

Outcome of Pregnant Patients with Cardiac Diseases Delivered in Tribhuvan University Teaching Hospital

Megha Koirala,¹ Bigen Man Shakya,¹ Bashu Dev Parajuli,¹ Basanta Ghimire,² Neeta Katuwal¹

ABSTRACT

Background: Pregnant women with cardiac disease pose a unique challenge to both the anaesthesiologists and obstetrician because of high morbidity affecting the maternal and fetal outcomes. Our research aims to provide an overview of pregnant women with heart disease coming for delivery in Tribhuvan University Teaching Hospital over one year, the occurrence of adverse maternal and neonatal outcome (mortality and morbidity) and correlation of certain maternal factors associated with adverse outcome.

Methods: This is an observational cross-sectional study conducted in Tribhuvan University Teaching Hospital from 2075/11/01 to 2076/10/30 where data of pregnant women beyond 28 wks period of gestation with diagnosed cardiac disease was recorded from secondary sources.

Results: The prevalence of pregnant women with cardiac disease presenting for delivery over one-year period was found out to be 120 (2.49%). Among them, almost 85 cases (71%) had valvular heart disease and 27 had mitral stenosis. The mortality was 2.5%. The complication rate among such patients was 30%, the patients requiring ICU admission was 20.7% and requiring mechanical ventilation was 6.7%. The neonatal mortality in such patients was 3.2% and 20.5% were premature, 27% had weight <2.5 kgs at birth and 10.7% required NICU admission. There was statistically significant association between history of prior cardiac event and NYHA with adverse maternal event with p value of <0.001.

Conclusions: History of prior cardiac event and higher NYHA grading in a pregnant patient with cardiac disease are major determinants for adverse maternal outcome.

Keywords: Maternal mortality; pregnancy complication.

INTRODUCTION

The prevalence of heart disease during pregnancy is 1-3% of pregnancies.^{1,2} Pregnancy in cardiac patients is associated with significant morbidity (16% of pregnancies).^{3,4} Mortality though rare in such patients is much higher than general obstetric population.⁵ Pregnant women with cardiac disease present a unique challenge to the anaesthesiologists while managing delivery under vaginal or caesarean route. The physiological changes of pregnancy add up more stress in the already compromised heart of a cardiac patient. Rates of fetal intrauterine growth retardation are increased with heart disease due to relative inability in maintaining

adequate utero-placental circulation. So, such patients are at increased risk for adverse maternal and fetal effects.^{6,7} Despite high burden of pregnant patients with cardiac disease in TUTH, there are only few published articles.⁸⁻¹⁰ Our research aims to provide an overview of pregnant women with heart disease coming for delivery in TUTH over one year, the occurrence of adverse maternal and neonatal outcome (mortality and morbidity) and correlation of certain maternal factors associated with adverse outcome.

METHODS

This observational cross-sectional study was conducted

Correspondence: Bigen Man Shakya, Tribhuvan University Teaching Hospital, Maharajgunj, Kathmandu, Nepal. Email: bigensk@yahoo.com, Phone: +9779841227182.

Author Affiliations

¹Tribhuvan University Teaching Hospital, Maharajgunj, Kathmandu, Nepal, ²Grande International Hospital, Dhapasi, Kathmandu, Nepal.

in the delivery room/ operation theatre of TUTH. After getting ethical clearance from Nepal Health Research Council and hospital IRB, the data was collected about the study patients from secondary sources. We included consecutive booked/unbooked pregnant women beyond 28 wks period of gestation with diagnosed cardiac disease presenting to TUTH for delivery either via vaginal route or caesarean section where anaesthesiologists were called from 2075/11/01 to 2076/10/30. Pregnancies with other comorbidities, pregnancy induced hypertension without any structural damage to the heart, delivery/ termination of pregnancy before 28 weeks of pregnancy were excluded.

The data was collected from in-patient medical records, obstetric record book, ICU/CCU record book and anaesthesia record book and crosschecked with multiple records by more than one investigator and enumerator and final cross checking and verification was done by primary investigator to minimize the error in data entry.

Maternal outcome was measured in terms of maternal mortality and morbidity. Maternal mortality was defined as maternal death intraoperatively or postoperatively till the patient was discharged from the hospital. Likewise maternal morbidity was defined in terms of maternal complications (hypotension, hypoxia, arrhythmias, pulmonary edema, congestive cardiac failure), maternal ICU/ CCU stay, requirement of vasopressors, requirement of mechanical ventilation during the delivery period till hospital discharge. The prevalence of heart disease in pregnant women, maternal mortality and morbidity due to cardiac disease in TUTH over one year was calculated. A booked case was defined as the pregnant women having regular ANC (ante natal care) visits. Duration of hospital stay was also recorded which was taken from the time of cesarean section/ vaginal delivery till the day of discharge. Maternal factors such as NYHA, high risk echo, previous cardiac event was correlated with maternal outcome.

