



## Original Article

# Maternal and fetal outcome in operated vs non-operated cases of congenital heart disease cases in pregnancy



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## ABSTRACT

**Objectives:** To study pregnancy outcomes in operated vs non-operated cases of congenital heart disease cases during pregnancy.

**Materials and methods:** A total of 55 patients of congenital heart disease who delivered in the authors unit in last 10 years were taken in this retrospective study. These were divided into two groups Group 1:29 (52.7%) patient who had no cardiac surgery and Group 2: 26(47.2%) who had cardiac surgery to correct their cardiac defect before pregnancy. All patients were evaluated for cardiac complications and outcome during pregnancy. Obstetric complications, mode of delivery and fetal outcome was compared in the two groups using statistical analysis.

**Result:** The commonest lesion was atrial septal defect (ASD) seen in 22(40%) patients followed by ventricular septal defect (VSD) in 16(29%). Congenital valvular disease 8(14.5%) and patent ductus arteriosus in 4(7.2%) cases. The mean age was  $25.9 \pm 3.15$  years in Group 1 and  $26.3 \pm 4.53$  years in Group 2. The baseline characteristics were similar in the two groups. There was no difference in cardiac complications, NYHA deterioration and need of cardiac drugs in the two groups. Obstetric complications and mode of delivery were also similar in the two groups. Mean birth weight was  $2516.65 \pm 514.04$  gm in Group 1 and  $2683.00 \pm 366.00$  gm in Group 2 and was similar. APGAR < 8, stillbirth rate and other neonatal complications were also similar in two groups.

**Conclusion:** The maternal and fetal outcome was excellent in patients with congenital heart disease and was similar in unoperated and operated cases.

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## 1. Introduction

Advancements in diagnosis and improvement in cardiac surgery for congenital heart disease (with better outcome) has radically changed the prognosis of congenital heart disease especially in complex lesions.<sup>1,2</sup> Hence more and more women of congenital heart disease are surviving to adulthood and getting married and are likely to have the complications in pregnancy.<sup>1,2</sup> Pregnancy is associated with severe hemodynamic changes like increasing blood volume, redistribution of regional blood flow and increased oxygen consumption which are well tolerated by normal women and many women with cardiac disease but it can be challenging for some cardiac patients especially with severe and complex disease.<sup>1,3,4</sup>

The prevalence of Rheumatic heart disease (RHD) has decreased dramatically in western countries where congenital heart disease is leading cardiac disease during pregnancy.<sup>1,5,6</sup> On the other hand, in the developing countries like India, RHD remains the commonest cardiac disease during pregnancy, mitral stenosis being the commonest lesion.<sup>7,8</sup> However even in developing countries, more patients of congenital heart disease are presenting for antenatal care especially in tertiary referral centre with facilities for cardiology and cardiac surgery. Congenital heart disease especially complex lesion is a high risk situation, prone to complications during pregnancy, labor, puerperium and is an important cause of maternal and perinatal morbidity and mortality.<sup>6,9–15</sup> Heart failure, arrhythmias, and bleeding complications due to anticoagulants can occur in these patients during pregnancy.<sup>14</sup> Even pharmacotherapy needed to stabilize maternal condition may cause problems for mother and fetus. Risk factors and predictor of complication in pregnancy have been elucidated for congenital and acquired heart disease by Siu et al.<sup>16,17</sup> It is presumed that cardiac

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surgery before pregnancy in congenital heart disease may have better pregnancy outcome especially for severe and complex lesions. We report result of pregnancy outcome of congenital heart disease patients who were either operated before pregnancy or were non operated cases.

## 2. Materials and methods

A total of 55 cases of congenital heart disease who delivered in obstetric unit of a tertiary centre unit in last 10 years from Jan 1997 to Dec 2016 were enrolled in this retrospective study. Another 191 women with normal pregnancy without heart disease or other medical problem who delivered in our hospital at the same time were taken as control for obstetric and perinatal outcome. Women with rheumatic heart disease, cardiomyopathies and Eisenmengers syndrome and other non-congenital heart disease were excluded from the study. The type of congenital heart disease was noted in all cases. The cases were divided in 2 groups, Group 1:29 (52.78%) cases who had no cardiac surgery and Group 2:26 (47.2%) cases who had cardiac surgery for the congenital heart disease prior to pregnancy. The baseline characteristics like range and means of age, obstetric history (primigravida, multigravida and previous abortions), time since diagnosis from pregnancy, New York Heart Association (NYHA) classification and any associated medical problems like anemia, hypertension, intrahepatic cholestasis etc were noted in all the patients. The cardiac complications and need of cardiac medication in the two groups were noted. The incidence of arrhythmias, any deterioration of NYHA classification during pregnancy was noted. Use of cardiac medications like digoxin, diuretics, beta blockers and anticoagulants was noted in all patients.

