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Cardiovascular disease and its foetomaternal outcome in pregnant women undergoing delivery in a tertiary care teaching hospital

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Abstract

Introduction: Cardiovascular disease (CVD) in pregnancy poses significant risks to mother and foetus. This study aimed to describe the spectrum of CVD and maternal and foetal outcomes in a hospital setting in Nepal.

Method: A retrospective, cross-sectional study was conducted using hospital records at the Department of Obstetrics and Gynaecology at Chitwan Medical College Teaching Hospital (CMCTH). Pregnant women with CVD admitted beyond 22 weeks of gestation for delivery from Nov 2019 to Dec 2024 were enrolled. Ethical approval was obtained. Maternal outcomes included mode of delivery, cardiac care unit (CCU) admission, and mortality. Foetal outcomes included gestational age, birth weight, intrauterine growth restriction (IUGR), stillbirth, neonatal ICU admission, and early neonatal death (NND). Data were analysed using SPSS version 25. Categorical data are presented as frequency (percentage).

Result: Among 191 patients who delivered at CMCTH, hypertensive disorders of pregnancy were most prevalent, seen in 153(80.1%), followed by rheumatic heart disease in 30(15.7%), congenital heart disease in 6(3.1%), and cardiomyopathy in 2(1.0%). The most common maternal outcome was emergency caesarean section in 109(59.1%). Admission to CCU occurred in 30(15.7%), and maternal mortality in 2(1.0%). Foetal adverse outcomes were low birth weight in 80(41.9%), preterm birth in 63(33.0%), and IUGR in 51(26.7%). Stillbirth and early neonatal death each occurred in 6(3.1%).

Conclusion: Hypertensive disorders constitute the major burden of CVD in pregnancy at this centre and are associated with high rates of operative delivery and adverse perinatal outcomes, including low birth weight and prematurity.

How to cite

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Introduction

Pregnancy induces significant cardiovascular changes that increase stress on the heart. Cardiovascular disease (CVD) in pregnancy poses profound risks to both mother and foetus, with maternal mortality risk markedly elevated and rising.¹

Globally, CVD is a leading cause of maternal death. In South Asia, the pooled prevalence of preexisting cardiac disease is 1.46% (95% CI 0.99–2.01),² while in Nepal, a rate of 6 per 1000 pregnancies has been reported.³

Maternal CVD disrupts normal pregnancy hemodynamic, potentially reducing uterine blood flow and leading to foetal growth restriction or death. CVD in pregnancy encompasses preexisting conditions (chronic hypertension, valvular/rheumatic heart disease, congenital heart disease) and those arising during gestation (pregnancy-induced hypertension, cardiomyopathies). These conditions often remain undiagnosed due to limited awareness or healthcare access, preventing timely intervention and contributing to obstetric complications and an estimated 10% maternal mortality in affected cases.^{4,5}

Trends of delayed childbearing have increased the prevalence of chronic hypertension and coronary artery disease in pregnancy.^{6,7} Management requires a dedicated multidisciplinary team for optimal outcomes, with delivery recommended in specialized centres.^{6–8} Recent U.S. data (2010–2019) indicate 11.3% of pregnant women have CVD, primarily hypertensive disorders, with prevalence increasing over the decade.⁹ In contrast, epidemiological patterns differ in South Asia, where rheumatic heart disease predominates (up to 90% of cases), unlike Western nations where congenital heart disease is more common.¹⁰

This study aims to provide comprehensive data on the short-term maternal and foetal outcomes of pregnancies complicated by cardiac disease at our centre. Generating this local evidence is crucial for improving clinical

management protocols and preventing adverse outcomes.

