DOI -10.21276/obgyn.2025.v12.i1.32 *ISSN Print – 2454-2334; ISSN Online – 2454-2342*

RESEARCH ARTICLE

Maternal and cardiac outcome in surgically intervened cardiac disease complicating pregnancy: a cross sectional study from a tertiary care centre in South India

Briji S Panicker, Sheila Balakrishnan

Corresponding author: Dr Briji S Panicker, Assistant Professor, Department of Obstetrics and Gynaecology, Jubilee Mission Medical College and Research Institute, Thrissur, Kerala, India; Email : drbrijisp@gmail.com

ABSTRACT

Objectives: To compare the cardiac and obstetric outcomes in patients with pregnancies complicated with surgically intervened cardiac disease and compare with outcomes in normal patients. To suggest modifications in care, if any, of patients who had previously undergone cardiac surgery in order to improve outcomes for the mothers. **Methods**: This was a cross sectional study involving 81 patients who had previously undergone cardiac surgery and admitted to the labour room of Sri Avittam Thirunal (SAT) hospital, Medical College, Thiruvananthapuram between July 2007 and December 2008. They were compared with equal numbers of patients with low risk normal pregnancies. **Results**: Among the 81 cardiac patients, 51 patients had congenital heart disease (CHD) and 30 patients had acquired valvular heart disease (AVHD). All the AVHD were rheumatic in origin. All the patients who had undergone cardiac surgery during pregnancy had improvement of cardiac status from New York Heart Association (NYHA) Class III, Class IV to Class II. Among the patients in low risk group (Class I & II), majority (44.60%) had spontaneous vaginal delivery and among the patients in high risk group (Class III & IV), 57.1% had outlet forceps delivery. In low risk group, majority (97.3%) had no postpartum complications. In high risk group 57.1% patients had pulmonary oedema. **Conclusion**: Cardiac patients with better functional class have the best cardiac outcomes. Most of the patients who had surgical correction were in the higher functional class and had little or no deterioration in their cardiac status.

Keywords: Surgically corrected cardiac disease, pregnancy, NYHA class.

Cardiac disease during pregnancy is one of the leading indirect causes of maternal mortality. The incidence of clinically significant disease in pregnancy is reported to be between 0.1% to 4%.[1] As compared to yester years, the incidence of rheumatic heart disease (RHD) even though decreasing worldwide constitutes a major threat in developing countries like India [1]. About 0.8% babies born have congenital heart defects [2, 3]. However, advances in the field of cardiology and cardiothoracic surgery have led to more than 90% survival of congenital heart disease patients to the age of 18 years [3].

Various issues are faced by modern obstetricians in the light of changing scenarios of heart disease in pregnancy in our country. Stress has to be placed upon the need for early cardiac intervention and need for peripartum endocarditis prophylaxis. Only by examining the patients with a spectrum of cardiac lesions and risk profiles, have we been able to define the interaction between the maternal cardiac status and outcome.

In this study, the maternal outcome in patients with pregnancies complicated with surgically intervened cardiac diseases were compared with those in normal patients, with the objective to determine the cardiac and obstetric outcomes and to suggest ways to modify the pregnancy and the care

Received: 30th May 2022, Peer review completed: 20th February 2023, Accepted: 24th February 2023.

Panicker BS, Balakrishnan S. Maternal and cardiac outcome in surgically intervened cardiac disease complicating pregnancy: a cross sectional study from a tertiary care centre in South India. The New Indian Journal of OBGYN. 2025; 12(1): 174-78.

given, to get a better outcome.

Materials and methods

This cross sectional study was conducted in the Department of Obstetrics and Gynaecology, Sri Avittom Thirunal (SAT) Hospital, Medical College Thiruvananthapuram in the period of July 2007 and Dec 2008. During this period all patients with surgically intervened cardiac disease complicating pregnancy both congenital and acquired, who got admitted in the labour room of SAT hospital with spontaneous or induced labour, with documented evidence of cardiac surgery was included in the study. The ethical clearance for the study was taken from the institutional ethical committee.

