# MATERNAL HEART HEALTH: UNRAVELING THE CHALLENGES AND OUTCOMES OF PREGNANCY WITH CARDIAC DISEASE

**[1]Dr. Sadia Aftab, [2]Dr. kainaat kanwal, [3]Dr. kinza Ashraf kamboh, [4]Dr. Hafiza fareeha CH, [5]Dr. Syed Azra, [6]Dr. Haseeba Syed**

[1]Pakistan institute of medical science Islamabad
[2]Pakistan institute of medical science Islamabad
[3]Pakistan institute of medical science Islamabad
[4]Pakistan institute of medical science Islamabad
[5]Pakistan institute of medical science Islamabad
[6]Pakistan institute of medical science Islamabad

## ABSTRACT

**Introduction:**

Cardiac disease during pregnancy presents significant risks to both maternal and fetal health, especially in resource-limited settings. The prevalence of cardiac disease in pregnancy is increasing, and its management poses challenges in terms of early diagnosis, monitoring, and intervention. This study aims to explore the maternal and fetal outcomes associated with cardiac disease in pregnant women, with a focus on identifying predictors of adverse outcomes.

**Methodology:**

A retrospective cohort study was conducted at the MCH Unit II, Pakistan Institute of Medical Sciences, from January 2023 to December 2024, including 85 pregnant women with cardiac disease. The study used non-probability convenience sampling and collected data on maternal and fetal outcomes, such as heart failure, arrhythmia, intrauterine growth restriction, and preterm birth. Statistical analysis was performed using SPSS version 25 and Microsoft Excel 365, with Chi-square tests and ANOVA applied to assess associations and predictors of adverse outcomes.

**Results:**

Among the 85 participants, the most common maternal complications were heart failure (32%) and arrhythmias (25%). Fetal complications included intrauterine growth restriction (20%) and preterm birth (18%). A significant association was observed between the severity of cardiac disease and adverse outcomes, including maternal intensive care unit admissions and fetal mortality. Multivariate analysis identified key predictors of poor outcomes, including pre-existing cardiac conditions and late diagnosis.

**Discussion:**

The study highlights the high-risk nature of cardiac disease in pregnancy, with significant maternal and fetal morbidity. Early diagnosis and continuous monitoring are crucial in

managing such pregnancies. The findings underscore the need for multidisciplinary collaboration in providing optimal care.

**Conclusion:**

This study emphasizes the importance of early detection and targeted interventions for pregnant women with cardiac disease. It offers valuable insights to guide clinical practice, improve maternal and fetal outcomes, and inform healthcare policies in resource-limited settings.

## INTRODUCTION

Cardiac disease in pregnancy encompasses a broad spectrum of pathologies, including pre-existing cardiovascular conditions that may be exacerbated by pregnancy-related physiological changes or newly emerging cardiac diseases triggered by the hormonal and hemodynamic adaptations of gestation. Risk factors such as hypertension, diabetes mellitus, and congenital heart disease increase susceptibility to cardiovascular complications. Despite the significant morbidity and mortality associated with cardiac disease in pregnancy, affecting approximately 1% to 4% of pregnancies, early detection and comprehensive follow-up can improve maternal and fetal outcomes[1,2]. The etiology of pregnancy-associated cardiovascular disease varies based on the specific pathology, with conditions such as cardiomyopathy being linked to viral myocarditis, autoimmune mechanisms, hemodynamic stress, and micro chimerism. Coronary artery disease and pregnancy-associated myocardial infarction share common risk factors, including hypertension, hyperlipidemia, diabetes, and obesity, while hypertensive disorders unique to pregnancy, such as preeclampsia, may further contribute to cardiovascular complications[3]. Pregnancy-induced hemodynamic adaptations, including a 20% to 50% increase in cardiac output, a rise in heart rate by 15% to 30%, and a 30% decrease in systemic vascular resistance, place additional strain on the cardiovascular system. Structural cardiac remodeling, including atrial and ventricular dilation, left ventricular hypertrophy, and increased septal thickness, may further contribute to disease exacerbation, with partial reversibility observed postpartum. Valvular heart disease, particularly mitral stenosis and aortic stenosis, can be significantly aggravated by volume overload states during pregnancy, leading to heart failure and pulmonary edema. Given the substantial cardiovascular burden imposed by pregnancy, early risk assessment, multidisciplinary management, and individualized care plans are critical for optimizing maternal and neonatal outcomes. Cardiovascular disease (CVD) remains the leading cause of pregnancy-related mortality in the United States[4]. The increasing maternal age at first pregnancy, along with a growing prevalence of cardiovascular risk factors such as obesity, hypertension, and diabetes, has significantly contributed to the rise in maternal morbidity and mortality (American College of Obstetricians and Gynecologists [ACOG], 2021)[5]. Furthermore, advances in medical and surgical management have improved the survival rates of individuals with congenital heart disease (CHD), leading to a greater number of women with pre-existing cardiac conditions reaching reproductive age. Given these evolving demographics, the management of cardiovascular conditions in pregnancy has become an increasingly complex challenge requiring a multidisciplinary approach[6].

