OPEN ACCESS

Scholars International Journal of Obstetrics and Gynecology

Abbreviated Key Title: Sch Int J Obstet Gynec
ISSN 2616-8235 (Print) |ISSN 2617-3492 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Original Research Article

Obstetric Characteristics and Post-Partum Cardiac Events among Women with Pre-Existing Heart Disease

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DOI: https://doi.org/10.36348/sijog.2026.v09i03.005 | **Received:** 22.01.2026 | **Accepted:** 18.03.2026 | **Published:** 28.03.2026

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Abstract

***Background*:** Maternal heart disease is a leading cause of maternal morbidity and mortality, and while pregnancy-related cardiac complications have been studied extensively, data on postpartum cardiac events and the influence of obstetric characteristics remain limited, particularly in low- and middle-income countries such as Bangladesh. The purpose of the study was to evaluate obstetric characteristics and the incidence of postpartum cardiac events in women with pre-existing heart disease. ***Methods*:** This hospital-based cohort study was conducted at the Department of Obstetrics and Gynaecology, Fetomaternal Medicine Unit, Dhaka Medical College Hospital, the Department of Fetomaternal Medicine, BSMMU, and the Department of Cardiology, NICVD, Dhaka, Bangladesh, from February 2020 to March 2021. Seventy-three postpartum women with pre-existing heart disease were enrolled. Data on demographics, obstetric history, cardiac status, and maternal outcomes were collected and analyzed using SPSS 26; $p < 0.05$ was significant. ***Results*:** Among 73 women with pre-existing heart disease, most were 18–30 years old (67.1%) and multiparous (78.1%), with term deliveries (83.6%) and LUCS (75.3%) common. Rheumatic valvular disease predominated (56.2%), followed by congenital heart disease (27.4%) and cardiomyopathy (16.4%), with 93.2% in NYHA I–II. Postpartum cardiac events occurred in 45.2%, higher in incidentally diagnosed women (61.8% vs 30.8%), particularly in multiparous, term, and vaginal deliveries. ***Conclusion*:** Women with pre-existing heart disease are at significant risk of postpartum cardiac complications, especially if undiagnosed, multiparous, or delivered vaginally, highlighting the need for early recognition and careful peripartum management.

Key words: Obstetric Characteristics, Postpartum Cardiac Events, Pre-Existing Heart Disease.

INTRODUCTION

Maternal heart disease (HD) represents the foremost cause of indirect maternal mortality in several high-income nations, including Italy, and is linked with significant maternal as well as feto-neonatal complications [1-4]. It complicates approximately 0.2%–4% of all pregnancies [5]. Over the past decade, its prevalence has steadily increased, a trend expected to continue due to a growing population of women with congenital heart disease (CHD) reaching reproductive age and a higher incidence of cardiovascular risk factors—such as advanced maternal age, obesity, chronic hypertension, and smoking—among pregnant women [6]. The interplay between pregnancy and pre-existing heart disease, or the emergence of cardiac disease during pregnancy, constitutes a leading contributor to indirect maternal deaths [7]. Pregnancy triggers multiple adaptations in the cardiovascular system, including a rise in cardiac output by up to 45% by 24 weeks of gestation, alongside a 5–10 mmHg reduction in blood pressure that reaches its nadir during the second trimester [8]. Additionally, maternal heart

rate increases by 10–20 beats per minute, peaking in the third trimester [9].

Despite advancements in predicting and managing cardiac complications during pregnancy, the long-term cardiovascular outcomes in women with heart disease remain insufficiently studied. Understanding these late outcomes is crucial, as women may face ongoing cardiovascular deterioration postpartum, along with increased risks of hypertension or diabetes mellitus, reflecting the link between pregnancy-related complications and subsequent adverse cardiovascular events [10-11]. Cardiac disease continues to be a major contributor to maternal morbidity and mortality [12]. The term 'cardiac disease in pregnancy and postpartum' (CDPP) encompasses a heterogeneous spectrum of acquired, congenital, and genetic disorders, including structural heart and aortic abnormalities, cardiomyopathies, rhythm disturbances, ischemic heart disease, and arterial dissections. These conditions may pre-exist or be diagnosed during pregnancy or in the postpartum period. Importantly, both mortality and morbidity studies often exclude women diagnosed in late or very late postpartum periods, those managed outside formal hospital settings, and individuals with milder, unrecognized symptoms, thereby limiting the understanding of the full spectrum of disease [13].