Various obstetric complications (anemia, preterm labor, antepartum hemorrhage, oligoamnios, ICP) and mode of delivery was noted in the two groups. The mode of delivery (vaginal or caesarean), instrumental delivery was noted in all patients.

Fetal outcome was noted in the two groups. The mean birth weight, fetal growth restriction, APGAR < 8, any still birth or neonatal death, any congenital anomaly and any neonatal complications were noted in all the patients.

## 3. Statistical analysis

Data analysis was carried out using statistical software STATA version 12.0. Continuous variables were tested for normality assumptions using appropriate statistical tests. For the variables that were approximately to normal distribution descriptive

statistics such as mean, standard deviation and the range values were calculated. For non-normal data median values were compared. Comparison of two group means were tested using student –t independent test. Categorical variables were expressed in terms of frequency and percent values. Frequency data by categories was compared using chi square test/Fischer exact test as appropriate. Two sided probabilities  $P < 0.05$  was considered for statistical significance.

## 4. Results

There were 55 total case of congenital heart disease who delivered during last 10 years in the authors unit. There were 29 (52.7%) non-operated cases (group 1) and 26(47.3%) operated cases before pregnancy (Group 2). The type of congenital heart disease is shown in Table 1. Atrial septal defect (ASD) was the commonest lesion seen in 22(40%) cases followed by ventricular septal defect (VSD) in 16(29%) cases, congenital valvular disease in 8(14.5%) cases, patent ductus arteriosus in 4(7.2%) cases. Other congenital disease were coarctation of aorta in 2(3.6%), tetralogy of fallot in 2 (3.6%), bicuspid aortic valve in 1(1.88%), congenital heart block in 1 (1.88%), sick sinus in 2(3.8%).

The baseline characteristics in the two groups are shown in Table 2. The mean age was  $25.9 \pm 3.85$  years in group 1 and  $26.3 \pm 4.53$  years in group 2 and was similar ( $p < 0.05$ ). There were 13(58.62%) primigravida in group 1 and 7(34.6%) in group 2 ( $p > 0.05$ ). Previous abortions were also seen in equal number of cases in two groups (24.15% vs 23.07%;  $P > 0.05$ ). Time since diagnosis from pregnancy was also similar in two groups being <10 years in 11(37.93%) in group 1 and 21(80.76%) in group 2. A total of 16(55.17%) patients in group 1 were in NYHA class 1 as compared to 20(76.92%) in group 2. In operated group (group 2) none of the patients was in severe NYHA class (NYHA class 3 and 4) as compared to 5(17.24%) in NYHA 3 and 1(3.4%) in NYHA 4 in group 1 (non operated group).

Thus all patients (26,100%) in operated group (Group 2) were in early NYHA class 1 and 2 as compared to 23(79.3%) in group 1 (non operated group). Thus severe disease NYHA 3 or 4 was seen in 6 (20.68%) in non operated (group 1) as compared to nil in group 2. Other associated problems seen were anemia, hyper or hypothyroidism, urinary tract infection, seizure disorder were similar in two groups.

Various cardiac complications and need of cardiac drugs in the two groups are shown in Table 3. Most cases were uneventful (75.8% vs 75.9%). Arrhythmia was seen in 5(17.2%) in group 1 and 5 (19.2%) cases in group 2 and was similar. Use of cardiac medication

**Table 1**  
Types of cardiac lesion in two groups.

S.No	Cardiac Condition	Non Operated NO. (%) N = 29(52.7%)	Operated Before Pregnancy NO. (%) N = 26(47.3%)
1.	Congenital Heart Disease#:		
	ASD	12(41.3)	10(38.4)
	VSD	8(27.6)	8(30.8)
	TOF	1(3.4)	1(3.8)
	PDA	1(3.4)	3(11.5)
	COA	1(3.4)	1(3.8)
	Bicuspid Aortic Valve	0	1(3.8)
	Congenital Valvular Disease	5(17.2)	3(11.5)
	Congenital Heart Block	0	2(7.6)
	Sick Sinus	1(3.4)	0

ASD:Atrial septal defect.

VSD:Ventricular septal defect.

