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Original Article

Obstetrics and Gynaecology Section

Foetomaternal Outcomes in Pregnant Women with Corrected vs Non Corrected Heart Disease: A Cross-sectional Analysis at a Tertiary Care Institute of Eastern India

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ABSTRACT

Introduction: Cardiac disease in pregnancy remains a major concern, particularly in developing countries like India. Pregnancy in women with heart disease increases the risk of maternal and foetal complications. Approximately 1% to 4% of pregnant women have concomitant cardiac disease.

Aim: To examine the foetomaternal outcomes of pregnant women in the corrected vs. non corrected heart disease groups.

Materials and Methods: This was a cross-sectional study conducted in the Department of Obstetrics and Gynaecology at IPGME&R, Kolkata, West Bengal, India, from February 2020 to July 2021. A total of 50 pregnant women were included in the present study, with 25 in the corrected heart disease group and 25 in the non corrected heart disease group. Foetomaternal outcomes, including intrapartum complications, maternal intensive care unit admission, mode of delivery, and foetal complications, were observed. Comparative analyses were conducted using the Student's t-test and Chi-square test. The p-values <0.05 was considered statistically significant.

Results: Data from the present study showed that out of a total of 50 pregnant women with heart disease, the majority (60%) were young (≤25 years). Approximately 48% of women were in their second pregnancy. The most common cardiac lesion in the corrected group was closure of Atrial Septal Defect (ASD) in 8 (16%) cases, while in the non corrected group, the most common was mitral regurgitation in 11 (22%) cases. In the corrected heart disease group, 15 (30%) had a caesarean section and 10 (20%) delivered vaginally, whereas in the non corrected group, 17 (34%) had a caesarean section and 8 (16%) delivered vaginally. Adverse cardiac events occurred in 2 (4%) of the corrected group, whereas 11 (22%) were observed in the non corrected group (p-value=0.0088, significant). Preterm birth and low birth weight babies were more common in the non corrected heart disease group (p-value=0.0449, significant).

Conclusion: The study concludes that most women with cardiac disease are young. Compared to the Corrected Group of Heart Disease (CGHD), the non corrected group of pregnant women are more likely to experience severe cardiac complications and require admission to the intensive care unit. The foetomaternal outcome is better in the corrected group. Successful management of pregnant women with heart disease requires a comprehensive multidisciplinary approach to optimise foetomaternal outcomes.

Keywords: Atrial septal defect, Congenital heart disease, Lower segment caesarean section, Ventricular septal defect

INTRODUCTION

Cardiac disease in pregnancy remains a major concern, particularly in developing countries such as India. Rheumatic Heart Disease (RHD) stands as the primary cause of cardiac disease in our country. Advances in diagnosis and improvements in cardiac surgery for congenital heart disease have significantly altered the prognosis of congenital heart disease, especially in complex cases. As a result, more women with heart disease are surviving into adulthood, getting married, and are likely to experience pregnancy complications [1].

The estimated prevalence of RHD is around 0.9 cases per 1000 children in the age group of 5-14 years, amounting to approximately 2.18 lakh cases of RHD in India. RHD leads to a spectrum of cardiac lesions characterised by permanent and progressive heart valve damage [2]. In a population study in north-central India, the prevalence of Congenital Heart Diseases (CHDs) in adults was 2.4 per 1000 individuals, with ASD being the most frequent defect at 44.5% [3].

While direct causes contributing to obstetrical mortality are decreasing globally, indirect causes such as heart disease remain a leading cause of maternal mortality, not only in high-income countries but also in Low-middle-income Countries (LMIC) like India. Pregnancy in women with heart disease heightens the risk of maternal and foetal complications. Approximately 1-4% of pregnant women have concomitant cardiac disease [4]. This population of pregnant women with heart disease represents a unique group of patients with an elevated risk for adverse outcomes. The significant haemodynamic changes during pregnancy can mimic the symptoms of congestive heart failure. Furthermore, many patients with heart disease are first identified during pregnancy evaluations, often in the late trimester, posing a further challenge for treating physicians. Consequently, there is a need for a dedicated cardiac care team or cardiac care registry for pregnant women throughout the country. Hence, this has motivated the authors to study the pregnancy outcomes of cardiac disease in a small subset of the population attending tertiary care hospitals. The study results can guide further avenues for future research. There are very few available studies, such as the one by Yadav V et al., which compared a small number of women for foetomaternal outcomes between corrected and non corrected heart disease in the Indian population [1]. They suggested that all pregnant women with congenital cardiac disease should seek cardiac consultation before conception, and those with complex lesions should undergo correction before attempting pregnancy.

