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# Maternal Outcome in Pregnancy with Heart Disease –A Case Control Study

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**ABSTRACT**

**Background:** Cardiac diseases in pregnant women are one of the leading cause of maternal morbidity and mortality. The objective of this study was to find out the maternal outcome in pregnant women with cardiac diseases attending department of Obstetrics & Gynecology, TUTH and Manmohan Cardiothoracic Vascular and Transplant Center (MCTVTC).

**Methods:** This was a hospital based, case control study conducted in Department of Obstetrics & Gynecology, TUTH and Manmohan CTVTC, Maharajgunj, Kathmandu. Pregnant women with preexisting and recently diagnosed heart disease coming to Department of Obstetrics & Gynecology, TUTH and Manmohan CTVTC after fulfilling inclusion and exclusion criteria.Their course in hospital was documented and any complications during the course of pregnancy were noted.

**Results:** There were total of 113 patients of heart disease with pregnancy heart disease with pregnancy, 15 of them were excluded due to other comorbidities. Then 98 cases were analyzed in one year period with 98 controls. The mean age was similar in both cases and controls group 27.1 and 27.2 years respectively. Comparing the outcome, admission to ICU/CCU was 23 times higher in cases than in control 19:1(OR 23.1(3.5-974.5) with p-value of <0.001), heart failure was 10 times higher in cases 10:1 (OR 10.9 (1.5-482.1) with p value of 0.01) as well as length of hospital stay was higher in cases with mean stay was 6.7:2.5 days with p-value of <0.001.

**Conclusion:** The outcome of pregnant women with heart disease was overall good in our study as there was no mortality. With multidisciplinary efforts all the complications were managed well even though women with heart disease had more adverse events as compared to women without heart disease.

**Keywords:** cardiovascular disease; complication; pregnancy.

## INTRODUCTION

Cardiac diseases in pregnancy, including congenital (CHD) and acquired conditions like rheumatic heart disease (RHD), are significant causes of maternal morbidity and mortality. In developing countries like Nepal, RHD remains the leading cause, while CHD is more prevalent in developed nations.[1, 2] Pregnancy exacerbates cardiovascular strain due to physiological changes like increased cardiac output and blood volume, posing risks for complications such as heart failure and arrhythmias.[3] Maternal mortality in Nepal is 7%, with worse outcomes in women unstable before pregnancy.[4] However, those stable or surgically treated prior to pregnancy have better outcomes.[5-7] At Institute of Medicine, Nepal, multidisciplinary care addresses these challenges, making it a referral center for high-risk pregnancies. This study aims to assess the incidence and maternal outcomes of cardiac diseases in pregnancy, emphasizing the need for specialized care in resource-limited settings.

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## METHODS

This hospital-based case-control study was conducted at the Department of Obstetrics & Gynecology and Manmohan Cardiothoracic Vascular and Transplant Center (MCTVTC), Tribhuvan University Teaching Hospital (TUTH), Kathmandu, over one year (15th June 2020–14th May 2021). The study included pregnant women with preexisting or newly diagnosed cardiac diseases who delivered beyond 28 weeks of

$$\text{Sample size (n)} = \frac{r+1}{r}\frac{(P*)(1-P*)(Z_\beta+Z_{\alpha/2})^2}{(P_1-P_2)^2}$$

gestation. A control group of women without cardiac diseases or other high-risk conditions was also included.

Where, $P_1$= 0.161, $P_2$= 0.004, $Z_\beta$ =0.84, $Z_{\alpha/2}$= 1.96, R= 1, P*= 0.084 after taking reference from, owens et al. in 2018.[8] The sample size was as 50 cases and 50 controls, based on a reference study. Inclusion and Exclusion Criteria, Cases: Pregnant women with congenital or acquired cardiac diseases (e.g., CHD, RHD, ischemic heart disease, cardiomyopathies, rhythm disorders) delivering after 28 weeks. Controls: Women without cardiac diseases delivering immediately after a case. Exclusion Criteria: Booked cases delivering outside the study center, postpartum/post-abortion referrals, drug-induced arrhythmias, refusal to participate, comorbidities (e.g., diabetes, hypertension), pregnancies terminated before 28 weeks, and ectopic or molar pregnancies. Study Variables, Key variables included maternal age, gravidity, type of heart disease, complications (e.g., heart failure, arrhythmias, hemorrhage), ICU/CCU/HDU admissions, duration of hospital stay, and mortality. Data Collection, Researchers identified eligible participants daily from maternity wards, labor rooms, and surgical wards. Detailed histories, clinical examinations, and follow-ups were conducted. Complications during pregnancy and maternal outcomes were documented using a structured proforma. Patients were followed until discharge. Data were recorded in a master chart and analyzed using HZR. A 95% confidence interval and a p-value<0.05 were considered statistically significant. This study was approved by the Institutional Review Committee of IOM. Written informed consent was obtained from all participants, and confidentiality was maintained.