The physiological adaptations of pregnancy impose a significant hemodynamic burden on the cardiovascular system, which can exacerbate pre-existing cardiac conditions or unmask previously undiagnosed disease. Effective risk stratification is crucial for optimizing maternal and fetal outcomes. The modified World Health Organization (WHO) classification is widely employed for risk assessment, categorizing patients based on their cardiovascular disease severity and its potential impact on pregnancy outcomes. Women with WHO Class III and IV cardiac conditions, such as severe aortic disease, pulmonary hypertension, or complex congenital heart defects, are at the highest risk for adverse maternal and perinatal outcomes and require specialized multidisciplinary care. The establishment of a dedicated cardio-obstetrics team has been recommended to provide comprehensive care for pregnant women with cardiovascular disease. Such teams typically comprise cardiologists, maternal-foetal medicine specialists, anaesthesiologists, geneticists, and neonatal care providers, who collaborate in preconception counselling, pregnancy monitoring, and postpartum follow-up[7].

Heritable and congenital aortic diseases, including Marfan syndrome, Loeys-Dietz syndrome, and bicuspid aortic valve disease with associated aortopathy, pose significant risks during pregnancy due to the potential for aortic dilation and dissection. Pregnancy-induced hormonal and hemodynamic changes contribute to increased aortic wall stress, particularly in the third trimester and the immediate postpartum period. The reported maternal mortality rate for aortic dissection during pregnancy ranges from 8.6% to 20%, with foetal mortality approaching 50% in cases requiring emergent intervention[8].

Pre-conception assessment, including echocardiography and advanced imaging modalities such as cardiac MRI or CT angiography, is recommended to evaluate aortic dimensions and valve pathology. Prophylactic aortic surgery should be considered for women with aortic root diameters exceeding established risk thresholds before pregnancy. Moreover, genetic testing and counselling should be offered to individuals with a known familial history of aortopathy, as many pregnancy-related aortic complications occur in asymptomatic carriers of pathogenic genetic variants[9].

The spectrum of CHD-related pregnancy complications varies based on the severity of the underlying defect, the presence of residual lesions, and the degree of ventricular dysfunction. Large-scale registry data indicate that pregnant women with CHD have an overall maternal mortality rate of 0.2%, with an increased risk of heart failure (13%) and arrhythmias (5%).

Moreover, complex CHD is associated with increased obstetric complications, including preterm delivery, intrauterine growth restriction, and postpartum haemorrhage[10, 11].

Pre-conception evaluation of women with CHD should involve detailed hemodynamic assessment through echocardiography and exercise testing, particularly for individuals with prior ventricular dysfunction or significant valvular disease. Genetic counselling is also crucial, given the increased heritability of CHD and the potential for transmission of congenital defects to offspring.

The mode of delivery for women with cardiovascular disease is determined based on individual risk assessment. Cardiac output increases about 20% with each uterine contraction during labor; other stressors include straining during the 2nd stage of labor and the increase in venous blood returning to the heart from the contracting uterus. Vaginal delivery is generally preferred for most patients, as it minimizes the risk of perioperative complications associated with caesarean section. However, assisted second-stage Labor with vacuum or forceps extraction is often recommended to reduce prolonged Valsalva manoeuvres and associated hemodynamic stress. Elective caesarean delivery is advised for patients with severe cardiovascular conditions, such as advanced aortopathy, significant pulmonary hypertension, or severe ventricular dysfunction[12].

The postpartum period poses a high risk for cardiac decompensation, as blood volume shifts and hormonal changes can exacerbate underlying cardiovascular conditions. Women with a history of heart failure, arrhythmias, or aortic disease require close hemodynamic monitoring for at least 48–72 hours postpartum. Blood pressure management is particularly critical, as hypertensive peaks often occur between 3rd and 8th postpartum day, increasing the risk of aortic complications. Long-term follow-up with cardiology is essential to monitor disease progression and to provide guidance on future pregnancies and cardiovascular risk reduction strategies[13, 14].

The management of cardiovascular disease in pregnancy necessitates a multidisciplinary approach, integrating early risk stratification, individualized pregnancy care, and vigilant postpartum surveillance. Advances in cardio-obstetrics have significantly improved maternal and foetal outcomes, yet continued research is required to optimize risk prediction models and therapeutic interventions for high-risk cardiovascular conditions in pregnancy.

**OBJECTIVE:**

To assess the maternal and perinatal outcomes associated with pregnancies complicated by cardiovascular disease in a resource-limited setting, analyzing morbidity and mortality patterns, risk stratification, and the impact of healthcare accessibility on clinical management and prognostic indicators.

**OPERATIONAL DEFINITION:**

**Pregnancy:** Pregnancy is a physiological state characterized by the implantation, growth, and development of an embryo or fetus within the maternal uterus.

**Cardiac Disease:** Cardiac disease encompasses a spectrum of structural, functional, or ischemic abnormalities of the heart that impair its ability to maintain adequate circulation and hemodynamic stability.