TOF:Tetralogy of fallot.

PDA:Patent ductus arteriosus.

COA:Coarctation of aorta.

#: some patients had more than one cardiac lesion.

**Table 2**

Baseline characteristics in two groups.  
 URTI: Upper respiratory tract infection  
 CVA: Cerebrovascular accident

S.No	Outcome	Non Operated No. (%) 29(52.7%)	Operated Before Pregnancy No. (%) 26(47.3%)	P value and significance
1	Mean Age	25.9 ± 3.15	26.3 ± 4.53	P > 0.05 NS
	<18	0	2(7.69)	P > 0.05 NS
	18–35	29(100)	24(92.3)	P > 0.05 NS
	>35	0	0	P > 0.05 NS
2.	Obstetric History:			
	Primigravida	17(58.62)	9(34.6)	P > 0.05 NS
	Multigravida	12(41.38)	17(65.38)	P > 0.05 NS
	Previous Abortions	7(24.15)	6(23.07)	P > 0.05 NS
3.	Time Since Diagnosis from Pregnancy:			
	<10 YRS	11(37.9)	21(80.76)	P > 0.05 NS
	10–20 YRS	4(13.8)	0	P > 0.05 NS
	>20 YRS	5(17.2)	5(19.2)	P > 0.05 NS
	During Pregnancy	9(31)	0	P > 0.05 NS
4.	NYHA Class:			
	NYHA 1	16(55.17)	20(76.9)	P > 0.05 NS
	NYHA 2	7(24.13)	6(23)	P > 0.05 NS
	NYHA 3	5(17.2)	0	P > 0.05 NS
	NYHA 4	1(3.44)	0	P > 0.05 NS
5.	Associated medical problems:			
	Chronic HTN	0	0	P > 0.05 NS
	Anemia	3(10.34)	2(7.69)	P > 0.05 NS
	Hyperthyroidism	0	1(3.8)	P > 0.05 NS
	Hypothyroidism	2(6.89)	3(11.53)	P > 0.05 NS
	URTI	0	1(3.84)	P > 0.05 NS
	Seizure Disorder	0	1(3.8)	P > 0.05 NS
	Arthritis	0	0	P > 0.05 NS
	CVA	0	0	P > 0.05 NS
	Hepatitis/HIV	0	1(3.8)	P > 0.05 NS
	Bronchial Asthma	0	0	P > 0.05 NS
	Beta Thal Trait	0	1(3.8)	P > 0.05 NS

NYHA: New York Heart Association

URTI: Upper respiratory tract infection

CVA: Cerebrovascular accident

**Table 3**

Cardiac complications and need of cardiac medication in two groups.

S.No	Outcome	Non Operated NO. (%) N = 29(52.7%)	Operated Before Pregnancy NO. (%) N = 26(47.3%)	P value and significance
1.	Cardiac Complications			
	A. Uneventful	22(75.8)	20(76.9)	P > 0.05 NS
	B. Stuck Valve	1(3.4)	2(7.6)	P = 0.598 NS
	C. CCF <sup>#</sup>	0	0	P > 0.05 NS
	D. Arrhythmia	1(3.4)	0	P > 0.05 NS
	E. Restenosis	0	0	P > 0.05 NS
	F. Nyha deterioration	5(17.2)	5(19.2)	P > 0.05 NS
	G. AF <sup>#</sup>	0	0	P > 0.05 NS
	Use Of Cardiac Medication:			
	A. Digoxin	4(13.7)	4(15.3)	P > 0.05 NS
	B. Diuretic	8(27.4)	5(19.2)	P = 0.537 NS
	C. Beta Blockers	2(6.8)	1(3.8)	P = 0.99 NS
	D. Anticoagulants	0	0	P > 0.05 NS
	E. Anti Hypertensive	0	0	P > 0.05 NS

<sup>#</sup>:CCF:Congestive cardiac failure

AF:Atrial fibrillation

like digoxin, diuretics and beta blockers was similar in the two groups being seen in 13.7% vs 15.3% (P > 0.05); 27.4% vs 19.2% (P = 0.537) and 6.8% vs 3.8% (P = 0.99).

Various obstetric complications and mode of delivery in the two groups is shown in Table 4. Anemia was seen in 4(13.6%) case in group 1 and 2(7.6%) cases in group 2 (P = 0.672). Pre eclampsia was

seen in 2(6.8%) cases in group 1 and in 2(7.6%) cases in group 2 (p > 0.05), oligoamnios was seen in 1 case in group 1 and nil in group 2, gestational diabetes mellitus was seen in 2 cases each in 2 groups, antepartum hemorrhage was seen in 2 cases (6.8%) in group 1 and nil in group 2. Other complications were also similar in two groups. The mode of delivery in the two groups is shown in

**Table 4**

Obstetric complications and mode of delivery in two groups.

