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WHEN TWO HEARTS BEAT AS ONE: A PROSPECTIVE OBSERVATIONAL STUDY ON MATERNAL AND FETAL OUTCOMES IN CARDIAC-COMPLICATED PREGNANCIES FROM A TERTIARY CENTRE IN SOUTH INDIA

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ABSTRACT **Background:** Cardiac disease is a significant non obstetric cause of maternal morbidity and mortality. Physiological changes of pregnancy may unmask or exacerbate underlying cardiac disease. **Objective:** To assess maternal and fetal outcomes in pregnancies complicated by heart disease. **Methods:** A prospective observational study was conducted at the Institute of Obstetrics and Gynaecology, Madras Medical College, Chennai from July 2022 to July 2023. A total of 110 antenatal women with pre existing or newly diagnosed cardiac disease were included. Detailed clinical evaluation, transthoracic echocardiography, risk assessment using NYHA and modified WHO classification, and peri partum monitoring were performed. Maternal and neonatal outcomes were analysed. **Results:** Most patients were aged 19-25 years (41.82%, n=46) and were primigravida (61.82%, n=68). Term deliveries occurred in 78.18% (n=86). Rheumatic heart disease (71.6%, n=79) was the most common aetiology, followed by congenital heart disease (21%, n=23) - predominantly ostium secundum atrial septal defect. Vaginal delivery was achieved in 56% (n=62) and forceps-assisted delivery was required in 22.8% (n=25). Preterm deliveries occurred in 7.27% (n=8) and there was one stillbirth (0.91%). Neonatal outcomes included 16.36% (n=18) NICU admissions and 2.73% (n=3) neonatal deaths; no neonatal congenital cardiac anomalies were detected. Two maternal deaths occurred due to Ebstein's anomaly and Eisenmenger syndrome. **Conclusion:** Pregnancy with cardiac disease requires multidisciplinary management. Early diagnosis, vigilant monitoring, and collaborative care between obstetricians, cardiologists, and anaesthesiologists are essential to optimise maternal and neonatal outcomes.

KEYWORDS : Heart disease; pregnancy; rheumatic heart disease; congenital heart disease; maternal outcome; neonatal outcome

INTRODUCTION

Cardiac disease complicates approximately 1-4% of pregnancies worldwide and remains a leading indirect cause of maternal mortality, particularly in low- and middle-income countries [1,2]. Pregnancy induces profound haemodynamic adaptations - including increases in plasma volume, stroke volume and heart rate - that may unmask or worsen underlying cardiac lesions and precipitate decompensation during late pregnancy or the peripartum period [3-6].

The aetiology of cardiac disease in pregnancy varies geographically. In high-income settings congenital heart disease (CHD) predominates as a consequence of improved childhood survival, whereas rheumatic heart disease (RHD) continues to account for the majority of cases in many parts of South Asia and sub-Saharan Africa due to ongoing rates of rheumatic fever and gaps in secondary prophylaxis [7-11]. Valve lesions (mitral stenosis and regurgitation) and pulmonary hypertension remain major contributors to adverse maternal outcomes in these regions.

Risk stratification using functional status (NYHA) and the modified WHO classification guides management and delivery planning, with multidisciplinary cardio-obstetric teams improving surveillance and outcomes [12-15]. Given the persistent burden of RHD in India and the increasing number of women with repaired or palliated CHD reaching childbearing age, contemporary, prospective data from tertiary referral centres are essential to inform local practice and resource allocation. This study aimed to evaluate maternal and fetal outcomes in pregnancies complicated by cardiac disease at a tertiary care referral centre in South India, reported in accordance with the STROBE guidelines for observational studies [16].

MATERIALS & METHODS

Study Design And Setting:

This prospective observational study was conducted at the Institute of Obstetrics and Gynaecology, Madras Medical College, Chennai, between 1 July 2022 and 30 July 2023. The study protocol was approved by the Institutional Ethics Committee (Approval No. 07.19.2022; EC Reg. No: ECR/270/Inst.TN/2013/RR-20; EC/NEW/INST/2021/1618). Written informed consent was obtained from all participants.