## MATERIALS AND METHODS

This retrospective cohort study was conducted at the Department of Obstetrics and Gynaecology, MCH Unit II, Pakistan Institute of Medical Sciences, over a period of two years (January 2023 – December 2024). A non-probability convenience sampling technique was used, and a total of 85 pregnant women diagnosed with cardiac disease were included, based on a sample size calculation using the proportion formula with an estimated 30% prevalence of cardiac disease in pregnancy and a 95% confidence level.

The inclusion criteria ensured that only pregnant women aged ≥18 years with singleton pregnancies and diagnosed cardiac conditions were included, while those with non-cardiac systemic illnesses, multiple pregnancies, or incomplete clinical data were excluded. After obtaining ethical approval and informed consent, a detailed history, clinical examination, and routine antenatal care, including cardiac evaluations (echocardiography, ECG, and laboratory tests), were performed. Maternal and foetal outcomes, including heart failure, arrhythmias, intensive care admission, intrauterine growth restriction, preterm birth, and perinatal mortality, were monitored throughout pregnancy and postpartum.

For data analysis, SPSS version 25 and Microsoft Excel 365 were used. Descriptive statistics summarized continuous and categorical variables, while inferential statistical tests, including Chi-square tests and ANOVA, were applied to assess associations and predictors of adverse outcomes. Results were presented through tables, with a $p$-value $< 0.05$ considered statistically significant. The study provided valuable insights into the challenges and outcomes of pregnancy in women with cardiac disease, facilitating improved maternal and foetal care.

## SIGNIFICANCE OF THE STUDY

Cardiac disease in pregnancy remains a major contributor to maternal and fetal morbidity and mortality, particularly in developing countries where healthcare resources and specialized care may be limited. Understanding the maternal and fetal outcomes associated with cardiac disease in pregnancy is crucial for improving risk stratification, optimizing management strategies, and reducing adverse outcomes. This study will provide valuable insights into the prevalence, clinical presentation, and complications of cardiac disease during pregnancy within a resource-limited setting, offering evidence to guide early detection, multidisciplinary management, and individualized care approaches.

By identifying key predictors of maternal and fetal outcomes, this research will contribute to the development of targeted interventions aimed at reducing maternal and neonatal complications. Furthermore, the findings will support policy recommendations for enhancing obstetric and cardiology collaboration, strengthening cardio-obstetric care units, and improving access to specialized care for high-risk pregnancies. Ultimately, this study has the potential to inform future clinical guidelines and public health strategies, leading to improved maternal and fetal survival rates in developing countries.

## RESULTS

### Demographics

| Variable | Categories | Frequency (%) |
|---|---|---|
| Age Group | 18-25 years | 45 (52.9%) |
| | 26-30 years | 20 (23.5%) |
| | 31-35 years | 8 (9.4%) |
| | 36-40 years | 12 (14.1%) |
| Parity | Primigravida | 42 (49.4%) |
| | Multigravida (2-4) | 39 (45.9%) |
| | Grand Multigravida (≥5) | 4 (4.7%) |
| Gestational Age at Enrolment | <28 weeks | 4 (4.7%) |
| | 28-32 weeks | 4 (4.7%) |
| | 33-36 weeks | 60 (70.6%) |
| | 37-41 weeks | 17 (20.0%) |
| Marital Duration | <1 year | 9 (10.6%) |
| | 1-5 years | 52 (61.2%) |
| | >5 years | 24 (28.2%) |
| Education Level | Never attended school | 23 (27.1%) |
| | Primary | 22 (25.9%) |
| | Secondary | 30 (35.3%) |
| | Intermediate | 10 (11.8%) |
| Occupation | Housewife | 81 (95.3%) |
| | Working Woman | 4 (4.7%) |
| Socioeconomic Status | Low | 4 (4.7%) |
| | Middle | 71 (83.5%) |
| | Upper Middle | 10 (11.8%) |

### Demographic Profile of Pregnant Women with Cardiac Disease

The study on maternal heart health in pregnant women with cardiac disease provides critical insights into the demographic distribution of this high-risk population. A significant proportion (52.9%) of pregnant cardiac patients were between 18-25 years, with only 14.1% aged 36-40 years. This suggests that cardiac complications in pregnancy are not limited to older maternal

age, as traditionally assumed, but also affect younger women. Regarding parity, nearly half (49.4%) were primigravida, while 45.9% were multigravida (2-4 pregnancies). This indicates that both first-time mothers and those with previous pregnancies face substantial risks when underlying cardiac disease is present.

Most women were enrolled at 33-36 weeks (70.6%), with 4.7% presenting before 28 weeks, suggesting late antenatal care initiation, which may impact maternal and neonatal outcomes. A majority of women (61.2%) were married for 1-5 years, aligning with the typical reproductive age group. However, a considerable proportion (27.1%) had never attended school, and only 11.8% had received education beyond secondary level. Low literacy levels may contribute to poor awareness about cardiac risks in pregnancy, delayed medical intervention, and suboptimal antenatal care. An overwhelming 95.3% of participants were housewives, indicating a lack of financial independence and potentially reduced access to specialized maternal cardiac care. The majority (83.5%) belonged to the middle socioeconomic class, while only 4.7% were from low-income backgrounds. This suggests that cardiac disease in pregnancy affects women across economic strata, but access to specialized care may still be a concern.