Several maternal and obstetric factors—such as disease severity, timing of onset, and gestational age at delivery—significantly influence perinatal morbidity and mortality in women with heart disease [14]. Evidence from the Registry on Heart Disease and Pregnancy (ROPAC) indicates that elective cesarean delivery offers minimal benefit to mothers with heart disease and is often associated with earlier delivery [15]. Consequently, current recommendations favor vaginal delivery unless obstetric conditions dictate otherwise. Evaluating maternal characteristics, including age, parity, gestational age at delivery, and mode of delivery, is therefore essential for stratifying risk and guiding management in this high-risk population.

Current prevalence and mortality estimates, as well as assessments of morbidity, likely underestimate the true burden of disease [16-17]. Variability in definitions, diagnostic criteria, and monitoring practices further complicates accurate morbidity assessment. Newly identified conditions may not have been captured in prior studies, and adequate diagnosis may require specialized imaging and expertise not universally available. There is a notable deficiency in comprehensive data regarding the lived experiences of women with CDPP, and few studies have explored its impact on daily activities, mental health, quality of life, interpersonal relationships, economic consequences, or the long-term risk of worsening cardiac health and premature death. These gaps highlight the pressing need for population-specific research, particularly in low- and middle-income countries such as Bangladesh, where data on postpartum cardiac outcomes in women with pre-existing heart disease remain scarce.

Given the high prevalence of maternal heart disease and its associated morbidity and mortality, understanding factors that influence outcomes is critical. While considerable research has focused on cardiac complications during pregnancy, evidence regarding postpartum cardiac events remains limited, particularly in low- and middle-income countries such as Bangladesh. Additionally, the impact of obstetric characteristics—including maternal age, parity, gestational age at delivery, and mode of delivery—on postpartum cardiac outcomes has not been fully elucidated in this population. Addressing these knowledge gaps is essential for improving risk stratification, guiding management, and ultimately reducing maternal morbidity in women with pre-existing heart disease. The purpose of the study is to evaluate obstetric characteristics and the incidence of postpartum cardiac events in women with pre-existing heart disease.

OBJECTIVE

- To evaluate obstetric characteristics and the incidence of postpartum cardiac events in women with pre-existing heart disease.

METHODOLOGY & MATERIALS

This hospital-based cohort study was conducted at the Department of Obstetrics and Gynaecology, Fetomaternal Medicine Unit, Dhaka Medical College Hospital (DMCH), the Department of Fetomaternal Medicine, Bangabandhu Sheikh Mujib Medical University (BSMMU), and the Department of Cardiology, National Institute of Cardiovascular Disease (NICVD), Dhaka, Bangladesh, between February 2020 and March 2021. A total of 73 postpartum women with pre-existing heart disease were included, selected based on predefined inclusion and exclusion criteria. The study aimed to evaluate obstetric characteristics and the incidence of postpartum cardiac events among women with pre-existing heart disease.

Inclusion Criteria

- Women in the postpartum period (up to 5 months after delivery) with pre-existing heart disease during pregnancy.

Exclusion Criteria

- Postpartum women with heart disease complicated by:
- Anemia in pregnancy
- Hypertensive disorders of pregnancy
- Gestational diabetes mellitus (GDM)
- Bronchial asthma
- Renal disease
- Women following abortion
- Women after medical termination of pregnancy
- Maternal death

Eligible postpartum women were initially assessed by attending physicians and subsequently evaluated by the principal investigator. Demographic and obstetric information, including maternal age, parity, gestational age at delivery, and mode of delivery, as well as cardiac characteristics such as type of heart disease, preconceptional counseling status, and NYHA functional class, were collected through structured questionnaires and review of medical records. Patients were followed from hospitalization until five months postpartum. Women without complications were monitored monthly via telecommunication, whereas those with complications were followed until resolution and subsequently monitored monthly either through clinic visits or telecommunication. Maternal cardiovascular outcomes recorded included cardiac events such as heart failure, postpartum cardiomyopathy, cardiac arrhythmia, and pulmonary edema.

Data were analyzed using SPSS version 26, with categorical variables presented as frequencies and percentages. Comparisons between groups were performed using Chi-square (χ^2) tests, and a p-value <0.05 was considered statistically significant. Ethical approval was obtained from the Ethical Review Committees of Dhaka Medical College, BSMMU, and NICVD, and written informed consent was obtained from all participants. Confidentiality was strictly maintained, and participation involved only non-invasive procedures in accordance with the Declaration of Helsinki.