Neonatal outcome was determined in terms of neonatal mortality and morbidity. Neonatal mortality was defined as neonatal mortality at and within 1 hour after birth. Neonatal morbidity was defined as adverse neonatal events such as prematurity (<37 weeks), birth weight <2.5 kgs, low APGAR score at 1 and 5 mins and NICU admission and these details were collected from anaesthesia record book. Maternal NYHA was correlated with fetal birth weight.

The collected data was entered in the Excel sheet and transported to SPSS version 16 and descriptive statistics in terms of mean, median and frequency was derived. The association of certain maternal factors with

maternal and neonatal mortality and morbidity was calculated using chi-square test. The fisher exact value was used where the cell value was <5. P value of <0.05 was considered as statistically significant.

RESULTS

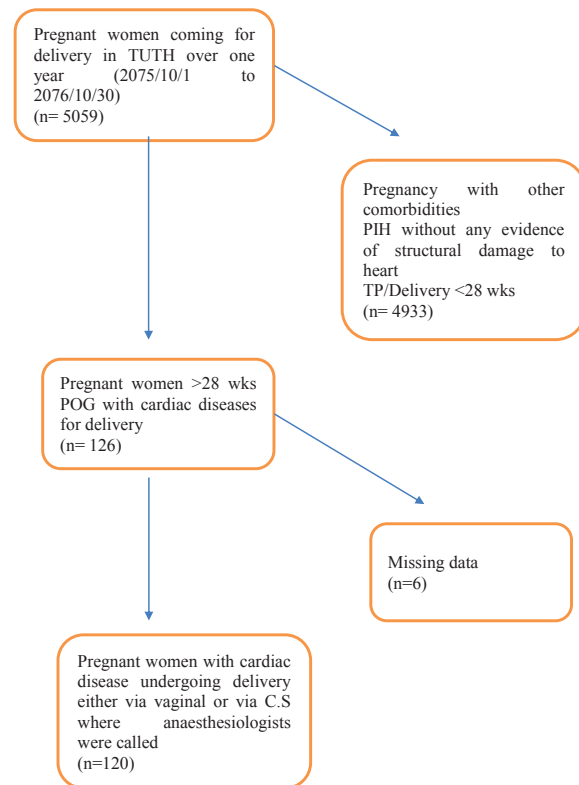


Figure 1. Flowchart of pregnant women with cardiac disease(C.S: Cesarean section; PIH: Pregnancy induced Hypertension; POG: Period of Gestation; TP: Termination of pregnancy; Wks: weeks.

Among 5059 pregnant women delivering in TUTH between 2075/11/1 to 2076/10/30, 126 women presented with cardiac disease beyond 28 weeks of gestation for delivery. Among them, anaesthesiologists were called for delivery via vaginal route or via cesarean section in 120 women and they were enrolled in our study and the remaining 6 were excluded due to missing or incomplete data.

The minimum and the maximum age of those pregnant women was 17 and 40 yrs. respectively.

Valvular heart disease is the most common heart disease with 85 (70.8%) cases. Isolated mitral stenosis was the most common valvular lesion accounting for 27 cases and the second common lesion was mitral regurgitation with 23 cases. Among the congenital heart diseases, the ASD was the most common with seven cases followed by VSD with five cases. Cardiomyopathy accounted in

a total of six cases. PSVT, WPW syndrome and Complete heart block accounted for four, three and two cases each respectively.

The distribution of heart disease according to etiology is given in Table 1.

Table 1. Distribution of Heart disease according to etiology.

Etiology of heart disease	Frequency (n)	Percent
Valvular	85	70.8%
Congenital	20	16.7%
Cardiomyopathy	6	5%
Others	9	7.5%

Ninety-five of the study population (79.2%) were more than 37 weeks period of gestation and only 25(20.8%) were preterm at the time of delivery. In majority of cases (74.2%) cardiac lesion was diagnosed before the conception however, cardiac lesion was diagnosed during pregnancy in 25.8% of cases. Hundred women (83.3%) had their regular antenatal visits to our hospital while 20 (16.7%) were unbooked cases. Out of the unbooked, eight women were referred from other hospitals of Kathmandu and 12 women were referred from outside Kathmandu.

The cardiac characteristics in the patients at the time of delivery is given in Table 2.

Table 2. Cardiac characteristics of the patients.