The cardiac and obstetric outcomes of 81 pregnant females with documented evidence of surgical intervention for heart disease were studied. They were compared with equal numbers of patients with low risk normal pregnancies and of same parity without cardiac illness. These patients received care from the same obstetricians as that of the cardiac patients.

Patients with medical or surgical illness that can affect the cardiac status, postnatal patients with surgically corrected heart disease delivered outside and patient who refused to give consent were excluded from the study.

Informed consent and a detailed history were taken by interview method using a structured questionnaire. During the study period, 17043 deliveries took place in SAT hospital of which 247 patients were complicated with heart disease. Out of these 81(32.8%) had surgical intervention for heart disease.

The cardiac patients were subjected to cardiologic and cardiothoracic evaluation**.** These included ECG and echocardiograms and the data were included in the questionnaire. All patients were put under continuous fetal monitoring, ECG monitoring, prop-up position, O_2 inhalation, SpO_2 monitoring and fluid restriction during labour.

Induction of labour was done for obstetric indications only. Infective endocarditis prophylaxis was given to the patient in the cardiac surgery group. Morphine was the analgesic of choice. Labour was allowed to progress normally and 2nd stage of labour cut short by outlet forceps wherever indicated. Obstetric and cardiac complications were noted separately. Postpartum complications were also noted.

Data analysis: Each pregnancy was treated as a separate data unit. Base line characteristics, obstetric outcomes and complications were compared between surgically corrected heart disease patients and uncomplicated normal pregnant patients by chi-square (χ^2) test. The analysis was done using SPSS 15 data management software. To examine the relationship of the cardiac events and maternal outcomes of the cardiac patients, they were divided according to the origin of the disease ie, congenital and acquired. They were also divided according to the New York Heart Association (NYHA) functional class [4]. Then, patients in class I and class II were grouped together as low risk group and class III and class IV as high risk group. These were compared with each other and analyzed in detail.

Results

Among the total patients, 51 patients (62.96%) had congenital heart disease (CHD) and 30 patients (37.04%) had acquired valvular heart disease (AVHD). All the AVHD were rheumatic in origin. Of the 51 patients with CHD, patients had undergone atrial septal defect (ASD) closure, ventricular septal defect (VSD) closure, patent ductus arteriosus (PDA) ligation, tetralogy of fallot (TOF) correction, undergone coarctation of aorta (CoA) repair and had undergone congenital pulmonary stenosis correction and transposition of the great arteries (TGA) correction. Of the 30 AVHD patients, patients had undergone balloon mitral valvotomy (BMV), closed mitral valvotomy (CMV), percutaneous transseptal mitral commissurotomy (PTMC), and valve replacements (table 1). Of the five patients with valve replacement, all had mechanical valves.

Table 1: Type of heart disease and surgical correction done

Type of heart disease	Surgical correction	Frequency	Percentage
Congenital heart disease (CHD)	ASD closure	24	29.62
	VSD closure	9	11.11
	PDA ligation	7	8.64
	TOF correction	6	7.41
	TGA correction	2	2.47
	CoA repair	1	1.24
	PS correction	2	2.47
Acquired valvular heart disease (AVHD)	Post BMV	12	14.81
	Post CMV	7	8.64
	Post PTMC	6	7.41
	Post valve replacement	5	6.18

In low risk group (NYHA class I & II), 51 patients (63.0%) during early pregnancy and 49 patients (66.2%) during late pregnancy were in the CHD group and 30 patients during early pregnancy (37.0%) and 25 patients (33.8%) during late pregnancy were in the AVHD group. In high risk group (NYHA class III & IV), during early pregnancy, there were no patients in CHD and AVHD group when compared to 2 patients (28.6%) in the CHD group and 5 patients (71.4%) in the AVHD group, in late pregnancy. In the first trimester, 64 patients (79%) were in NYHA class I,