Participants:

All pregnant women presenting to the antenatal clinic, labour ward, or referred from peripheral centres with known pre-existent cardiac disease or newly diagnosed cardiac disease during pregnancy were eligible. We excluded women with systemic illnesses not primarily related to cardiac pathology (for example: chronic renal disease, insulin-dependent diabetes mellitus, or active thyroid disease) if these were the predominant contributors to the current pregnancy complications; such exclusions were applied to create a more homogeneous cardiac cohort.

Clinical Assessment And Investigations:

Each participant underwent evaluation by obstetric and cardiology teams, including NYHA classification, electrocardiography, and echocardiography. Additional investigations were performed as indicated.

Risk Stratification And Management:

Patients were classified using the modified WHO and NYHA systems. Management, including delivery planning and anticoagulation, was individualized by a multidisciplinary cardio-obstetric team.

Data Collection:

Maternal and neonatal outcomes were prospectively recorded and analyzed using SPSS version 25. Continuous variables were expressed as mean ± SD or percentages. t-test, Mann-Whitney U, and Chi-square tests were applied; $p < 0.05$ was considered statistically significant.

Reporting Standards:

The study adheres to STROBE guidelines for observational research.

RESULTS:

A total of 110 pregnant women with cardiac disease were enrolled and analysed. The mean age was 26.8 ± 4.9 years; 41.82% (n=46) were aged 19-25 years. Most women were primigravida (61.82%, n=68). Term deliveries occurred in 78.18% (n=86), and preterm deliveries in 7.27% (n=8). Vaginal delivery was achieved in 56% (n=62); 22.8% (n=25) required outlet forceps, 10.53% (n=11) vacuum, and 10.67% (n=12) cesarean section.

Rheumatic heart disease (RHD) was the most common aetiology (71.6%, n=79), followed by congenital heart disease (CHD) (21%, n=23), predominantly ostium secundum atrial septal defect. Among the remaining 7.4% (n=8) cases grouped as "other cardiac diseases," three patients had peripartum cardiomyopathy diagnosed based on echocardiographic left ventricular dysfunction occurring in late pregnancy or early puerperium. Two women presented with isolated arrhythmias (one supraventricular tachycardia and one Wolff-Parkinson-White syndrome), both managed medically with rate-control therapy and delivered uneventfully. One patient had hypertrophic obstructive cardiomyopathy under regular cardiology follow-up, one had ischemic heart disease with a prior myocardial infarction, and one had secondary pulmonary hypertension unrelated

to rheumatic etiology. These cases were managed with individualized cardio-obstetric input and close intrapartum monitoring. [Table 1]

Table 1: Etiology Of Cardiac Disease

Type of Cardiac Disease	Specific Subtype / Diagnosis	Number of cases (n)	Percentage (%)
Rheumatic heart disease (RHD)	Mitral stenosis ± regurgitation, aortic valve disease	79	71.6
Congenital heart disease (CHD)	Ostium secundum ASD, VSD, PDA (repaired/unrepaired)	23	21.0
Other acquired or miscellaneous cardiac diseases		8	7.4
	Peripartum cardiomyopathy	3	2.7
	Isolated arrhythmia (supraventricular tachycardia / WPW syndrome)	2	1.8
	Hypertrophic obstructive cardiomyopathy	1	0.9
	Ischemic heart disease (post-MI, stable)	1	0.9
	Pulmonary hypertension secondary to non-rheumatic cause	1	0.9

ASD – Atrial Septal Defect
VSD – Ventricular Septal Defect
PDA – Patent Ductus Arteriosus
WPW – Wolff–Parkinson–White Syndrome
MI – Myocardial Infarction
RHD – Rheumatic Heart Disease
CHD – Congenital Heart Disease

Maternal cardiac complications included heart failure episodes, arrhythmias, and need for HDU admission. There were two maternal deaths (1.82%): one patient with Eisenmenger syndrome and another with uncorrected Ebstein's anomaly who presented in advanced cardiac failure. [Table 2]

Table 2: Maternal Outcomes

Outcome	Number (n)	Percentage (%)
Heart failure episodes	—	—
Arrhythmias	—	—
HDU admission for post partum monitoring	72	65.45
Maternal deaths	2	1.82
Eisenmenger syndrome	1	—
Ebstein's anomaly	1	—

ICU Intensive Care Unit

Neonatal outcomes included 16.36% (n=18) NICU admissions and 2.73% (n=3) neonatal deaths; 59.09% (n=65) of neonates had birth weights >2.5 kg. No neonatal congenital cardiac anomalies were identified on initial screening. [Table 3].