Specifications	Grade	Frequency (n)	Percent
NYHA Grade	I	99	82.5%
	II	18	15%
	III	2	1.7%
	IV	1	0.8%
Prior cardiac event	Present	35	29.2%
High risk echo	Present	36	30%
High PAP	Present	26	21.7%
Cyanosis	Present	0	0%

Type of anaesthesia/analgesia for different modes of deliveries is given in Table 3.

Table 3. Type of anaesthesia/analgesia provided for different modes of deliveries.

Mode of delivery	Type of Anaesthesia/ Analgesia	Frequency (n)	Percent
Vaginal Deliveries	Normal	29	24.2%
	Epidural	28	23.3%
	Monitored anaesthesia care	1	0.8%
Cesarean Section		91	75.8%
	Spinal	39	32.5%
	Combined spinal Epidural	16	13.3%
	General Anaesthesia	36	30%

Regarding the monitoring done, apart from the basic standard monitoring, arterial line was inserted in 54 women, central venous catheter was inserted in seven women and cardiac output monitoring was done in two women. 66 women had no additional monitoring.

Table 4 shows the frequency and percentage of adverse maternal and neonatal outcome.

Table 4. Adverse maternal and neonatal outcome.

	Adverse Outcome	Specifications	Frequency (n)	Percent
Maternal	Mortality		3	2.5%
	Morbidity	Complications	36	30%
		Requiring ICU bed	26	21.7%
		Requiring post op ward	63	52.5%
	Requiring mechanical ventilation	8	6.7%	
Neonatal	Mortality		4	3.2%
	Morbidity	Prematurity	25	20.5%
		APGAR <7/10 at 1 min	23	18.9%
		APGAR <7/10 at 5 mins	6	4.9%
		Birth weight <2.5 kgs	33	27%
	Requiring NICU admission	13	10.7%	

There was total 3 maternal deaths (2.5%) in the one-year period. Among the three mortalities, two of them had severe MS and the third one had VSD with severe PAH. All three had past history of heart failure, NYHA II at the time of delivery and underwent operative deliveries under general anaesthesia. Two of them got intubated on the second day of surgery after being extubated in the operation theatre after completion of cesarean section whereas the third one remained intubated post-surgery. The mortalities occurred on 5th, 11th and 14th post-operative day. During the intraoperative period, 20 patients (16.7%) required vasopressor bolus dose while 10 patients (8.3%) required infusion of vasopressor.

There was statistically significant association between previous cardiac event and maternal NYHA status with maternal complication. (p value <0.001) The correlation is shown in table 5.

Table 5. Association of maternal factors with maternal and neonatal outcome.

Cardiac Specification	Maternal Complication		P Value	Fetal Birth weight		P value
	Yes	No		<2.5kgs	>2.5kgs	
NYHA Status						
I	21(21.2%)	78(78.8%)		25(75.8%)	76(85.4%)	
II	12(66.7%)	6(33.3%)	<0.001*	7 (21.2%)	11(12.4%)	0.175*
III	2(100%)	0(0%)		0(0%)	2(2.2%)	

Table 5. Association of maternal factors with maternal and neonatal outcome.

Cardiac Specification	Maternal Complication		P Value	Fetal Birth weight		P value
IV	1(100%)	0(0%)		1(3%)	0(0%)	
HighRisk echo						
Present	15(41.7%)	21(58.3%)	0.068**			
Absent	21(25%)	63(75%)				
High PAP						
Present	11(42.3%)	15(57.7%)	0.122**			
Absent	25(26.6%)	69(73.4%)				
Previous Cardiac event						
Present	22(62.9%)	13(37.1%)	<0.001**			
Absent	14(16.5%)	71(83.5%)				

*fisher exact test, **chi square test

DISCUSSION

This observational cross-sectional study included consecutive pregnant women more than 28 wks POG with diagnosed cardiac disease coming to TUTH over one year. The prevalence of pregnant women with cardiac disease presenting for delivery over one-year period was found out to be 2.49%. The most common cardiac lesion in our study was valvular lesion constituting 70.8% indicating the dominance of rheumatic fever in our part⁸⁻¹² in contrast to the western part.^{3,7}

Majority of our patients had good exercise tolerance and only 3 of the women had either NYHA III or IV. In Koirala et al¹⁰, 20% had poor functional status of NYHA III and IV whereas in our study only 2.5% had poor functional status. In the previous study, the patients were enrolled in second trimester and NYHA recorded then, whereas in our case, NYHA was recorded from anaesthesia record book and it was at the time of delivery. The NYHA might have been poor during the time of admission or at any time during pregnancy but this was not recorded in our anaesthesia record. High rate of booked cases along with cardiac medication and constant supervision by cardiologists must have contributed to a good functional status in higher percentage of women at delivery in our study.