RESULTS

Table 1: Baseline Obstetric Characteristics of Women with Pre-Existing Heart Disease (N = 73)

Characteristic	Category	n (%)
Age (years)	18–30	49 (67.1)
	>30	24 (32.9)
Parity	Primi	16 (21.9)
	Multi	57 (78.1)
Time of Delivery (weeks)	≤36	6 (8.2)
	37–39	61 (83.6)
	≥40	6 (8.2)
Mode of Delivery	Vaginal	18 (24.7)
	LUCS	55 (75.3)

The majority of women were aged 18–30 years (49 patients, 67.1%), while 24 patients (32.9%) were older than 30 years. Multiparous women predominated (57 patients, 78.1%) compared to primiparous women (16 patients, 21.9%). Most deliveries occurred between 37–39 weeks of gestation (61 patients, 83.6%), while 6 women delivered at ≤36 weeks and another 6 at ≥40 weeks (8.2% each). Regarding mode of delivery, 55 patients (75.3%) underwent lower uterine cesarean section (LUCS), and 18 women (24.7%) had vaginal deliveries.

Table 2: Cardiovascular Disease Profile of Women with Pre-Existing Heart Disease (N = 73)

Category	Cardiovascular Disease	n (%)
Rheumatic (Valvular) Heart-Disease	Isolated Mitral Stenosis	23 (31.5)
	Combined Mitral Stenosis and Mitral Regurgitation	11 (15.1)
	Mitral Stenosis with Aortic Valve Disease	7 (9.6)
	Subtotal	41 (56.2)
Congenital Heart Disease	Atrial Septal Defect	13 (17.8)
	Ventricular Septal Defect	5 (6.8)
	Patent Ductus Arteriosus	2 (2.7)
	Subtotal	20 (27.4)
Dilated Cardiomyopathy		12 (16.4)
Total		**73 (100)**

Rheumatic valvular heart disease was the most common cardiac condition, affecting 41 women (56.2%). Within this group, isolated mitral stenosis was seen in 23 patients (31.5%), combined mitral stenosis with mitral regurgitation in 11 (15.1%), and mitral stenosis with aortic valve disease in 7 (9.6%). Congenital heart disease was identified in 20 patients (27.4%), with atrial septal defect predominating (13 patients, 17.8%). Dilated cardiomyopathy was present in 12 patients (16.4%).

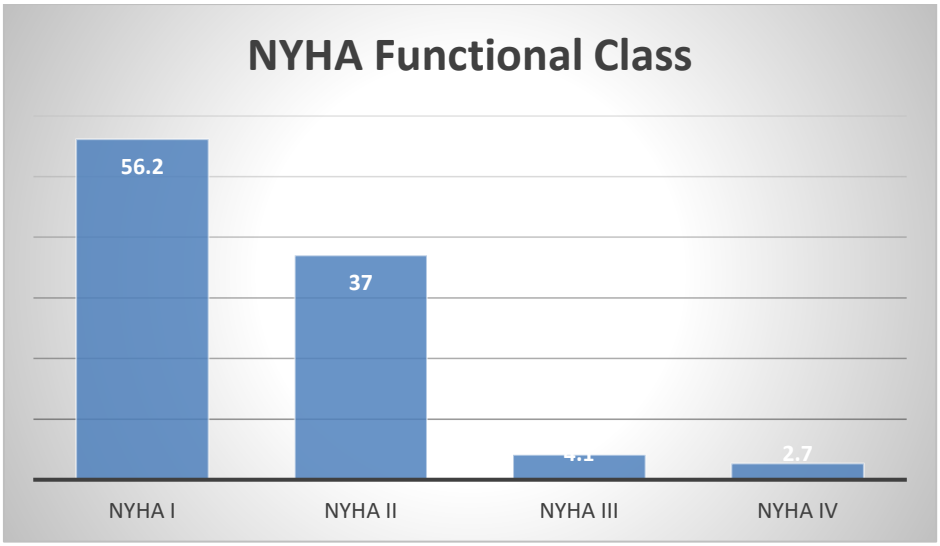

Figure 1: NYHA Functional Class Distribution Among Women with Pre-Existing Heart Disease (N = 73)

Most women were classified as NYHA I (41 patients, 56.2%) or NYHA II (27 patients, 37.0%), indicating mild functional limitation. Only 3 women (4.1%) were classified as NYHA III, and 2 women (2.7%) were NYHA IV.