S. No	Outcome	Group 1 Non Operated NO. (%) N = 29 (52.7%)	Group 2 Operated Before Pregnancy NO. (%) N = 26 (47.3%)	Group 3 Normal Pregnant Women Without Cardiac Disease N = 191	P value and significance
1.	Obstetric Events:				
	Anemia	4(13.6)	2(7.6)	28(14.6)	P = 0.672 NS
	PIH	2(6.8)	2(7.6)	19(9.9)	P > 0.05 NS
	Oligoamnios	1(3.4)	0	4(2)	P > 0.05 NS
	GDM	2(6.8)	2(7.6)	12(6.3)	P > 0.05 NS
	APH	2(6.8)	0	1(0.5)	P > 0.05 NS
	PPROM	0	1(3.8)	3(1.5)	P > 0.05 NS
	ICP	2(6.8)	3(11.5)	5(2.6)	P = 0.659 NS
	Previous LSCS	1(3.4)	4(15.3)	7(3.7)	P > 0.05 NS
	Post Partum Complication	0	0	1(0.5)	P > 0.05 NS
	Mean Gestation Age (weeks)	37.1 ± 2.34	37.4 ± 3.32	38.4 ± 3.18	P > 0.05 NS
	Mode Of Delivery:				
	Vaginal:	22(75.8)	18(69.2)	152(79.6)	P > 0.05 NS
	• Spontaneous	20(68.9)	16(61.5)	130(68)	
	• Induced	2(6.8)	2(7.6)	22(11.5)	
	• Instrument Delivery	16(55.1)	7(26.9)	4(2)	
	LSCS	7(24.1)	8(30.7)	39(20.4)	P > 0.05 NS
	• Elective	3(10.3)	3(11.5)	21(10.9)	
	• Emergency	4(13.7)	5(19.2)	18(9.4)	

GDM:Gestational diabetes mellitus.

APH: Antepartum hemorrhage.

PROM:Premature rupture of membrane.

ICP:Intrahepatic cholestasis of pregnancy

**Table 4.** Vaginal delivery was achieved in majority of cases being 22 (75.8%) in group 1 and 18(69.2%) in group 2 (P > 0.05). Use of forceps or ventouse was seen in 16(55%) cases in group 1 and in 7 (26.9%) cases in group 2 and was also similar. Caesarean section rate was 24% in group 1 and 30.7% in group 2 and was similar in the two groups (P = 0.03).

Fetal outcome in the two groups is shown in **Table 5** and was similar in the 2 groups. The mean birth weight was 2516.65 ± 514.04 gm in group 1 and 2683 ± 366.06 gm in group 2 (p > 0.05). fetal growth restriction (FGR) was also similar in the two groups being seen in 3(10.3%) in group 1 and 1(3.8%) in group 2. Incidence of <8 APGAR was also similar in the two groups (10.3% vs 11.5%). There was only one still birth in group 2. Incidence of cardiac anomaly was seen in 1(3.4%) in group 1 and 1(3.8%) in group 2 and the lesion was similar.

There was no significant difference in maternal and fetal outcome in operated versus non operated cases.

## 5. Discussion

Due to improvement in the treatment of congenital heart disease (CHD), most women with CHD now survive to adulthood, get married and try conception.<sup>1,2,18,19</sup> During pregnancy, labor and puerperium these women are at increased risk of getting arrhythmias and congenital heart failure possibly due to volume shift and hypertension.<sup>20–22</sup> Traditional thinking that cardiac surgery prior to pregnancy improves maternal and fetal outcome in patients with CHD. Hence preconceptional care is important for such patients. The patients where pregnancy is contraindicated like primary pulmonary hypertension, Eisenmenger's Syndrome should be advised not to conceive. Certainly, cardiac disease like TOF and other complex CHD should preferably be operated prior to pregnancy for optimum outcome.

However the present study on 55 CHD cases with 29(52.7%) being non operated (group 1) and 26(47.2%) being operated cases

**Table 5**

Fetal outcome in two groups.