17 patients (21%) were in class II, and none were in class III and IV. During the course of pregnancy (3rd trimester), 7 patients had worsening of functional class. 61 patients remained in class I (75.3%), 13 patients in class II (16%), 4 patients worsened to class III (4.9%) and 3 patients to class IV (3.7%). After delivery, the status of 61 patients (75.3%) in class I during the third trimester remained unchanged. Of the 13 patients in class II during the 3rd trimester, 5 patients worsened in their functional class and 8 patients (9.8%) remained in class II. There were 7 patients (8.6%) in class III and 5 (6.2%) patients in class IV (table 2).

Table 2: NYHA functional class of the study population

Functional class	During early pregnancy	During late pregnancy	After delivery
Class I	64(79.0%)	61(75.3%)	61(75.3%)
Class II	17(21.0%)	13(16.0%)	8(9.8%)
Class III	0(0.0%)	4(4.9%)	7(8.6%)
Class IV	0(0.0%)	3(3.7%)	5(6.2%)

All the patients who had undergone cardiac surgery during pregnancy were in NYHA class III, n=2 (40%) and class IV, n=3 (60%). After surgery all the patients improved in their NYHA functional class and became class II. Among the study population, 65 patients (87.84%) in low risk group had good exercise tolerance during late pregnancy, when compared to 3 patients (42.86%) in high risk group. This was found to be statistically significant (table 3).

Table 3: Exercise tolerance according to NYHA functional class

Exercise tolerance in cardiac patients during pregnancy	NYHA during late pregnancy	
	Low risk group	High risk group
Good	65 (87.84%)	3 (42.86%)
Moderate	8 (10.81%)	3 (42.86%)
Poor	1 (1.35%)	1 (14.29%)
Chi square = 10.710; p= 0.005 (< 0.01)		

Among the study population, 26 patients (51%) in the CHD group underwent corrective surgery between 11 - 20 years of age, when compared to 16 patients (53.3%) in AVHD group. This was comparable with each other. But in the age group of ≥ 21 years, 2% patients (n=1) in CHD group underwent surgery when compared to 40% (n=12) in AVHD group. This was found to be highly significant statistically (table 4).

Table 4: Distribution of type of cardiac disease according to the age at cardiac surgery

Age at cardiac surgery (years)	Type of cardiac diseases		Total
	Congenital	Acquired	
≤ 1	5(9.8%)	0(0%)	5(6.2%)
2 – 10	19(37.3%)	2(6.7%)	21(25.9%)
11 – 20	26 (51%)	16(53.3%)	42(51.9%)
≥ 21	1(2%)	12(40%)	13(16%)
Chi square= 26.808; P= 0.00 (< 0.001)			

Among the 81 patients, 47 patients (92.2%) with congenital heart disease had good exercise tolerance during late pregnancy, when compared to 21 patients (70.0%) with acquired valvular heart disease. This was found to be statistically significant (table 5).

Table 5: Exercise tolerance and type of cardiac disease

Exercise tolerance during pregnancy	Type of cardiac diseases		Total
	Congenital	Acquired	
Good	47 (92.2%)	21 (70.0%)	68 (84.0%)
Moderate	4 (7.8%)	7 (23.3%)	11(13.6%)
Poor	0(0.00%)	2(6.7%)	2(2.5%)
Chi square= 7.842; P= 0.020 (< 0.05)			

Among the patients in low risk group, 33 patients (44.60%) had spontaneous vaginal delivery, 13 patients (17.60%) had outlet forceps delivery, 10 patients (13.50%) had vacuum delivery and 18 patients (24.30%) had LSCS. Among the patients in high risk group, none had spontaneous vaginal delivery, 4 patients (57.10%) had outlet forceps delivery, one patient (14.30%) had vacuum delivery and 2 patients (28.30%) had LSCS. The difference in the mode of delivery, between the two groups was found to be statistically significant (table 6).