## RESULTS

A total of 113 parturients with heart diseases presented to us in one year period, 15 of them had other co-morbidities along with heart disease so we have excluded them and analyzed 98 cases in one year period. In the control arm we also took 98 patients for comparison. Patients who were excluded, had heart disease along with other co-morbidities such as thrombocytopenia-4, pre eclmapsia-6, hypothyroidism-2, gestational diabetes mellitus-2 and thalassemia-1. The mean age of cases was 27.1 years and that of control was 27.2 years. Cases and control were comparable in terms of age. The study compared the gravidity (number of pregnancies) between pregnant women with heart disease (cases) and those without (controls). The distribution was as follows: Primigravida (First Pregnancy): Cases: 41(41.8%), Controls: 44(44.8%), Second Gravida (Second Pregnancy):Cases: 33(33.7%),Controls: 28(28.6%), Third Gravida (Third Pregnancy):Cases: 14(14.3%), Controls: 19(19.4%), Fourth Gravida (Fourth Pregnancy): Cases: 5(5.1%), Controls: 4(4.1%), Grand Multigravida (Five or More Pregnancies):Cases: 5(5.1%), Controls: 3(3.1%),Both groups were comparable in terms of gravidity, with no statistically significant difference (p-value=0.8). The majority of participants in both groups were primigravida, indicating that first-time pregnancies

**Table 1. Maternal outcomes.**

| Maternal Outcomes | Case n(%) | Control n(%) | Fisher's p-value |
|---|---|---|---|
| No adverse event | 61 (62.2) | 94 (95.9) | <0.001 |
| ICU/CCU stay | 19 (19.4) | 1 (1.0) | |
| Heart Failure | 10 (10.2) | 1 (1.0) | |
| PPH | 3 (3.1) | 2 (2.0) | |
| Ionotropes | 2 (2.0) | 0 (0.0) | |
| PSVT | 1(1.0) | 0 (0.0) | |
| LAMA | 2 (2.0) | 0 (0.0) | |
| **Total** | **98 (100)** | **98 (100)** | |

were the most common among both cases and controls.

In majority of cases 61(62.2 %) the maternal outcome was uneventful. There was no maternal mortality but 2 patients went on LAMA and lost to follow up. Thus their status is unknown. There was adverse events in 37(37.8%) of cardiac cases during pregnancy while only 4 (4.1%) of control had some complications. The rates of adverse event was higher in the cases than control (p-value< 0.001).

Nineteen cases (19.4%) as compared to one (1%) control needed ICU/CCU admission (Odds Ratio

**Table 2. ICU/CCU admission in case and control.**

| Variables | Yes n(%) | No n(%) | p-value | Odds Ratio (95% CI) |
|---|---|---|---|---|
| Case | 19(95.0) | 79(44.9) | <0.001 | 23.1 (3.5-974.5) |
| Control | 1(5.0) | 97(55.1) | | |
| Total | 20(100.0) | 176(100.0) | | |

23.1, 95% CI 3.5-974.5) with 23.1 times higher odds of patients with heart disease being admitted to ICU/CCU than patients without heart diseases.

Only one (1%) control had heart failure while ten cases(10.2%) had heart failure (Odds Ratio of 10.9

**Table 3. Heart failure in case and control.**

| Variables | Yes n(%) | No n(%) | p-value | Odds Ratio (95% CI) |
|---|---|---|---|---|
| Case | 10(90.9) | 88(47.6) | 0.01 | 10.9 (1.5-482.1) |
| Control | 1(9.1) | 97(52.4) | | |
| Total | 11(100.0) | 185(100.0) | | |

(95% CI: 1.5-482.1)) This showed that cases with heart diseases had 10.9 times higher risk of cardiac failure during pregnancy or postpartum as compared to patients without heart disease.

Three (3.1%) of the cases and two (2%) controls had PPH but the difference was not statistically significant.

**Table 4. PPH in case and control.**

| Variables | Yes n(%) | No n(%) | p-value | Odds Ratio (95% CI) |
|---|---|---|---|---|
| Case | 3(90.9) | 95(47.6) | 1 | 1.5 (0.2-18.5) |
| Control | 2(9.1) | 96(52.4) | | |
| Total | 5(100.0) | 191(100.0) | | |

Two (2%) of the cases required ionotropes support but none of controls required ionotropes & difference

**Table 5. Ionotropes use in case and control.**

| Variables | Yes n(%) | No n(%) | p-value | Odds Ratio (95% CI) |
|---|---|---|---|---|
| Case | 2(100.0) | 96(49.5) | 0.5 | Infinity (0.2-Infinity) |
| Control | - | 98(50.5) | | |
| Total | 2(100.0) | 194(100.0) | | |

was not significant statistically.

One (1%) case developed PSVT but none of the control had PSVT and reverted after chemical

**Table 6. PSVT in case and control.**

| Variables | Yes n(%) | No n(%) | p-value | Odds Ratio (95% CI) |
|---|---|---|---|---|
| Case | 1(100.0) | 97(49.7) | 1 | Infinity (0.03-Infinity) |
| Control | - | 98(50.3) | | |
| Total | 1(100.0) | 195(100.0) | | |

cardioversion.

