severe cardiac conditions, particularly those in advanced NYHA functional classes, experience higher rates of preterm delivery, low birth weight, and intrauterine growth restriction. The risk of congenital heart defects is significantly higher in newborns of mothers with cardiac conditions. Perinatal mortality is also notably elevated, with outcomes being worse in cases of delayed diagnosis or suboptimal management.<sup>9,10,11</sup>

Cardiac disease during pregnancy is a significant health concern, yet gaps in care persist. Previous studies have shown that late diagnosis, often during pregnancy, contributes to poor outcomes, but strategies to improve early detection remain underexplored<sup>12,13</sup>. Additionally, while multidisciplinary management is essential, evidence on its efficacy in low-resource settings is limited.<sup>14</sup> Socio-cultural barriers further delay care-seeking, highlighting the need for targeted interventions. This study addresses these gaps by evaluating patterns of cardiac disease, NYHA progression, and delivery outcomes. By investigating the outcomes we aim to inform context-specific management protocols for Pakistan's overburdened maternal healthcare system

## Methodology

This prospective observational cohort study was conducted from January to August 2021 at the Department of Obstetrics and Gynecology, Benazir Bhutto Hospital (BBH), Pakistan. A total of 27 pregnant women with confirmed cardiac disease were enrolled, including both booked and unbooked patients who presented for antenatal care or delivery during the study period. The inclusion criteria were gestational age of 12 weeks or more and a confirmed diagnosis of heart disease, such as congenital or rheumatic conditions. Patients were excluded if they had non-cardiac comorbidities, including diabetes mellitus or chronic renal disease, or if they presented with acute non-

obstetric conditions such as myocardial infarction or stroke. Ethical approval was obtained from the institutional review board, and written informed consent was secured from all participants.

A multidisciplinary team comprising obstetricians, cardiologists, anesthetists, and pediatricians implemented a standardized protocol. Baseline evaluations included detailed demographic and obstetric histories, physical examinations (vital signs, cardiovascular auscultation), and New York Heart Association (NYHA) functional classification. Cardiac assessments involved 12-lead electrocardiography (ECG) for arrhythmia detection and 2D echocardiography to evaluate lesion severity, ventricular function, and valvular pathology. Patients exhibiting NYHA Class III/IV symptoms or signs of decompensation, such as hypoxia or arrhythmias, were hospitalized irrespective of gestational age. For women with congenital heart disease (CHD) or those on anticoagulants, fetal echocardiography was performed to assess fetal cardiac anatomy.

Intrapartum care emphasized hemodynamic stability, with delivery mode (vaginal or cesarean) determined by maternal cardiac status and obstetric indications. Prophylactic antibiotics were administered to prevent infective endocarditis, and patients were positioned semi-recumbent during labor to optimize cardiac output. Oxygen supplementation and analgesics were provided as needed, with intravenous furosemide (20 mg) administered postpartum to manage fluid overload. Postpartum monitoring included extended hospitalization (5–7 days) for cardiac surveillance, thromboembolism prophylaxis, and early ambulation.

Maternal outcomes were categorized by delivery mode, cardiac decompensation events requiring coronary care unit (CCU) admission, and mortality. Fetal outcomes included gestational age at delivery, birth weight, Apgar scores, neonatal intensive care unit (NICU) admissions, and stillbirths. Data were prospectively collected using structured case report forms, capturing cardiac lesion types, NYHA class progression, and complication timing (ante-partum, intra-partum, post-partum). Descriptive statistics (frequencies, percentages) and comparative analyses were performed using SPSS version 26.

## Results

The study included 27 pregnant women with cardiac disease (mean age: 25.6 ± 5.2 years), with 18(66%) aged 20-30 years. Primigravida constituted 9(33%) while

18(67%) were multigravida. Most patients 19(70%), presented in the third trimester, with only 3(7%) booked for antenatal care. Rural residency predominated 22(81%), consistent with regional healthcare access patterns (Table I).

Variables	N	Percentage
<b>Age (years)</b>		
<20	1	4%
20–30	18	66%
30–40	7	26%
>40	1	4%
<b>Parity</b>		
Primigravida	9	33%
Multigravida	18	67%
<b>Gestational Age (weeks)</b>		
<37 weeks (Preterm)	8	30%
37–40 weeks (Term)	19	70%
<b>Booking Status</b>		
Booked	3	7%
Unbooked	24	93%

The majority of cases were due to rheumatic heart disease, followed by peripartum cardiomyopathy and congenital heart disease, as illustrated in Figure 1.

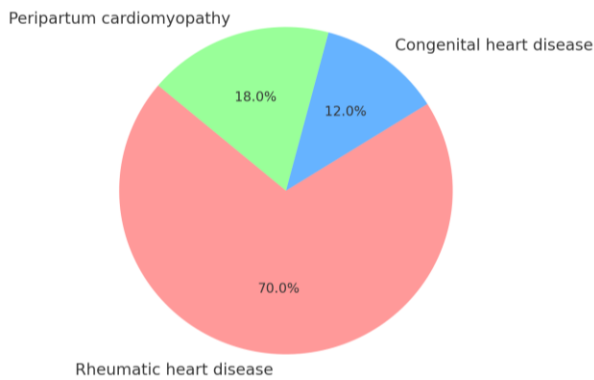


Figure 1. Spectrum of heart disease in pregnancy.