Table 3: Neonatal Outcomes

Outcome	No. of cases (N)	Percentage (%)
Birth weight >2.5 kg	65	59.09
Birth weight 1.5–2.5 kg	35	31.82
NICU admissions	18	16.36
Neonatal deaths	3	2.73
Stillbirth	1	0.91
Congenital heart disease	0	0

kg kilogram; NICU- neonatal intensive care unit

DISCUSSION

This prospective study highlights that rheumatic heart disease (RHD) continues to be the predominant cause of cardiac disease in pregnancy in our tertiary referral centre, accounting for approximately 72% of cases. This finding mirrors numerous regional reports demonstrating the ongoing burden of RHD in South Asia despite overall global declines, largely attributable to gaps in primary and secondary prevention and socio-economic determinants of health [17-20].

Congenital heart disease (CHD) comprised one-fifth of our cohort, reflecting improving survival of children with congenital cardiac lesions and the consequent increase in women of reproductive age with repaired or palliated CHD. Contemporary registries, including ROPAC, have documented a relative increase in CHD cases in pregnancy in high-income settings, whereas low- and middle-income countries typically report a mixed pattern with substantial RHD representation [21,22].

The maternal mortality observed (1.82%) is within the range reported in tertiary-centre series from similar settings but must be interpreted cautiously due to modest cohort size and the disproportionate impact of high-risk diagnoses such as Eisenmenger syndrome and advanced cyanotic heart disease. Prior studies and registry data consistently identify cyanosis, pulmonary hypertension, right ventricular failure, and mechanical prosthetic valves as key predictors of adverse maternal outcomes [23-25]. These conditions underscore the importance of preconception counselling and multidisciplinary management; women with WHO class IV conditions should be counselled against pregnancy and offered alternatives such as adoption or surrogacy where appropriate [26].

Our delivery practice-predominantly vaginal delivery with assisted second-stage management-aligns with international guideline recommendations that favour vaginal delivery in most cardiac patients while reserving cesarean section for obstetric indications or specific cardiac concerns (e.g., severe aortic dilatation, uncontrolled heart failure) [27,28]. Instrumental delivery was employed frequently to minimise maternal exertion during the second stage, consistent with recommendations from the ESC and AHA on labour management in cardiac patients [29]. A practical and individualised approach, as described by Hameed and Elkayam, emphasises tailoring the mode of delivery and peripartum monitoring to the specific lesion, hemodynamic status, and maternal tolerance [24].

Neonatal outcomes in our study were largely favourable, with low rates of congenital cardiac anomalies on initial screening. Preterm birth and low birth weight were the principal contributors to neonatal morbidity, findings that parallel those of the ROPAC registry and similar regional cohorts [27]. Adequate antenatal surveillance and collaborative planning of delivery timing are therefore essential, particularly in mothers with severe valvular or decompensated cardiac disease.

The strengths of our study include its prospective design, comprehensive cardiology evaluation with echocardiography, and multidisciplinary management reflective of real-world tertiary-centre practice. Limitations include its single-centre nature, relatively limited sample size that constrained power for multivariable analyses, and the absence of extended postpartum follow-up beyond the immediate puerperium. Nevertheless, the data provide contemporary regional insight into maternal and perinatal outcomes in cardiac pregnancies and reinforce the need for dedicated cardio-obstetric services in India.

CONCLUSIONS

Pregnancy in women with cardiac disease remains a significant clinical challenge in our setting, with rheumatic heart disease as the leading aetiology. Multidisciplinary, protocolised care with early risk stratification, targeted antenatal surveillance, and collaborative delivery planning can optimise maternal and neonatal outcomes. Strengthening primary and secondary prevention of rheumatic fever, expanding access to cardiac care, and establishing cardio-obstetric services will be important to reduce the burden of cardiac complications in pregnancy in low-resource settings.

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