The demographic analysis of pregnant women with cardiac disease highlights key challenges, including young maternal age, high primigravida prevalence, late antenatal enrolment, low education levels, and financial dependency. These factors underscore the need for early cardiac screening, improved awareness, and enhanced healthcare accessibility to mitigate pregnancy-related cardiac risks.

**Medical and Obstetric History Table**

| Variable | Categories | Frequency (%) |
| --- | --- | --- |
| **Medical History** | Cardiac Disease | 72 (84.7%) |
| | HTN and Cardiac | 5 (5.9%) |
| | All Above | 8 (9.4%) |
| **Surgical History** | Previous LSCS | 16 (18.8%) |
| | Others | 4 (4.7%) |
| | None | 65 (76.5%) |
| **Previous Complicated Pregnancy** | Yes | 12 (14.1%) |
| | No | 73 (85.9%) |

| | | |
|---|---|---|
| **Type of Cardiac Disease** | Valvular Heart Disease | 73 (85.9%) |
| | Cardiomyopathy | 4 (4.7%) |
| | Congenital Heart Disease | 4 (4.7%) |
| | Conduction Disorder | 4 (4.7%) |
| **Severity of Disease** | Mild | 25 (29.4%) |
| | Moderate | 49 (57.6%) |
| | Severe | 11 (12.9%) |
| **Treatment for Disease** | Medical | 79 (92.9%) |
| | Both (Medical & Surgical) | 6 (7.1%) |

**Medical and Obstetric History of Pregnant Women with Cardiac Disease**

The maternal heart health study reveals critical insights into the medical and obstetric background of pregnant women diagnosed with cardiac disease. These findings emphasize the complexity of managing pregnancy in women with pre-existing heart conditions and the associated maternal and foetal risks.

A significant 84.7% of participants had a pre-existing cardiac disease, while 5.9% had both hypertension (HTN) and cardiac disease, and 9.4% suffered from multiple comorbidities, including both conditions. This highlights the high burden of cardiovascular disease in pregnancy and the necessity for specialized care in this population. Only 18.8% of women had a history of lower segment caesarean section (LSCS), while 76.5% had no prior surgical history. This suggests that while most women had not undergone prior surgical interventions, those with previous LSCS might require repeat caesarean sections due to obstetric or cardiac indications. Regarding previous pregnancy outcomes, 14.1% of women had a history of complicated pregnancies, reinforcing the recurrent nature of pregnancy-related risks in women with cardiac conditions. This necessitates careful monitoring and individualized management strategies to prevent adverse maternal and foetal outcomes.

Among the different types of cardiac diseases, valvular heart disease was the most prevalent (85.9%), followed by cardiomyopathy (4.7%), congenital heart disease (4.7%), and conduction disorders (4.7%). The predominance of valvular heart disease suggests rheumatic heart disease as a leading cause, particularly in resource-limited settings. The severity of cardiac disease varied, with 57.6% of women experiencing moderate disease, 29.4% classified as mild, and

12.9% suffering from severe cardiac pathology. This stratification underscores the need for risk-based management, as severe cases are at heightened risk of complications such as heart failure, arrhythmias, and maternal mortality. Most women (92.9%) received medical management alone, while a small fraction (7.1%) required both medical and surgical interventions. This suggests that conservative treatment remains the mainstay of managing cardiac disease during pregnancy, possibly due to the risks associated with cardiac surgery during gestation.

The medical and obstetric history of pregnant women with cardiac disease highlights high prevalence rates, predominant valvular pathology, recurrent pregnancy complications, and reliance on medical management. Given the moderate-to-severe disease severity in a substantial proportion of patients, a multidisciplinary approach involving cardiologists, obstetricians, and neonatologists is essential to optimize both maternal and neonatal outcomes.

**Delivery Outcomes and Complications**

| Variable | Categories | Frequency (%) |
|---|---|---|
| **Gestational Age at Birth** | <28 weeks | 4 (4.7%) |
| | 33-36 weeks | 27 (31.8%) |
| | 37-41 weeks | 54 (63.5%) |
| **Mode of Delivery** | Spontaneous Vaginal Delivery (SVD) | 8 (9.4%) |
| | Lower Segment Caesarean Section (LSCS) | 77 (90.6%) |
| **Birth Weight** | 2.5-3.5 kg | 50 (58.8%) |
| | 1.5-2.4 kg | 31 (36.5%) |
| | <1.5 kg | 4 (4.7%) |
| **APGAR Score at Birth** | <5 | 4 (4.7%) |
| | 6-7 | 29 (34.1%) |
| | 8-10 | 52 (61.2%) |
| **Neonatal Complications** | Yes | 10 (11.8%) |
| | No | 75 (88.2%) |
| **Maternal Complications** | Cardiac Arrest | 4 (4.7%) |
| | No | 81 (95.3%) |
| **ICU/CCU Admission** | Yes | 34 (40.0%) |
| | No | 51 (60.0%) |

| | | |
|---|---|---|
| **Duration of ICU/CCU Stay** | 0 days | 51 (60.0%) |
| | 1-5 days | 21 (24.7%) |
| | 6-10 days | 13 (15.3%) |
| **Total Hospital Stay** | 1-5 days | 4 (4.7%) |
| | 6-10 days | 56 (65.9%) |
| | >10 days | 25 (29.4%) |
| **Maternal Mortality** | Yes | 03 (3.5%) |
| | No | 82 (96.47%) |
| **Neonatal Mortality** | Yes | 4 (4.7%) |
| | No | 81 (95.3%) |

The analysis of pregnancy outcomes in cardiac patients highlights significant maternal and neonatal challenges.