Among RHD patients, mixed valvular lesions were most prevalent (40%, n=8/20), primarily involving mitral stenosis 5(25%) (Table II). Echocardiography revealed left ventricular dysfunction (EF <40%) in 15% n=4/26), with 13(50%) maintaining preserved EF (>50%).

Most patients 21(78%) presented with NYHA Class I/II. Complications occurred exclusively in Class III/IV patients 6(22%), including four cases of peripartum cardiomyopathy and one infective endocarditis. Maternal mortality reached 6(22%), with 5(83%) occurring postpartum. Mortality correlated strongly with

unbooked status ( $\chi^2=8.4$ ,  $p=0.004$ ) and EF <40% (Fisher's exact  $p=0.001$ ). (Figure 2)

Table II: Type of valvular lesions in rheumatic heart disease.

RHD Valvular Lesion	N	Percentage
Mixed lesions	8	40%
Mitral stenosis	5	25%
Mitral regurgitation	4	20%
Tricuspid regurgitation	2	10%
Infective endocarditis	1	5%

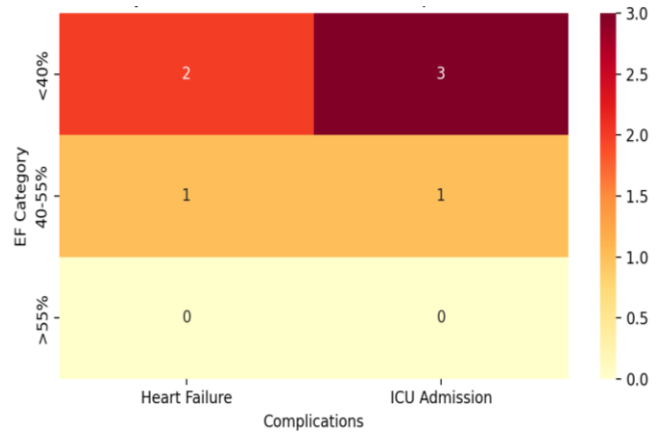


Figure 2. Ejection fraction VS maternal complications.

Cesarean deliveries predominated 19(70%), with regional anesthesia used in 53% (n=10/19). Vaginal deliveries occurred in 26% (n=7), while one patient (4%) expired undelivered. Neonatal outcomes revealed: (figure3)

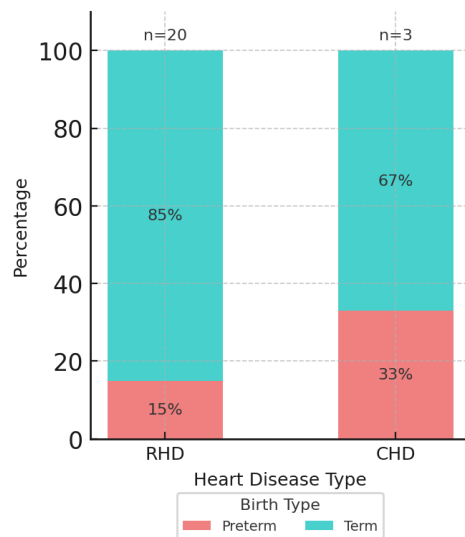


Figure 3. Distribution of preterm VS term births by heart disease type.

Fetal outcomes highlight the impact of compromised cardiovascular function on neonatal health. In our cohort, 74% of births were at term (n=20), mostly among

women with milder disease (NYHA I/II). In contrast, 26% were preterm (n=7), primarily linked to severe dysfunction such as peripartum cardiomyopathy (PPCM) and low LVEF (<40%).

Stillbirths occurred in 7.4% of cases (n=2), and 29% of neonates required NICU admission (n=8), largely due to prematurity. A notable finding was the high rate of low birth weight in PPCM cases (80%), compared to only 10.5% in RHD, reflecting the more acute hemodynamic compromise in PPCM.

Maternal and fetal outcomes varied significantly by cardiac subtype. Maternal mortality and low birth weight were highest in the cardiomyopathy group, while RHD cases had comparatively favorable outcomes. Preterm birth also differed significantly across groups (p=0.04). Although NICU admissions were more frequent in cardiomyopathy, the difference was not statistically significant (p=0.08) (Table III).