Method

A cross-sectional observational study was conducted in the Department of Obstetrics and Gynaecology at Chitwan Medical College Teaching Hospital (CMCTH). The study population comprised pregnant women with CVD who were admitted beyond 22 weeks of gestation (WOG) and underwent delivery (vaginal or caesarean) at CMCTH from November 2019 to December 2024. Data were extracted retrospectively from the hospital's electronic medical records system and paper-based patient files. These records included admission notes, progress notes, delivery reports, laboratory and imaging results, discharge summaries, and death certificates, where applicable. To ensure completeness and accuracy, the extracted data were cross-verified against separate departmental registers maintained by the Obstetrics and Gynaecology, Cardiology, and Neonatal Intensive Care Units. Women with incomplete or missing essential data in these records were excluded from the final analysis. Thus, the data represent all eligible cases meeting the inclusion criteria during the study period for whom a complete clinical dataset was available.

The data collection specifically focused on maternal and foetal outcomes. Maternal outcomes were presence of cardiac conditions (CVD, RHD, CHD); mode of delivery (categorized as spontaneous vaginal, assisted vaginal, emergency or elective caesarean section); admission to the cardiac care unit (CCU); and maternal death. Foetal outcomes included gestational age at delivery (extreme preterm, very preterm, late preterm, or term), birth weight (categorized as extremely low, low, or normal), presence of intrauterine growth restriction (IUGR), intrauterine foetal death (IUFD) or stillbirth, admission to the neonatal intensive care unit (NICU), and early neonatal death (eNND) occurring <7 days of life.

After Institutional Review Committee (IRC) approval, data were recorded on a structured

data collection sheet (proforma), entered into Microsoft Excel for initial management, and then exported to SPSS version 25 for statistical analysis. Descriptive statistics were used, with results presented as frequencies and percentages for categorical variables, and as mean (with standard deviation) or median (with range) for continuous variables, as appropriate.

Result

Out of total 191 patients with cardiovascular diseases in pregnancy, 153(80.1%) had hypertensive disorders of pregnancy (HDP), while 30(15.7%) had rheumatic heart disease, 6(3.1%) had congenital heart disease and 2(1%) had developed cardiomyopathy. The mean age of the pregnant women was 28.0±5.44 years, with the 26–30 year age group 72(37.7%) being most common. Brahmins were the most prevalent ethnic group 75(39.3%) followed by Janjatis 53(27.7%). Regarding obstetric history, 83(43.5%) were primigravida and 94(49.2%) were nullipara, Table 1.

Most deliveries were conducted via emergency caesarean section 109(59.1%). Maternal morbidity included CCU admission in 30(15.7%) cases, peripartum haemorrhage in 10(5.2%)

cases, and maternal death in 2(1.0%) cases, Table 2.

Foetal outcomes included preterm birth in 63(33.0%) cases, low birth weight in 80(41.9%) cases, and IUGR in 51(26.7%) cases. Other adverse outcomes included IUFD in 6(3.1%) cases, admission to the NICU in 33(17.3%) cases, and early neonatal death in 6(3.1%) cases, Table 3.

Proportional distribution among pregnant women delivering at CMCTH (n=191) revealed that hypertensive disorders constituted the majority (80.1%), followed by rheumatic heart disease (15.7%), congenital heart disease (3.1%), and cardiomyopathy (1.0%), Figure 1.

The adverse foetomaternal outcomes in deliveries (n=191) according to maternal age group revealed that in the 26–30 years age group, CVD was present in 72(37.7%), followed by the 21–25 years age group in 52(27.2%). Regarding adverse neonatal outcomes, LBW was seen in 80(41.9%), followed by preterm birth in 63(33.0%) and IUGR in 51(26.7%) cases. Admission to the NICU occurred in 33(17.3%) cases, while both IUFD and early neonatal death (eNND) occurred in 6(3.1%) cases each.

Table 1. Distribution of cardiovascular diseases by baseline characteristics of delivery at CMC, n=191

Characteristic	Hypertensive Disorders (n=153)	RHD (n=30)	CHD (n=6)	Cardiomyopathy (n=2)	Total N=191
Ethnicity					
Brahmin	62	10	3	0	75
Chhetri	19	2	0	0	21
Dalit	18	8	1	1	28
Janjati	44	7	1	1	53
Aadibashi	10	3	1	0	14
Gravida					
1	70	11	2	0	83
2	48	10	2	1	61
3	18	7	2	0	27
≥4	17	2	0	1	20
Parity					
0	78	14	2	0	94
1	57	13	3	1	74
2	12	2	1	0	15
3	4	0	0	1	5
4	2	1	0	0	3

CVD: Cardiovascular disease; HDP: Hypertensive disorders of pregnancy; RHD: Rheumatic heart disease; CHD: Congenital heart disease.