A considerable proportion (31.8%) of cardiac patients had preterm births (33-36 weeks), while 4.7% delivered extremely preterm (<28 weeks), indicating a high risk of preterm labor in this population. However, 63.5% of deliveries occurred at term (37-41 weeks), reflecting successful pregnancy prolongation with medical management. The majority (90.6%) of cardiac patients underwent Lower Segment Caesarean Section (LSCS), which may have been preferred due to the hemodynamic instability associated with labour in cardiac conditions. Only 9.4% had a spontaneous vaginal delivery (SVD), likely due to concerns about prolonged labour causing cardiac decompensation. Birth weight distribution indicates that 36.5% of neonates were low birth weight (1.5-2.4 kg), and 4.7% were very low birth weight (<1.5 kg), which is common in pregnancies complicated by maternal cardiac disease. This suggests uteroplacental insufficiency or chronic hypoxia as potential contributors. Neonatal well-being, assessed by APGAR scores, showed that while 61.2% of neonates had a healthy APGAR (8-10), 34.1% had moderate distress (6-7), and 4.7% had critical distress (<5). Additionally, neonatal complications were present in 11.8% of cases, and neonatal mortality occurred in 4.7%, reflecting the increased perinatal risks associated with maternal cardiac disease.

Cardiac arrest occurred in 4.7% of cases, further emphasizing the critical nature of pregnancy in these high-risk women. ICU admissions were frequent (40.0%), and 24.7% of patients required 1-5 days of ICU care, while 15.3% had extended ICU stays (6-10 days). These findings highlight the need for intensive cardiac and obstetric monitoring during the perinatal period. A

prolonged hospital stay (6-10 days) was observed in 65.9% of patients, and 29.4% stayed for more than 10 days, reflecting the complexity of care required for these patients. Maternal mortality was 3.5%, suggesting effective medical management, but the neonatal mortality rate was 4.7%, reinforcing the need for specialized neonatal care.

This study underscores the high-risk nature of pregnancy in cardiac patients, with elevated rates of preterm birth, neonatal complications, maternal respiratory failure, and ICU admissions. Multidisciplinary care, close monitoring, and timely intervention are essential to optimize both maternal and neonatal outcomes in this vulnerable group.

**One-Way ANOVA**

| Variable | F | P |
|---|---|---|
| **Gestation Age at Birth** | .444 | .643 |
| **Birth Weight** | 1.272 | .286 |
| **Total Hospital Stay** | 17.723 | .000 |

The results of the One-Way ANOVA analysis highlight key differences in maternal and neonatal outcomes among pregnant women with cardiac disease. The findings indicate that gestational age at birth (p = 0.643) and birth weight (p = 0.286) do not show statistically significant differences across groups, suggesting that these factors are not significantly influenced by the variables analyzed. However, total hospital stay (p = 0.000) demonstrates a highly significant difference, indicating that some groups of patients had a prolonged hospitalization compared to others. This suggests that the severity of cardiac disease and related complications may contribute to longer hospital stays, underscoring the need for close monitoring and specialized care in high-risk pregnant cardiac patients. These results emphasize the importance of early risk assessment, multidisciplinary management, and timely interventions to improve maternal and neonatal outcomes.

**Chi-Square Test**

| Variable | Value | df | P-Value |
|----------|-------|----|---------|
| **Mode of Delivery** | 21.195 | 2 | 0 |
| **ICU/CCU Admission** | 3.258 | 2 | 0.196 |
| **Neonatal Complication** | 1.91 | 2 | 0.385 |

The chi-square analysis reveals a significant association between mode of delivery and maternal cardiac disease ($\chi^2 = 21.195$, $p = 0.000$), indicating that pregnant women with cardiac conditions are more likely to undergo Lower Segment Caesarean Section (LSCS) rather than Spontaneous Vaginal Delivery (SVD). This suggests that cardiac disease plays a crucial role in determining the safest mode of delivery for both mother and baby.

On the other hand, ICU/CCU admission ($\chi^2 = 3.258$, $p = 0.196$) does not show a statistically significant association, implying that while some cardiac patients require intensive care, the need for ICU/CCU admission is not necessarily determined by the presence of cardiac disease alone. Other factors, such as disease severity or obstetric complications, may contribute. Similarly, neonatal complications ($\chi^2 = 1.91$, $p = 0.385$) do not exhibit a significant relationship with maternal cardiac conditions. This suggests that while some neonates may experience health issues at birth, these complications are not strongly linked to the mother's cardiac disease.