MATERIALS AND METHODS

The present cross-sectional study was conducted in the Department of Obstetrics and Gynaecology, in association with the Department of Cardiology and the Department of Anaesthesiology at IPGME&R,

Kolkata, West Bengal, India from February 2020 to July 2021. The study was conducted after obtaining approval from the Institutional Ethics Committee (Memo no: IPGME&R/IEC/2020/122 dated 12/02/2020). A total of 50 pregnant women with a CGHD and 25 pregnant women without CGHD (NCGHD) were included in the study.

Sample size calculation: A pragmatic sample of 50 women was taken for the above study.

Inclusion criteria: Pregnant women with corrected (correction done before conception) and uncorrected heart disease of more than 28 weeks of gestation, diagnosed at the time of booking for delivery were included in the study.

Exclusion criteria: Pregnant women with cardiac disease requiring immediate cardiac surgical intervention, those with gestational diabetes mellitus, ischaemic heart disease, and women not willing to participate in the present study were excluded.

Study Procedure

Antenatal mothers with heart disease, both corrected and uncorrected, admitted at IPGMER were assessed for eligibility for the study based on inclusion and exclusion criteria. Pregnant women with cardiac disease were interviewed, and demographics such as age, parity, types of heart disease, mode of delivery, intrapartum complications, intensive care unit admission, and neonatal outcomes including mean period of gestation, birth weight, and Appearance, Pulse, Grimace, Activity and Respiration (APGAR) score were measured. Clinical examinations, laboratory tests, ultrasonography, and cardiology evaluations were performed. Foetomaternal outcomes, i.e., intrapartum complications, maternal Intensive Care Unit (ICU) admission, mode of delivery, and foetal complications, were assessed.

STATISTICAL ANALYSIS

The data was analysed using Statistical Package for Social Sciences (SPSS) (version 27.0; SPSS Inc., Chicago, IL, USA) and GraphPad Prism version 5. Descriptive statistics for continuous data were reported as mean±standard deviation and compared using Student's t-test. The confidence interval was 95%. Categorical data were presented as numbers and percentages and compared using a Chi-square test. p-values <0.05 were considered statistically significant.

RESULTS

Most of the patients in the corrected and non corrected heart disease groups belong to the ≤25 years age group (28% and 32%, respectively). The majority of heart disease patients were bearing a second child in CGHD and NCGHD (48%) [Table/Fig-1].

Variables	Corrected heart disease	Non corrected heart disease	Total
Age			
≤25	14 (28%)	16 (32%)	30 (60%)
26-30	07 (14%)	08 (16%)	15 (30%)
31-35	04 (8%)	01 (2%)	05 (10%)
Total	25 (50%)	25 (50%)	50 (100%)
Parity			
Primigravida	10 (20%)	10 (20%)	20 (40%)
2nd Gravida	11 (22%)	13 (26%)	24 (48%)
3rd Gravida	4 (8%)	2 (4%)	6 (12%)
Total	25 (50%)	25 (50%)	50 (100%)

[Table/Fig-1]: Demographic profile of the study group (N=50).

The most common heart disease in the corrected group was ASD closure (16%), and the most common in the non corrected variety was mitral valve regurgitation (22%) [Table/Fig-2].

Although the majority of the patients (64%) underwent caesarean section in both corrected and non corrected groups, heart disease itself was not an indication for caesarean section [Table/Fig-3a].

Heart disease	Corrected heart disease (n=25)	Non corrected heart disease (n=25)	Total
ASD closure	8 (16%)	0	8 (16%)
Atrial Septal Defect (ASD)	0	6 (12%)	6 (12%)
Eisenmenger syndrome	0	1 (2%)	1 (2%)
Mitral valve replacement	7 (14%)	0	7 (14%)
Mitral valve regurgitation	0	11 (22%)	11 (22%)
Mitral valve stenosis	0	5 (10%)	5 (10%)
Percutaneous balloon mitral valvuloplasty	4 (8%)	0	4 (8%)
Ventricular septal defect	0	2 (4%)	2 (4%)
VSD closure	6 (12%)	0	6 (12%)
Total	25 (50%)	25 (50%)	50 (100%)

[Table/Fig-2]: Frequency of heart disease in corrected and non corrected groups (N=50).

Mode of delivery	LSCS	Vaginal delivery	Total
Corrected heart disease	15 (30%)	10 (20%)	25 (50%)
Non corrected heart disease	17 (34%)	8 (16%)	25 (50%)
Total	32 (64%)	18 (36%)	50 (100%)

[Table/Fig-3a]: Mode of delivery (N=50).
p-value: 0.5563, Odds ratio: 0.7059, (95% CI, 0.2212-2.2525). Chi-square test was used

[Table/Fig-3b] which shows most of the indications for Caesarean section in both CGHD and NCGHD were performed due to post-caesarean pregnancy, i.e., 40.6%. One patient in NCGHD had Eisenmenger syndrome and underwent preterm caesarean section.