Table 6: Mode of delivery and NYHA functional class during late pregnancy

Mode of delivery	NYHA during late pregnancy	
	Low risk group	High risk group
Spontaneous vaginal	33 (44.60%)	0 (0.00%)
Outlet forceps	13 (17.60%)	4 (57.10%)
Vacuum	10 (13.50%)	1 (14.30%)
LSCS	18 (24.30%)	2 (28.60%)
Chi square= 7.9435; P= 0.041 (< 0.05)		

Among the total patients, 10 patients (55.55%) in low risk group had undergone elective cesarean section and 8 patients (44.44%) had undergone emergency cesarean section. Two patients (100%) in high risk group had undergone elective cesarean section and none underwent emergency cesarean section.

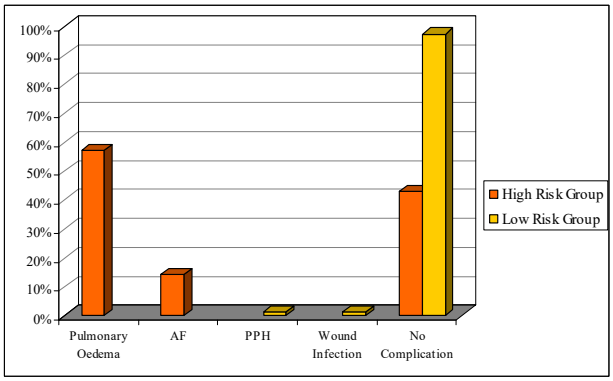

Figure 1: Postpartum complications and NYHA class

Among the total patients, 72 patients (97.30%) in low risk group had no postpartum complications. One patient each (1.40%) in this group had PPH and wound infection. 2 patients (28.57%) in high risk group had no complications. 4 patients (57.10%) had pulmonary oedema in this group

(figure 1). 1 patient (14.28%) had Atrial Fibrillation. There were no patients with valve thrombosis, cardiac failure or infective endocarditis, postpartum. The difference between the two groups was statistically significant ($p < 0.001$).

Discussion

Congenital cardiac anomalies constituted most of the patients in the study. Acquired heart diseases were rheumatic in origin for patients in the study group. Majority of the patients with congenital heart disease had earlier corrections. Most patients with congenital heart disease essentially lead normal lives with little comorbidities and therefore have more successful pregnancies. Most other studies suggest the same outcome [1, 2, 5]. However, in developing countries like India rheumatic heart disease was the most common in the population [6, 7].

Among the 81 cardiac patients, 7 patients (8.64%) had a worsening of cardiac functional status. The results had shown an increase in the number of patients in the high risk group (NYHA class III & IV cardiac status) as the pregnancy advanced. The condition of patients with poor functional class is likely to worsen along the course of pregnancy. This has been previously demonstrated [6, 8 -11]. However, some studies show good outcomes with surgically corrected conditions like transposition of great arteries.[12] In the study the no of patients who showed worsening of functional class were not statistically significant (8.64%). The patients were able to achieve a better functional class after surgical correction and were able to complete the pregnancies without significant deterioration and hence this better result.

Higher number of patients with surgically corrected acquired cardiac disease had worsening of their functional class during pregnancy. These patients had undergone surgery later in their lives. 40% had undergone cardiac surgery after 21 years of age. The main reason for postponement of surgery had been socio economic and hence were likely to have had been in worse cardiac status when undergoing surgery and hence less than optimal outcome. This might explain the worsening of cardiac function during pregnancy in these patients. The patients with congenital heart disease had undergone surgery earlier in their lives and had better functional outcomes. It was observed that patients, who had valvular heart disease including those who had undergone surgical correction, had higher percentage of poor cardiac and maternal and fetal outcome than the control group of normal patients [13].