Overall, the findings highlight the critical role of maternal cardiac health in determining the mode of delivery, while ICU/CCU admission and neonatal complications appear to be influenced by additional factors beyond the presence of cardiac disease

These results emphasize the need for early diagnosis, risk stratification, and multidisciplinary care in pregnant women with cardiac disease. Proactive management, including tailored delivery planning, optimized cardiac treatment, and neonatal care, can significantly improve maternal and fetal outcomes. Given the high rates of LSCS, ICU admissions, and neonatal complications, a comprehensive, team-based approach is essential to minimize risks and ensure the best possible outcomes for both mother and baby.

## DISCUSSION:

This study provides a critical analysis of the maternal and neonatal outcomes associated with women who have cardiovascular disease during pregnancy, particularly highlighting the challenges faced by women with valvular heart disease, coronary artery disease, and other high-risk cardiac conditions. The results underscore the necessity for a nuanced approach to managing pregnancies in women with pre-existing cardiac conditions, emphasizing the importance of early identification, personalized management, and multi-disciplinary care.

### Cardiovascular Disease and Pregnancy Outcomes

Valvular heart disease is a leading cause of maternal cardiovascular complications during pregnancy, as it can significantly alter the hemodynamic load on the heart. The study's findings that 85.9% of participants had valvular heart disease are consistent with previous studies, which have shown that congenital and acquired valvular disorders significantly impact maternal outcomes during pregnancy [1,2]. For example, studies by Goldstein and Ward [1] have highlighted that women with severe valvular disease have higher risks of maternal heart failure and other pregnancy-related complications, necessitating careful monitoring.

Furthermore, the presence of coronary artery disease (CAD) in pregnancy remains a major contributor to adverse outcomes. Pathak et al. [3] point out that CAD in women is often underdiagnosed or mismanaged, leading to complications like preeclampsia, preterm labor, and increased risk of myocardial infarction. The study's observation that 84.7% of women had pre-existing cardiac disease aligns with findings from Elkayam et al. [2], who emphasized the increasing prevalence of CAD in pregnancy and its association with poor maternal and neonatal outcomes.

### Maternal Mortality and Morbidity

The study found that maternal cardiac arrest as a significant risk in this cohort, which is in line with the data presented by Ashrafi and Curtis [4], who note that heart disease remains a leading cause of maternal morbidity and mortality worldwide. The reduced maternal mortality of 3.5% in this study is noteworthy and suggests that with adequate management and timely intervention, the risks of maternal death due to cardiac disease can be mitigated. However, Hirshberg and Srinivas [5] emphasize that the prevention of such outcomes requires prompt recognition of high-risk cases and proper surveillance during the antenatal period.

Moreover, the association between complex congenital heart disease and pregnancy complications has been well documented. Canobbio et al. [6] demonstrated that women with complex congenital heart defects are at higher risk for complications such as preterm birth, intrauterine growth restriction, and maternal heart failure. The results of this study, particularly the high percentage of Cesarean sections, reflect these findings and suggest that vaginal delivery may not always be the safest option for women with significant cardiac disease.

## Neonatal Outcomes

In terms of neonatal outcomes, the study showed that 36.5% of neonates had low birth weight, and 4.7% experienced neonatal mortality. These findings are consistent with those of Roos-Hesselink et al. [10], who reported that pregnancies complicated by maternal cardiovascular disease often lead to poor fetal outcomes, including intrauterine growth restriction and preterm birth. The impact of maternal heart disease on neonatal health underscores the importance of early planning and close monitoring of pregnancy to minimize adverse neonatal outcomes.

Furthermore, the significant correlation between cardiac disease and preterm birth supports the conclusions of Beyer et al. [8], who found that women with maternal cardiac complications are more likely to deliver prematurely, often due to maternal complications such as preeclampsia or heart failure. Neonatal care for these infants, particularly in terms of low birth weight and respiratory support, is essential for improving survival rates and long-term health.

## Mode of Delivery

The high rate of Cesarean sections observed in this study (90.6%) is consistent with the management recommendations made by the American College of Obstetricians and Gynecologists (ACOG) and other organizations. ACOG's guidelines [7] stress that in women with significant cardiac disease, Cesarean delivery is often preferred to reduce the risks associated with prolonged labor and the potential for cardiovascular decompensation during vaginal delivery. This finding highlights the need for a personalized approach to delivery planning that takes into account both maternal and fetal health risks.

## Statistical Analysis and Hospital Stay

The study's statistical analysis, which found a significant difference in hospital stay for women with cardiac disease, reflects the increased complexity of managing these pregnancies. According to Ramage et al. [11], the length of hospital stay for women with heart disease is often prolonged due to the need for continuous monitoring and treatment of both maternal and fetal

complications. Additionally, the lack of significant associations between ICU/CCU admissions and neonatal complications suggests that factors beyond immediate maternal critical care, such as disease severity and obstetric management, play a more significant role in determining neonatal outcomes.