Among all 196 patients, mean length of hospital stay was 4.6 days. In cases, mean length of hospital stay

**Table 7. Length of hospital stay in case and control.**

| Variables | Mean Length of stay | SD | p-value |
|---|---|---|---|
| Case | 6.7 | 3.7 | <0.001 |
| Control | 2.5 | 1.2 | |

was 6.7 days (with SD=3.7). In control group mean length of hospital stay was 2.5 days, (SD=1.2). Heart disease leads to a longer hospital stay in parturient (p-value< 0.001).

Comparing the adverse outcomes among different groups of heart disease, we found that in comparison to congenital heart disease, RHD had 6.4 times and other heart disease 4.8 times higher odds of adverse events during pregnancy and delivery .PPH was also found to be higher in RHD compared to congenital and other types of heart disease but was not statistically significant.

## DISCUSSION

**Table 8. Summarizing different outcome with relation to different types of heart diseases.**

| Variables | OR (95% CI) | p-value |
|---|---|---|
| **Adverse Event** | | |
| Congenital | Ref. | 0.06 (Overall) |
| Rheumatic | 6.4 (1.4-29.9) | 0.02 |
| Other | 4.8 (0.6-37.4) | 0.13 |
| **PPH** | | |
| Congenital | Ref. | 1.00 (Overall) |
| Rheumatic | 3.7e+07 (0-Inf) | 1 |
| Other | 1.0 (0-Inf) | 1 |
| **Heart Failure** | | |
| Congenital | Ref. | 1.00 (Overall) |
| Rheumatic | 5.1e+07 (0-Inf) | 1 |
| Other | 1.0 (0-Inf) | 1 |
| **PSVT** | | |
| Congenital | Ref. | 1.00 (Overall) |
| Rheumatic | 1.0 (0-Inf) | 1 |
| Other | 9.0e+08 (0-Inf) | 1 |

Pregnancy induces significant physiological changes in the cardiovascular system, which can impose an additional burden on women with underlying heart disease. This increased hemodynamic stress raises the risk of morbidity and mortality during pregnancy and delivery.[9,10] To assess maternal outcomes in pregnant women with heart disease, we conducted a comparative analysis of 98 affected women and 98 pregnant women without heart disease at our referral center. The mean age of women with heart disease was 27.1 years, which aligns with findings from previous studies in Nepal and South Asia.[4, 6, 9] Most women (41.8%) were primigravida, although 24.5% had three or more pregnancies, highlighting the need for increased awareness regarding birth control and pregnancy risks among cardiac patients. Similar trends were observed in studies by Chhetri et al. and Paudyal et al., which also found a high prevalence of primigravida cases but included women with multiple pregnancies.

International studies from Kenya and Nigeria reported repeated pregnancies in women with heart disease, suggesting a low level of awareness in their populations as well.[11, 12] These findings emphasize the global need for better reproductive health education for women with cardiovascular conditions. Most women with heart disease (62.2%) had uneventful pregnancies, while 37.8% experienced complications. In contrast, only 4.1% of control group patients had complications. ICU admission rates were significantly higher in women with heart disease (19.4% vs. 1%), and heart failure occurred in 10.2% of cardiac cases compared to 1% of controls. Additionally, 2% of cardiac patients required inotropes, whereas none in the control group did. Similar findings were reported by Lumsden et al., who observed higher cardiac care unit (CCU) admission rates among heart disease patients.[12] Furthermore, 41 women in their study experienced heart failure during pregnancy. However, rates of postpartum hemorrhage (PPH) and paroxysmal supraventricular tachycardia (PSVT) were similar between both groups, a trend also demonstrated by Lumsden et al.

Women with heart disease had a significantly longer hospital stay (6.7 vs. 2.5 days in controls). This can be attributed to increased complication rates and hospital protocols requiring five-day antibiotic prophylaxis for infective endocarditis. Among different cardiac conditions, RHD patients had a 6.4-fold higher risk of complications, while other acquired heart diseases carried a 4.8-fold increased risk compared to CHD patients. This discrepancy can be explained by the fact that most CHD patients had undergone corrective surgeries, enabling them to better tolerate pregnancy-induced cardiovascular changes. In contrast, a study by Dayan et al. reported higher rates of heart failure and arrhythmias in CHD patients, likely due to a greater CHD prevalence in their cohort. [13]

No maternal deaths were recorded in our study, although previous research has reported mortality rates ranging from 1% to 10%.[14, 15] Studies by McFaul et al. and Sawhney et al. documented higher mortality rates among patients with NYHA class III–IV heart

disease.[5, 16] Lumsden et al. reported nine maternal deaths, with an overall 10-fold increase in mortality among cardiac patients.[12] In contrast, Chhetri et al. reported a 4% mortality rate, while Paudyal et al. found no deaths, similar to our findings.[9,10] The absence of mortality in our study may be attributed to timely medical interventions, a multidisciplinary approach, and the exclusion of unstable cases from the study period.

## CONCLUSIONS

Pregnant women with heart disease face significantly higher risks of complications, particularly those with RHD. The findings underscore the importance of early diagnosis, preconception counseling, and specialized multidisciplinary management to optimize maternal and fetal outcomes.

**Conflict of interest:** None

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