Indications	CGHD	NCGHD	Total
Postcaesarean pregnancy	7	6	13 (40.6%)
Premature rupture of membrane with non progress of labour	3	4	7 (21.8%)
Meconium-stained liquor/foetal distress	3	4	7 (21.8%)
Malpresentation/malposition	2	2	4 (12.5%)
Maternal indication (Eisenmenger syndrome)	0	1	1 (3.1%)
Total	15	17	32 (100%)

[Table/Fig-3b]: Indication for caesarean section (total caesarean section, n=32).

Analysis of maternal adverse cardiac events revealed that 2 (4%) in the CGHD had experienced adverse cardiac events compared to 11 (22%) in the NCGHD. The odds ratio was 0.1107 with a 95% confidence interval of 0.0213 to 0.5743. The z-statistic was 2.620, and the p-value was 0.0088 (significant). One pregnant woman with Eisenmenger syndrome in NCGHD died due to cardiac arrest at 33 weeks of gestation [Table/Fig-4].

Intrapartum complication	CGHD	NCGHD	Total
Arrhythmia	0	2 (4%)	2 (4%)
Cardiac arrest	1 (2%)	6 (12%)	7 (14%)
Cardiac failure	1 (2%)	1 (2%)	2 (4%)
Paroxysmal Supraventricular Tachycardia (PSVT)	0	1 (2%)	1 (2%)
Pulmonary oedema	0	1 (2%)	1 (2%)
Minor symptoms including vomiting	2 (4%)	2 (4%)	4 (8%)
No complication	21 (42%)	12 (24%)	33 (66%)
Total	25 (50%)	25 (50%)	50 (100%)

[Table/Fig-4]: Association between intrapartum complication.
Chi-square test was used

This finding [Table/Fig-5] depicts that the majority of ICU admissions took place in the NCGHD (40%) compared to the CGHD (12%), which is statistically significant with a p-value of 0.0317, odds ratio of 0.2045, and a 95% confidence interval of 0.0481 to 0.8699. The Chi-square test was used.

Intensive therapy unit admission	CGHD	NCGHD	p-value
Yes	3 (12%)	10 (40%)	0. 0317
No	22 (88%)	15 (60%)	
Total	25 (100%)	25 (100%)	

[Table/Fig-5]: Intensive therapy unit admission status between study groups (N=50). Chi-square test was used

Foetal/Neonatal outcome [Table/Fig-6] shows that parameters like low birth weight are significantly lower in the CGHD (p-value=0.0449), and the one-minute APGAR score is significant (p-value=0.0447) in the CGHD compared to the NCGHD.

Variables	CGHD (25)	NCGHD (25)	p-value	Odds ratio	95% Confidence interval
Period of gestation (Mean) (weeks)	37.56±2.92	36.16±3.55	0.1344*		
Birth weight (mean) (kg)	2.89±0.23	2.64±0.47	0.0209*		0.4604-0.0396
Meconium-stained liquor	3	3	1		
Stillbirth	0	1	0.4921	0.3203	0.0124-8.2460
Preterm birth (<37 wk)	7	12	0.1489	0.4213	0.1303-1.3626
Low birth weight (<2.5 kg)	1	7	0.0449 (significant)	0.1071	0.0121-0.9503
Apgar score					
1 min	7.52±1.36	6.56±1.89	0.0447* (significant)		
5 min	8.2±1.74	8.32±1.28	0.7824*		

[Table/Fig-6]: Foetal/neonatal outcome and complications (N=50). *student t-test was used

DISCUSSION

Pregnancy with heart disease is a high-risk condition. In a developing country like India, there is an emerging necessity for prepregnancy counselling, understanding its related complications, and the need for a multidisciplinary approach. The task force for the management of cardiovascular disease during pregnancy by the European Society of Cardiology in 2018 also suggested that all women with known cardiac disease who want to conceive should undergo pre-pregnancy counseling, considering not only their medical condition but also their emotional, cultural, psychological, and ethical issues [5].

Analysis of the demographic profile shows that out of a total of 50 women in the present study, the majority were ≤25 years (60%), and primigravida comprised 40%. Other authors found similar findings, with cases ranging from 60-94% being young (<30 years) and a varied range (20-70%) of primigravida in their respective studies [6-10]. A retrospective study performed at the National Hospital of Obstetrics and Gynaecology (Hanoi, Vietnam) found that the majority of women having a pregnancy with heart disease were <35 years (86.97%), with a mean age of 28.18±5.05 years, and most of them were primigravida (47.54%), followed by second gravida (42.61%) [11]. Owens A et al., also observed the mean age in their study population to be 29.3±6.3 [12].