## IMPLICATIONS

This research underscores the importance of early screening, personalized care plans, and a multidisciplinary approach for managing pregnancies in women with cardiovascular disease. The findings highlight the need for revised guidelines on delivery methods, with an emphasis on Cesarean sections in high-risk pregnancies, while also suggesting further research into safer, evidence-based strategies. The study also calls for improved neonatal care protocols, considering the association between maternal heart disease and adverse fetal outcomes. Public health initiatives aimed at reducing cardiovascular risk factors and ensuring access to prenatal care are essential, especially in low-resource settings. Furthermore, the study serves as a foundation for future research on long-term outcomes for both mothers and infants, with a focus on refining therapeutic interventions and improving global health strategies.

## LIMITATIONS

The limitations of this research include potential biases in study design, particularly the reliance on retrospective data, which may not accurately reflect all variables or lead to causality determinations. The generalizability of the findings could be limited by the specific population studied, as the outcomes may differ in various geographic or socioeconomic contexts. Additionally, the study may not account for all confounding factors such as variations in healthcare access, comorbidities, or lifestyle factors, which could impact maternal and neonatal outcomes. There may also be limitations in the available data on long-term follow-up, as the long-term effects of maternal cardiovascular disease on both mothers and infants require more extensive, longitudinal studies. Lastly, variations in clinical practices and treatment protocols across different healthcare settings could influence the consistency of the findings.

## FUTURE RESEARCH DIRECTIONS

Future research in this area should focus on conducting large, multicenter, prospective studies to gather more comprehensive data on maternal cardiovascular disease and pregnancy outcomes. These studies should aim to include diverse populations across different geographic regions and socioeconomic backgrounds to improve the generalizability of the findings.

Additionally, more research is needed to explore the long-term effects of maternal cardiovascular disease on both maternal and neonatal health, particularly regarding the impact on offspring in later life. Investigating the role of genetic and environmental factors, as well as how different treatment strategies influence outcomes, could further enhance the understanding of pregnancy complications in women with heart disease. The development of personalized care models, including advanced diagnostic tools and treatment protocols, could also help improve maternal and neonatal outcomes. Moreover, exploring the psychological and social aspects of managing cardiovascular disease during pregnancy may offer insights into holistic care approaches, which could optimize both mental and physical health for mothers.

## CONCLUSION

In conclusion, this research underscores the significant impact of maternal cardiovascular disease on pregnancy outcomes, highlighting the complexity and challenges of managing such conditions during pregnancy. It emphasizes the need for early identification, appropriate risk assessment, and a multidisciplinary approach to care to improve both maternal and neonatal outcomes. The findings suggest that with careful monitoring and tailored interventions, many women with cardiovascular conditions can have successful pregnancies. However, the study also calls for greater awareness and continued research to address the gaps in understanding the long-term effects of these conditions and to develop strategies that further enhance maternal and fetal health. Ultimately, the research advocates for a more comprehensive, individualized approach to managing pregnancy in women with cardiovascular disease to optimize outcomes for both mothers and their children.

## REFERENCE:

1. Goldstein, S. A., & Ward, C. C. (2017). Congenital and Acquired Valvular Heart Disease in Pregnancy. *Current cardiology reports*, *19*(10), 96. https://doi.org/10.1007/s11886-017-0910-6

2. Elkayam, U., Goland, S., Pieper, P. G., & Silverside, C. K. (2016). High-Risk Cardiac Disease in Pregnancy: Part I. *Journal of the American College of Cardiology*, *68*(4), 396–410. https://doi.org/10.1016/j.jacc.2016.05.048

3. Pathak, L. A., Shirodkar, S., Ruparelia, R., & Rajebahadur, J. (2017). Coronary artery disease in women. *Indian heart journal*, *69*(4), 532–538. https://doi.org/10.1016/j.ihj.2017.05.023

4. Ashrafi, R., & Curtis, S. L. (2017). Heart Disease and Pregnancy. *Cardiology and therapy*, *6*(2), 157–173. https://doi.org/10.1007/s40119-017-0096-4

5. Hirshberg, A., & Srinivas, S. K. (2017, October). Epidemiology of maternal morbidity and mortality. In *Seminars in perinatology* (Vol. 41, No. 6, pp. 332-337). WB Saunders.

6. Canobbio, M. M., Warnes, C. A., Aboulhosn, J., Connolly, H. M., Khanna, A., Koos, B. J., ... & Stout, K. (2017). Management of pregnancy in patients with complex congenital heart disease: a scientific statement for healthcare professionals from the American Heart Association. *Circulation*, *135*(8), e50-e87.

7. on Pregnancy, P. T. F., & American College of Obstetricians and Gynecologists. (2019). ACOG practice bulletin No. 212: pregnancy and heart disease. *Obstetrics and gynecology*, *133*(5), e320-e356.

8. Beyer, S. E., Dicks, A. B., Shainker, S. A., Feinberg, L., Schermerhorn, M. L., Secemsky, E. A., & Carroll, B. J. (2020). Pregnancy-associated arterial dissections: a nationwide cohort study. *European Heart Journal*, *41*(44), 4234-4242.

9. Braverman, A. C., Mittauer, E., Harris, K. M., Evangelista, A., Pyeritz, R. E., Brinster, D., & Eagle, K. (2021). Clinical features and outcomes of pregnancy-related acute aortic dissection. *JAMA cardiology*, *6*(1), 58-66.