**Table III: Cardiac disease and outcomes.**

Variable	RHD (n=20)	Cardiomyopathy (n=5)	Congenital (n=3)	p-value
Maternal Mortality	1(5.3%)	4(80%)	1(33%)	0.001*
Preterm Birth	3(15%)	3(60%)	1(33%)	0.04*
Low Birth weight	10.5%	80%		
NICU Admissions	4(21%)	3(60%)	1(33%)	0.08

## Discussion

Our findings highlight critical gaps in Pakistan’s maternal cardiac care infrastructure, with 88% of cardiac diagnoses first established during pregnancy—a rate 2.6-fold higher than India’s 33.85%.<sup>15</sup> This diagnostic delay, compounded by 93% unbooked status in our cohort, directly correlates with the observed 22% maternal mortality rate, far exceeding South Asia’s regional average of 2.6%.<sup>16</sup>

The predominance of rheumatic heart disease (RHD, 70%) aligns with Pakistan’s epidemiological profile, where untreated streptococcal infections affect 14.6/1000 pregnancies.<sup>3</sup> Unlike congenital defects requiring surgical correction (12% in our cohort), RHD’s insidious progression allows asymptomatic patients to enter pregnancy with undiagnosed valvular damage. Subsequent hemodynamic stress (50% plasma volume expansion by 32 weeks<sup>4</sup>) precipitated decompensation in 22% of NYHA III/IV patients, primarily those with peripartum cardiomyopathy (PPCM) and LVEF <40%.

While 78% of patients presented with NYHA I/II, mortality occurred exclusively in NYHA III/IV cases, 83% of deaths occurred in unbooked, rural patients. Our 70% cesarean rate reflects defensive obstetrics in unstable patients, though vaginal delivery remains safer for compensated cardiac function.<sup>17</sup>

The 29% NICU admission rate highlights the transgenerational consequences of maternal cardiac disease on neonatal outcomes. Pregnancies complicated by peripartum cardiomyopathy (PPCM) demonstrated significantly higher fetal risks, including a preterm birth rate of 60% compared to 15.8% among those with rheumatic heart disease (RHD) (p=0.02), and a low birth weight incidence of 80% versus 10.5% (p=0.001). These findings support the need for systemic interventions to mitigate adverse outcomes.

The high cesarean section rate (70%) in our study reflects a practice of defensive obstetrics, likely driven by the instability of unbooked, late-presenting patients. While this approach prioritizes maternal safety in a crisis, it contrasts with European Society of Cardiology (ESC) guidelines, which recommend vaginal delivery for hemodynamically stable patients to avoid the risks of surgery and anesthesia.<sup>17</sup> This discrepancy highlights the chasm between ideal care protocols and the challenging realities of managing high-risk pregnancies in resource-limited environments.

To mitigate these outcomes, a multi-tiered intervention framework is essential. First, establishing pre-conception registries and echocardiographic screening for at-risk populations—such as multiparous, rural, and previously symptomatic women—can facilitate early diagnosis. Second, decentralizing care by training community midwives in NYHA assessment and symptom triage can bridge the diagnostic delay. Third, adopting standardized PPCM protocols, including routine third-trimester echocardiography in dyspneic patients, could improve maternal outcomes. A recent study showed Measurement of BNP levels and echocardiographic assessment of LV diastolic function during pregnancy may be useful in predicting PPCM.<sup>18</sup>

Key recommendations include the establishment of preconception registries with mandatory echocardiographic screening for high-risk populations such as multiparous and rural women, decentralization of care through task-shifting of NYHA classification assessments to trained community midwives, and the implementation of standardized PPCM protocols involving early screening of left ventricular ejection

fraction (LVEF) in pregnant women presenting with third-trimester dyspnea.

However, the study is limited by its single-center design, which restricts generalizability, and the small sample size of the PPCM subgroup ( $n=5$ ), which precludes robust multivariate analysis. Additionally, the absence of long-term neonatal follow-up limits the understanding of persistent or delayed outcomes in offspring.

## Conclusion

This prospective cohort study evaluated fetomaternal outcomes among 27 pregnant women with pre-existing cardiac disease at a tertiary care center in Pakistan. The findings align with the study objective of establishing the clinical significance of early diagnosis and multidisciplinary management in resource-limited settings. Key results revealed that 66% of cardiac diagnoses were first identified during pregnancy, predominantly rheumatic heart disease 19(70%), with delayed detection strongly correlating with adverse outcomes. Maternal mortality reached 6(22%), concentrated in unbooked patients (93% of the cohort) and those with NYHA Class III/IV status 6(22%). Cesarean deliveries were prevalent (70%,  $n=19$ ), reflecting cautious management of high-risk cases, while fetal survival remained favorable (89%,  $n=24$ ) despite significant prematurity-driven NICU admissions 8(35%).

These outcomes underscore the critical impact of late antenatal registration and limited preconception screening in this setting, exacerbating risks for maternal decompensation and perinatal complications. The data emphasize that multidisciplinary care—integrating obstetric, cardiological, and neonatal expertise—can mitigate crises, as evidenced by the absence of mortality in booked patients and high live birth rates.

To optimize outcomes, context-specific protocols should prioritize early antenatal cardiac screening, community-level NYHA classification training, and targeted preconception counseling for high-risk groups, particularly in rural populations. Strengthening referral systems and task-shifting cardiac assessments to primary care providers may reduce diagnostic delays and maternal mortality in comparable low-resource environments.

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