S. No	Outcome	Non Operated No. (%) N = 29(52.7%)	Operated Before Pregnancy No. (%) N = 26(47.3%)	Group 3 Normal Pregnant Women Without Cardiac Disease N = 191	P value and significance
1	Fetal Outcome:				
	Mean Birth Weight (in gram)	2516.65 ± 514.04	2683 ± 366.06	2820 ± 218.64	P = 0.398 NS
	FGR	3(10.3)	1(3.8)	2(1)	P > 0.05 NS
	APGAR < 8	3(10.3)	3(11.5)	2(1)	P > 0.05 NS
	Still Birth	0	1(3.8)	1(0.5)	P = 0.236 NS
	Congenital Anomaly (hypoplastic left ventricle)	1(3.4)	1(3.8)	2(1)	P > 0.05 NS
	Antenatal Positive Fetal Echo Finding	1/10	0/9	0	P = 0.424 NS

LFD: Large for dates.

FGR: Fetal growth restriction.

before pregnancy (group 2) couldn't demonstrate any difference in maternal or fetal outcome in the two groups. The cardiac complications, need of cardiac medications was similar in the two groups. The two groups were similar in baseline characteristics. Obstetric events and mode of delivery was also similar in the two groups; mean birth weight, fetal death rate and fetal congenital malformation rate was also similar in the two groups. Although the result of the present retrospective study showed that maternal and perinatal outcome in congenital heart disease were similar whether prior cardiac surgery was performed or not, the two groups may not be similar.

Although the birth weight in the two groups was not different statistically probably due to less number of cases, but birth weight was 167 g more in group 2 (operated group) ( $2683.00 \pm 366.06$  g) as compared to  $2516.65 \pm 514.04$  g in group 1 (non operated group). The increased birth weight in group 2 tends to favor better outcome in operated cases (group 2) despite the fact that operated group might have more severe and complex cardiac lesions indicating positive impact of surgical intervention in congenital heart disease.

In their study on congenital heart disease in pregnancy in a low income country Arora et al.<sup>23</sup> observed better outcome with cardiac surgery. They advocated availability and access to timely treatment of congenital heart disease as preferable to reduce disease related morbidity and mortality. Moreover women whose cardiac anomaly remains uncorrected but who survive to adulthood might present with many secondary changes in heart and other organs like pulmonary hypertension making them further vulnerable to the hemodynamic changes of pregnancy.

Hence adolescent girls and women with congenital heart disease must report to their cardiologist before venturing into pregnancy who may advise them early diagnosis and treatment including cardiac surgery before trying for conception for better maternal and perinatal outcome.

Admittedly, the cardiac lesions are of relative less complex varieties, mostly left-right shunt lesions (only 1 TOF); the outcome could have been much different if more complex patients with right-left shunt were included. Many authors have observed increased complications of CHD during pregnancy, labor and puerperium and consider CHD to be an important cause of maternal and perinatal morbidity and mortality.<sup>9–15</sup> it could be due to inclusion of all cases of CHD especially complex and cyanotic heart disease cases. Generally, Eisenmenger's syndrome and pulmonary hypertension are associated with increased maternal morbidity and mortality.<sup>1,21</sup>

Hayward et al.<sup>22</sup> in their study on all patients of CHD delivered in state of California observed a higher rate of caesarean delivery in women with CHD (46.2% for complex CHD, 78.8% for non complex CHD).<sup>22</sup> They also observed increased risk of pre eclampsia (probably due to reduced placental perfusion) in women with CHD. However, cardiac events were infrequent even in their study on CHD.<sup>20</sup> The result of present study which is a real world subset, lesions likely to be encountered in clinical practice is also similar to these studies.

### 5.1. Limitation of the study

The major limitation of this present study is small numbers and its retrospective nature. The numbers are small because now-a-days majority of patients get operated before conception and it is very unlikely to find un-operated patients at least in Western world. In this series, the cardiac surgery was performed as per need

of the patients. Most probably the patients with severe disease were operated while without severe diseases were not operated. Second limitation is that we excluded patients of Eisenmenger's Syndrome and other severe cardiac disease from the present study. Another limitation is a very few number of patients with cyanotic complex congenital heart disease likely to do better with surgery.

It is recommended that all women with congenital heart disease should seek consultation of a cardiologist first before trying for conception and those with severe disease and complex lesions may be offered cardiac surgical intervention for optimum outcome in pregnancy.

To conclude CHD is a high risk pregnancy but maternal and perinatal outcome is reasonably good in tertiary centre at least in acyanotic CHD, with facilities of cardiac care and obstetric care and a multidisciplinary team approach.

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