Table 2. Maternal delivery outcomes and morbidity by type of cardiovascular disease, n=191

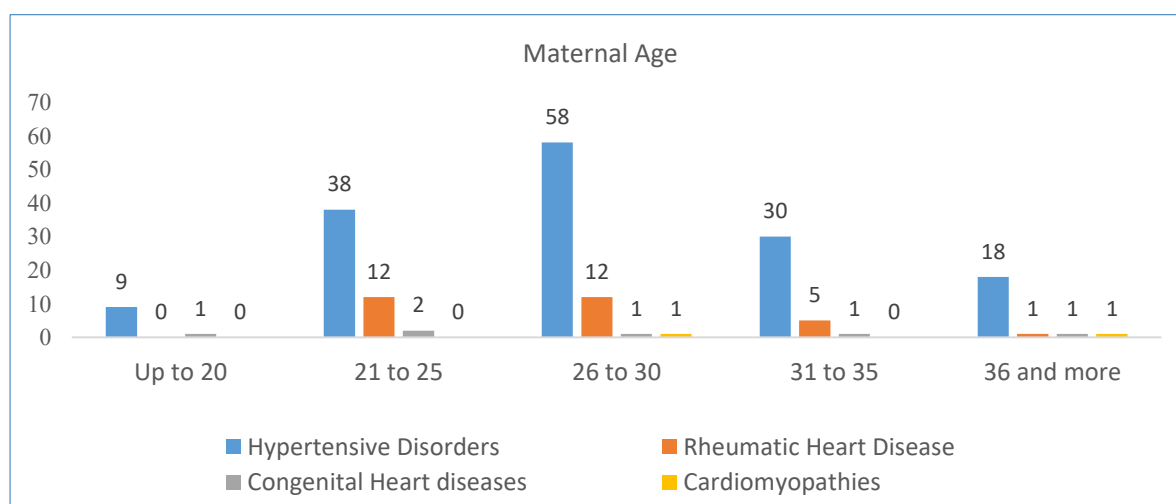
Outcome	Hypertensive disorders (n=153)	RHD (n=30)	CHD (n=6)	Cardiomyopathy (n=2)	Total n=191
Mode of delivery					
Spontaneous vaginal	30	1	1	0	32
Assisted vaginal	7	0	0	0	7
Emergency LSCS	94	12	2	1	109
Elective LSCS	22	17	3	1	43
Maternal morbidity					
Peripartum haemorrhage	8	1	1	0	10
Maternal death	1	1	0	0	2
CCU admission	8	20	0	2	30

LSCS: Lower segment caesarean section; CCU: Cardiac care unit.

Table 3. Foetal and neonatal outcomes by type of maternal cardiovascular disease, n=191

Outcome	Hypertensive Disorders (n=153)	RHD (n=30)	CHD (n=6)	Cardiomyopathy (n=2)	Total N=191
Foetal maturity (WOG)					
Extreme preterm (<28)	1	0	0	0	1
Very preterm (28-32)	12	0	0	0	12
Moderate/late preterm (>32)	40	9	0	1	50
Term (37-42)	100	21	6	1	128
Birth weight					
Extremely Low (<1000g)	4	0	0	0	4
Low (1000-2500g)	66	9	0	1	76
Normal (≥2500g)	83	21	6	1	111
Other morbidities					
IUGR	47	4	0	0	51
IUFD	5	1	0	0	6
NICU admission	31	1	0	1	33
Early NND	5	0	0	1	6

WOG: Weeks of gestation; IUGR: Intrauterine growth restriction; IUFD: Intrauterine foetal death; NICU: Neonatal intensive care unit; NND: Neonatal death.