Table 3: Post-Partum Cardiac Events Among Women with Pre-Existing Heart Disease Stratified by Awareness Status (N = 73)

Outcome	Group I (Known) (n=39)	Group II (Incidental) (n=34)	Total (N=73)	p-value
Overall outcome				**0.01**
Any cardiac event	12 (30.8)	21 (61.8)	33 (45.2)	
No cardiac event	27 (69.2)	13 (38.2)	40 (54.8)	
Type of event	(n=12)	(n=21)	(n=33)	0.07
Pulmonary edema	4 (33.3)	8 (38.1)	12 (36.4)	
Cardiac arrhythmia	3 (25.0)	6 (28.6)	9 (27.3)	
Heart failure	3 (25.0)	6 (28.6)	9 (27.3)	
Postpartum cardiomyopathy	2 (16.7)	1 (4.8)	3 (9.1)	

Percentages for type of event are based on the number of women within each group who experienced a cardiac event (Group I: n = 12; Group II: n = 21).

Overall, 33 patients (45.2%) experienced a post-partum cardiac event, with a significantly higher proportion in women with incidental diagnosis of heart disease (Group II, 21 patients, 61.8%) compared to women with known heart disease (Group I, 12 patients, 30.8%; p = 0.01). Pulmonary edema was the most frequent type of event (12 patients, 36.4%), followed by cardiac arrhythmia and heart failure (9 patients each, 27.3%), and postpartum cardiomyopathy (3 patients, 9.1%).

Table 4: Obstetric Factors Associated with Post-Partum Cardiac Events Stratified by Awareness Status (N = 73)

Characteristic	Group I (Known Heart Disease)		Group II (Incidentally Diagnosed)		p-value
	Total (n)	Cardiac Event n (%)	Total (n)	Cardiac Event n (%)	
Overall	39	12 (30.8)	34	21 (61.8)	0.01
Parity					
Primiparous	10	3 (30.0)	6	2 (33.3)	1.00
Multiparous	29	9 (31.0)	28	19 (67.9)	0.01
Time of delivery					
≤36 weeks	3	3 (100)	3	2 (66.7)	1.00
37–39 weeks	35	8 (22.9)	26	14 (53.8)	0.02
≥40 weeks	1	1 (100)	5	5 (100)	N/A
Mode of delivery					
Vaginal delivery	4	0 (0)	14	10 (71.4)	0.04
LUCS	35	12 (34.3)	20	11 (55.0)	0.13

N/A = Not applicable, as cardiac event could not be computed because the event became constant in this category

Multiparous women who were not aware of their heart disease had a higher risk of post-partum cardiac events (19/28, 67.9%) compared to multiparous women with known heart disease (9/29, 31.0%; p = 0.01). Delivery at 37–39 weeks was associated with significantly fewer events in women with known heart disease (8/35, 22.9%) compared to those with incidental diagnosis (14/26, 53.8%; p = 0.02). Vaginal delivery was associated with more post-partum cardiac events in women with incidental diagnosis (10/14, 71.4%) versus those with known heart disease (0/4, 0%; p = 0.04). No significant association was observed for deliveries at ≤36 or ≥40 weeks or for LUCS (p > 0.05).

DISCUSSION

In this hospital-based cohort study conducted at Dhaka Medical College Hospital, Bangabandhu Sheikh Mujib Medical University, and the National Institute of Cardiovascular Disease, a substantial proportion of postpartum women with pre-existing heart disease experienced cardiac events. Most participants were multiparous and aged 18–30 years, with the majority delivering between 37–39 weeks and undergoing lower uterine cesarean section. Rheumatic valvular heart disease was the predominant cardiac condition, and most women were classified as NYHA I or II. Women with an incidental diagnosis of heart disease had a significantly higher incidence of postpartum cardiac events compared to those with a known diagnosis, with multiparity, vaginal delivery, and delivery at 37–39 weeks associated with increased risk, emphasizing the role of obstetric characteristics in influencing maternal cardiovascular outcomes.