Similar studies showing types of heart disease groups in corrected and non corrected heart disease during pregnancy are not available. However, existing studies by Salam S et al., and Anupama Suresh Y et al., observed a high prevalence of RHD in India. Among the RHD group, involvement of the mitral valve in the form of either mitral stenosis or mitral regurgitation is more common, as described in their study [7,13].

In the present study, heart disease itself is not an indication for caesarean section. Since the present study was undertaken in a tertiary care centre dealing with referral cases, a higher rate of caesarean section was observed, with the majority being due to obstetrical indications. Contrary to the present study, Konar H and Chaudhuri S, found that the majority delivered vaginally (67%) [14]. A similar observation was made by Salam S et al., and Mohan A et al., where 43% and 55% of patients delivered vaginally [7,8]. Another large population study conducted over a span of 14 years found that out of 2,284,044 women, only 3871 women (0.2%) had heart disease during pregnancy. Among them, 54.9% had vaginal deliveries, and 45.1% had caesarean deliveries [12]. Similar observations were made by Ng AT et al., who observed that 41.8% of patients with cardiac disease delivered vaginally, whereas 58.2% had a caesarean delivery [15].

Considering intrapartum complications in both groups, 2 (4%) individuals had adverse cardiac events in the CGHD group, whereas it was 11 (22%) in the NCGHD group. Authors like Mohan A et al., observed that 17.24% of patients had cardiac failure and 14 (12%) experienced cardiac death [8]. Joshi G et al., noted that 16.7% had cardiac failure, with 4.8% of women dying [9]. Baghel J et al., noted that 14.9% had adverse cardiac outcomes, among whom 69% developed cardiac failure in the antenatal period. The author also observed a 1.8% maternal cardiac mortality rate [16].

In the present study, considering admission to the intensive care unit, out of a total of 50 women with heart disease in pregnancy, 13 required ICU admission (10 women had NCGHD, and three were in the CGHD). A similar observation was made by Mohan A et al., where 20.68% of patients required HDU admission, with an average duration of stay of 7±2 days, mainly due to cardiac causes [8].

On observing perinatal outcomes and complications, Salam S et al., observed 14.44% stillbirths, 24.44% Neonatal Intensive Care Unit (NICU) admissions, and neonatal death in 2.22% of cases. None of the offspring had congenital heart disease, and the majority (72.8%) weighed >2 kg [7]. Another study by Joshi G et al., documented 42 patients with heart disease and found the live birth rate was 90.5%, with the rest being intrauterine deaths. Among live births, 16 (42.1%) babies were preterm (≤ 2 kg), and 5 (13.1%) died in the neonatal period. No baby had congenital heart disease [9]. Mohan A et al., studied perinatal outcomes in terms of LBW, NICU admission, cause of neonatal death, and IUFD and found that 22 (18.9%) babies were premature, 5.1% were IUGR, IUFD in 8.6%, LBW in 17.2%, and extreme prematurity and birth asphyxia leading to neonatal death in 6 (5.1%) cases [8]. A study by Owens A et al., compared heart disease with the no-heart disease group and found that Neonatal Adverse Cardiac Events (NACE) were more common and statistically significant in the heart disease group. They studied variables such as foetal death, prematurity, small for gestational age, IUGR, RDS, intracranial and cerebral ventricular haemorrhage, congenital heart disease, as well as non NACE variables like length of hospital stay and birth weight. They found all variables were more common in the heart disease group compared to the no-heart disease group (p-value is <0.0001, clinically significant) [12].

Women in the reproductive age group and early pregnancy with suspected cardiac symptoms require screening and preconception cardiology evaluation for early detection and correction of cardiac disease. A nationwide registry for cardiac disease in pregnancy should be properly maintained. All pregnant women with cardiac disease should be referred to a dedicated multidisciplinary cardiac care unit, and specific guidelines should be formulated to manage such high-risk pregnancies. Additionally, there is a need for an advanced neonatal support unit equipped to detect in-utero and ex-utero heart disease and handle preterm babies.

Limitation(s)

It is a single-centre study with a limited study population. Analysis of pregnancy outcomes in the early trimesters, such as miscarriages and foetal anomalies, is not available. No long-term follow-up of the cases was conducted.

CONCLUSION(S)

Compared to the CGHD, non corrected groups of pregnant women are more likely to experience severe cardiac complications and require admission to the intensive care therapy unit. The foetomaternal outcome is better in the corrected group. Successful management of a woman with a pregnancy affected by heart disease requires a comprehensive multidisciplinary approach to optimise the foetomaternal outcome.

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