The rate of cesarean section was very high amounting to 91 cases (75.8%) in our study. We have taken only those

cardiac pregnant patients where anaesthesiologists were called to provide analgesia for vaginal delivery or anaesthesia for cesarean section which makes it obvious to get such a finding of high operative deliveries. But as we derived the data from other record books such as in-patient medical records and obstetric record book, we found out that the total pregnant women with cardiac disease beyond 28 weeks pregnancy coming for delivery were 126 over the one year study period. This shows that in only 6 deliveries, the anaesthesiologists weren't involved in managing the delivery. So, we have concluded that operative deliveries are indeed high for pregnant patients with cardiac disease in our institute. The study done by Roos-Hesselink et al¹³ also found out that the rate of cesarean section is much higher in pregnant women with cardiac disease than in normal population (41% vs 23%). Another study from our institute itself done by Paudyal et al⁹ also showed a high rate of operative deliveries i.e., 60% in pregnancy with cardiac disease. The decision of operative delivery totally depends on the decision of obstetrician which in turn hugely depends upon obstetric/fetal indication and local resources.

Almost all the vaginal route deliveries were conducted under epidural analgesia except one case of complete heart block, in which monitored anaesthesia care was provided since the patient was on continuous isoprenaline infusion. Among the 91 deliveries via

caesarean section, 39 were conducted under sole spinal, 36 under general anaesthesia and 16 under combined spinal epidural anaesthesia. Spinal anaesthesia is the preferred anaesthetic technique for caesarean section but in our study, there was equally high incidence of general anaesthesia for operative deliveries which probably must be due to high prevalence of mitral stenosis in our study. General anaesthesia is generally recommended in severe mitral stenosis in order to avoid the fall in systemic vascular resistance occurring due to spinal anaesthesia.¹⁴

There was total three mortality (2.5%) over one year period. The maternal mortality in study done by Silversides et al³ had a maternal death of 0.6%. and the study done by Roos-Hesselink et al¹³ showed the mortality of 0.6% and 3.9% respectively in developed and developing countries. Studies done in our part; conducted by Chetri et al¹¹ showed maternal mortality of 4% and Koirala et al¹⁰ showed the mortality of 1.17%. The mortality of the developing countries seems to be slightly higher than in the developed countries.

In our study we encountered cardiac complications in 30% women which is much higher than the study from other centers. Silversides et al³ had cardiac complication rate of 16% and Sui et al⁷ had cardiac event rate of 13%. The higher rate of complication in our study may be because we have also included hypotension requiring bolus doses of vasopressor (16.7%) as a complication while the other studies haven't. Hypotension is very common during operative deliveries because it can be caused by drugs used for general anesthesia or by spinal anaesthesia and the incidence of operative deliveries is very high in our study (75.8%). The hypotension requires immediate intervention in the setting of cardiac disease where the reserve is already compromised which is why we included it as a complication in our study.

There was statistically significant association between previous cardiac event and maternal NYHA status with maternal complication. (p value <0.001) This significant association highlights the importance of proper history taking and clinical status during risk stratification.

Two of the 120 women gave birth to twin babies and there was total 4 neonatal deaths in the 122 deliveries. The neonatal mortality in our study is 3.2% which is higher than in the western part (Khairy et al¹⁵ showed neonatal death rate of 1.4%; Roos-Hesselink et al¹³ showed neonatal death of 0.6%). Whereas in the studies done in our part; Chetri et al¹¹ found the perinatal mortality to be 16% and Koirala et al¹⁰ found the fetal death rate to be 10.5%. The rate is lower in our study than the studies done in our part of world, probably

because the neonatal mortality in our study is taken from at the time of birth till 1 hour after birth, from the anaesthesia record book.

Thirty-three of the neonates in our study had birth weight of <2.5 kgs which probably must have been contributed by prematurity as 20.8% of the neonates were premature (<37 weeks.) Also, cardiac disease in the mother itself must have contributed to low birth weight.

The limitation of our study is that it is a single center study done in a limited period of time. In our study we cannot come to a definite conclusion about the risk factors that significantly contribute to the maternal morbidity and mortality except for prior history of cardiac event. This requires a larger sample size which can only be possible by assessing the data of multiple hospitals for which maintaining a national registry system for high-risk pregnancy is highly recommended.

CONCLUSIONS

The mortality in pregnant patients with cardiac disease coming for delivery over one year period is 2.5%. The complication rate among such patients is 30%, the patients requiring ICU admission is 20.7% and requiring mechanical ventilation is 6.7%. There is a significant association between history of prior cardiac event and NYHA in a pregnant patient with cardiac disease with adverse maternal event.

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CONFLICT OF INTEREST

None.

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