**Figure 1. Maternal age distribution and prevalence of selected adverse foetal and neonatal outcomes in deliveries at CMC, n=191**

Discussion

This study included 191 pregnant women with cardiovascular issues complicating pregnancy who underwent delivery at CMCTH. The most common cardiovascular complication was hypertensive disorders of pregnancy, which constituted 153(80.1%) of the population, followed by rheumatic heart disease comprising 30(15.7%), congenital heart disease 6(3.1%), and cardiomyopathy 2(1.0%). This distribution aligns with findings from other studies, who also reported a higher burden of hypertensive disorders followed by rheumatic and congenital heart disease.^{11,12}

Regarding maternal morbidity, most deliveries were conducted via emergency caesarean section 109(59.1%), which was most prevalent among hypertensive disorders. A larger proportion of mothers with rheumatic and congenital heart disease underwent elective caesarean section in anticipation of potential complications and to allow for optimization when possible. Although existing literature often cites vaginal delivery as the preferred route for women with maternal cardiovascular disease, recent trends increasingly favour operative delivery under general or epidural anaesthesia.^{13–15}

Among maternal complications, 30(15.7%) mothers required CCU care, predominantly those RHD or cardiomyopathy. There were two maternal deaths (1.0%), one from hypertensive disorders and one from RHD. Peripartum haemorrhage occurred in 10(5.2%) pregnancies. These adverse outcome are consistent with literature, reporting an adjusted odds ratio of 9.28 (95% CI: 6.35–13.56) for maternal mortality in similar populations,⁴ another study documented a higher need for hospitalization in cardiac centres with a hazard ratio of 1.77 (95% CI: 1.72–1.82).¹⁶ The increased incidence of maternal mortality among mothers with cardiac diseases has also been highlighted in a meta-analysis.¹⁰

Overall, low birth weight 80(41.9%), preterm birth 63(33.0%), and IUGR 51(26.7%) were the most common foetal morbidities observed,

predominantly among the hypertensive and rheumatic heart disease groups. Similar findings were reported in a tertiary centre study, where preterm birth and IUGR were common foetal complications.¹⁷ A comparative analysis on neonatal effects in pregnant women with cardiovascular risk versus low risk recorded foetal growth restriction in 9.15% of cases after 22 weeks of gestation, with neonatal morbidity at 11.7% and neonatal mortality at 1.7%.¹⁸ Another study in India on maternal and foetal outcomes in pregnancy with heart disease reported a significant burden of IUFD and low birth weight, which corresponds to our findings of 6(3.1%) stillbirths and 6(3.1%) early neonatal deaths.¹⁹

This study reveals a significant spectrum of cardiovascular diseases in pregnancy and their association with adverse maternal and foetal outcomes. Efforts should be made to identify these maternal conditions earlier and implement strategies to minimize the occurrence of such adverse outcomes.

Limitations of this study include its retrospective design and reliance on hospital records, which may introduce selection bias and limit data completeness. As a single-centre study the findings may not be generalizable. The accuracy of the results could also be influenced by unmeasured confounding factors and potential inconsistencies in clinical documentation. For instance, variables such as maternal socioeconomic status, detailed medication adherence, and the severity of comorbid conditions were not systematically recorded, which may confound the observed associations between cardiovascular disease types and outcomes. Furthermore, variations in documentation practices across different clinicians and over time could affect the consistency and completeness of data abstraction.

Conclusion

This study provides insights into the various cardiovascular diseases occurring in pregnancy and their relationship to maternal and foetal outcomes. Hypertensive disorders of pregnancy and rheumatic heart disease were the most

common conditions prevailing in pregnancy. Caesarean delivery, CCU admission, and maternal death were the most frequent and serious complications, whereas low birth weight, preterm birth, and IUGR were the most common foetal outcomes.

Author contribution

Concept design: RS, SRR, AH; Literature search: RS, SS, SAS; Data collection: RS, AH, PG, AP; Data analysis: RS, SAS, PG; Draft manuscript: RS, SRR, BMD, AH, SAS; Final manuscript and accountability: All

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Conflict of Interest

None

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Supplementary material

The data and supplementary material that support the findings of this study are available from the corresponding author upon reasonable request.

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