In the present study, most women with pre-existing heart disease were aged 18–30 years (67.1%), with a smaller proportion over 30 years (32.9%), and multiparous women predominated (78.1%) compared to primiparous women (21.9%). The majority of deliveries occurred at term (37–39 weeks, 83.6%), while preterm (≤36 weeks) and post-term (≥40 weeks) deliveries were less frequent (8.2% each). Lower uterine cesarean section (LUCS) was performed in 75.3% of cases, whereas vaginal delivery accounted for 24.7%. These observations are consistent with Richardson *et al*. [18], who reported that women with cardiovascular disease in pregnancy are typically younger and include a substantial proportion of multigravida patients, with term deliveries predominating. Similarly, Aracil *et al*. [19] found higher cesarean section rates among women with cardiac disease, paralleling the elevated LUCS rate in our cohort. Overall, these findings reinforce the pattern that younger, multiparous women with pre-existing heart disease often deliver at term and frequently require operative intervention.

The cardiovascular profile of our cohort was dominated by rheumatic valvular heart disease (41 women, 56.2%), with isolated mitral stenosis being most common (23 patients, 31.5%), followed by combined mitral stenosis and regurgitation and mitral stenosis with aortic valve involvement. Congenital heart disease was observed in 20 patients (27.4%), predominantly atrial septal defect (13 patients, 17.8%), followed by ventricular septal defect and patent ductus arteriosus, while dilated cardiomyopathy was present in 12 patients (16.4%). These findings align with Kulsum *et al*. [20], who reported rheumatic disease in 70% of pregnant women with pre-existing cardiac conditions, and Farhan *et al*. [21], who described valvular disease as the most frequent diagnosis, followed by congenital heart disease and cardiomyopathy. Collectively, these studies indicate that rheumatic and congenital heart diseases remain the leading pre-existing cardiac conditions in pregnancy, with cardiomyopathy representing a smaller but clinically relevant subgroup.

Regarding functional status, most women were classified as NYHA class I (56.2%) or II (37.0%), indicating no or mild limitation of physical activity, whereas only 4.1% and 2.7% were in classes III and IV, respectively. This distribution mirrors previous studies: Madazli *et al*. [22] reported 55.6% and 36.1% in NYHA I–II among 144 pregnancies, while Liu *et al*. [23] found 83.3% of 207 women in classes I–II. These findings suggest that most women with pre-existing heart disease who reach pregnancy have relatively preserved functional status, with a small but clinically significant subgroup at higher risk.

Post-partum cardiac events occurred in 33 women (45.2%), with higher rates among women with incidentally diagnosed disease (61.8%) compared to those with known disease (30.8%). Pulmonary edema was the most frequent complication (36.4%), followed by arrhythmias and heart failure (27.3% each), and postpartum cardiomyopathy (9.1%). These results are consistent with Poli *et al*. [24], Lima *et al*. [25], and Gelson *et al*. [26], who reported similar trends in postpartum cardiac complications and highlighted pulmonary edema as a common adverse event. Together, these studies underscore the substantial risk of postpartum cardiac events in women with pre-existing heart disease and the importance of close monitoring during the peripartum period.

Analysis of obstetric risk factors revealed that multiparous women with incidental diagnosis had higher event rates (67.9%) than their known-disease counterparts (31.0%; p = 0.01), whereas primiparous women showed no significant difference. Deliveries at 37–39 weeks were associated with fewer events in known-disease women (22.9%) versus incidental cases (53.8%; p = 0.02). Vaginal delivery carried higher risk in incidentally diagnosed women (71.4%) compared to none in the known group (p = 0.04), whereas LUCS showed no significant association. These findings echo Silversides *et al*. [27], who identified parity and obstetric factors as predictors of maternal cardiac complications, and Furenäs *et al*. [28], who demonstrated similar

influences of obstetric history on postpartum cardiac risk, emphasizing the importance of early diagnosis and tailored peripartum management.

Limitations of the study

The study had a few limitations:

- Limited time and resources constrained the study scope.
- A larger sample size could have enabled analysis of cardiac events by heart disease type and the effect of pre-conception counseling.
- COVID-19 impacted hospital admissions, reducing patient enrollment.
- Conducted in only three centers, findings may not be generalizable nationwide.

CONCLUSION

Women with pre-existing heart disease face increased maternal risk during pregnancy and the postpartum period, with obstetric management often influenced by underlying cardiac conditions. In this cohort, rheumatic valvular disease was the most common cardiac disorder, followed by congenital heart disease and cardiomyopathy, and most women had preserved functional status (NYHA I–II). Postpartum cardiac events were frequent, particularly among those with incidentally diagnosed heart disease, multiparity, deliveries at 37–39 weeks, and vaginal births. These findings underscore the importance of early diagnosis, vigilant monitoring, and tailored peripartum care to mitigate maternal cardiac complications.

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