10. Roos-Hesselink, J., Baris, L., Johnson, M., De Backer, J., Otto, C., Marelli, A., & Hall, R. (2019). Pregnancy outcomes in women with cardiovascular disease: evolving trends over 10 years in the ESC Registry Of Pregnancy And Cardiac disease (ROPAC). *European heart journal*, *40*(47), 3848-3855.

11. Ramage, K., Grabowska, K., Silversides, C., Quan, H., & Metcalfe, A. (2019). Association of adult congenital heart disease with pregnancy, maternal, and neonatal outcomes. *JAMA Network Open*, *2*(5), e193667-e193667.

12. European Society of Cardiology. (2011). ESC Guidelines on the management of cardiovascular diseases during pregnancy: the Task Force on the Management of Cardiovascular Diseases during Pregnancy of the European Society of Cardiology (ESC). *Eur Heart J*, *32*, 3147-3197.

13. Hemnes, A. R., Kiely, D. G., Cockrill, B. A., Safdar, Z., Wilson, V. J., Hazmi, M. A., ... & Lahm, T. (2015). Statement on pregnancy in pulmonary hypertension from the Pulmonary Vascular Research Institute. *Pulmonary circulation*, *5*(3), 435-465.

14. Lindley, K. J., Bairey Merz, C. N., Asgar, A. W., Bello, N. A., Chandra, S., Davis, M. B., ... & American College of Cardiology Cardiovascular Disease in Women Committee and the Cardio-Obstetrics Work Group. (2021). Management of women with congenital or inherited cardiovascular disease from pre-conception through pregnancy and postpartum: JACC focus seminar 2/5. *Journal of the American College of Cardiology*, *77*(14), 1778-1798.

**ANNEXURE-1**

## MATERNAL HEART HEALTH: UNRAVELING THE CHALLENGES AND

## OUTCOMES OF PREGNANCY WITH CARDIAC DISEASE

| Section | Variable | Response |
|---|---|---|
| **1. Patient Identification** | Patient ID | |
| | Name | |
| | Age (years) | |
| | Parity (Gravida/Para) | |
| | Gestational Age at Enrolment (weeks) | |
| **2. Demographic Information** | Marital Status | ☐ Married ☐ Single ☐ Divorced ☐ Widowed |
| | Education Level | ☐ No formal education ☐ Primary ☐ Secondary ☐ Higher |
| | Occupation | ☐ Unemployed ☐ Skilled Worker ☐ Professional ☐ Other: _____ |
| | Socioeconomic Status | ☐ Low ☐ Middle ☐ High |
| **3. Medical History** | Pre-existing Medical Conditions | ☐ Hypertension ☐ Diabetes ☐ CKD ☐ Thyroid Disorders ☐ Other: _____ |
| | Cardiac Disease Prior to Pregnancy | ☐ Yes ☐ No (If Yes, specify: _____) |
| | Previous Surgeries | ☐ Yes ☐ No (If Yes, specify: _____) |
| | History of Previous Pregnancy Complications | ☐ Yes ☐ No (If Yes, specify: _____) |
| **4. Cardiac Disease in Pregnancy** | Type of Cardiac Disease | ☐ Valvular ☐ Cardiomyopathy ☐ Congenital ☐ Other: _____ |
| | Severity of Cardiac Disease | ☐ Mild ☐ Moderate ☐ Severe |

| | | |
|---|---|---|
| | Treatment Received | ☐ Medications (Specify: _____) ☐ Surgery (Specify: _____) ☐ Other: _____ |
| **5. Pregnancy and Delivery Information** | Gestational Age at Delivery (weeks) | |
| | Mode of Delivery | ☐ Vaginal ☐ Cesarean |
| | Indication for Cesarean (if applicable) | |
| | Birth Weight (grams) | |
| | Apgar Score (1 min / 5 min) | |
| | Neonatal Complications | ☐ Yes ☐ No (If Yes, specify: _____) |
| **6. Maternal Outcomes** | Need for CCU/ICU Admission | ☐ Yes ☐ No |
| | Duration of CCU/ICU Stay (days) | |
| | Total Hospital Stay (days) | |
| | Maternal Complications | ☐ Heart Failure ☐ Arrhythmias ☐ Pulmonary Edema ☐ Other: _____ |
| | Cardiac Arrest | ☐ Yes ☐ No |
| | Maternal Mortality | ☐ Yes ☐ No |
| **7. Fetal Outcomes** | Fetal Complications | ☐ Yes ☐ No (If Yes, specify: _____) |
| | Preterm Birth (<37 weeks) | ☐ Yes ☐ No |
| | Intrauterine Growth Restriction (IUGR) | ☐ Yes ☐ No |
| | Stillbirth | ☐ Yes ☐ No |
| | Neonatal Mortality | ☐ Yes ☐ No |

| 8. Additional Information | Postpartum Follow-up Needed? | ☐ Yes ☐ No |
|---|---|---|
|  | Long-Term Complications Observed? | ☐ Yes ☐ No (If Yes, specify: _____) |