Patients who had undergone surgery during pregnancy had improved functional class after surgery and there was no worsening during labour or postpartum. Even though most patients were drug free during pregnancy, the overall intake of therapeutic drugs during pregnancy, in those who were on these drugs had gone up. This might be due to the increased stress of pregnancy. Almost all the patients had infective endocarditis prophylaxis [9]. 5 patients were on anticoagulants as they were having mechanical prosthetic heart valves. Till 12 weeks of gestation, they were on heparin injections and then converted to oral anticoagulants (warfarin). After 32 weeks of gestation, they were switched to heparin again till delivery. In the postpartum period, along with heparin, oral anticoagulants were started, and heparin tapered, after titrating the dose of oral anticoagulants.

Higher number of patients had term deliveries among both the normal and surgically corrected group of patients and was like previous studies [13 - 17]. Few other studies which had patients with cardiac disease both surgically corrected and non corrected found higher rate of preterm deliveries in patients with previously corrected transposition of great arteries which could be ascribed to the previous complex anomaly [7, 8].

45.70% of the patients with surgically intervened cardiac disease had spontaneous vaginal delivery when compared to 59.30% of the normal patients. There was a high rate (24.69%) of caesarean section in the surgically corrected heart disease group. This group also had a higher rate of outlet forceps and vacuum deliveries. The higher rate of instrumental delivery was reported in patient with NYHA classes III and IV similar to previous studies [5,7,13]. The caesarean section was primarily done for obstetric and fetal indications [16]. The rate of caesarean section was higher in the cardiac surgery group and this was due to obstetric reasons, in contrary to some studies [8]. Majority of the patients underwent the surgery as an elective procedure.

There was no statistically significant difference in the frequency of postpartum complication in both patients with surgically corrected heart disease and normal patients. The frequency of patients with no complications was 91.40% for each group similar to some major studies [8]. Majority of the patients (97.30%) with low risk cardiac status had no complications. Four patients who formed 57.10% of the high-risk cardiac status had pulmonary oedema [6]. In this study, the frequency of complications other than pulmonary oedema was similar in both normal and heart disease groups. It was also noted that significant number of complications were found in patients with surgically corrected acquired heart diseases as compared to the surgically corrected

congenital heart disease. The patients with surgically corrected congenital heart disease were essentially free from postpartum complications in our study.

This study was done in the year 2007 to 2008. This study is relevant in the current scenario as many similar studies related to surgically corrected cardiac disease in pregnancy as a group has not been done in the intervening time period till today. Follow up studies are required to ascertain the validity of the findings in today's context.

Conclusion

Pre-existing results of many studies state that cardiac patients with better functional class have the best cardiac outcomes and the results confirm this. Most of the patients who had surgical correction were in the higher functional class and had little or no deterioration in their cardiac status. The obstetric outcomes are comparable to both the patients with heart disease and normal pregnant patients primarily because most of the patients were in good to fair cardiac status at the time of delivery. The rate of spontaneous deliveries was reduced in the heart disease group and there was a concomitant increase in the need for operative vaginal deliveries and caesarean section. This might be ascribed to the need to reduce the stress of delivery for the patients with surgically corrected cardiac disease.

Conflict of interest: None. **Disclaimer:** Nil.

References

1. Siu SC, Sermer M, Colman JM, et al. Prospective multicenter study of pregnancy in women with congenital heart diseases. Circulation. 2001; 104: 515-21.
2. Mc Faul PB, Dornan JC, Lamki H, Boyle D. Pregnancy complicated by maternal heart diseases. A review of 519 women. Br J Obstet Gynae. 1988; 95: 861-67.
3. Niwa K. Adult Congenital Heart disease with pregnancy. Korean Circ J. 2018 April: 48(4): 251-76.
4. The Criteria Committee of the New York Heart Association. Disease of the heart and blood vessels: Nomenclature and Criteria for diagnosis, 6thedn. Boston: Little Brown; 1964.
5. Yadav V, Sharma JB, et al. Maternal and fetal outcome in operated vs nonoperated cases of CHD cases in pregnancy. Indian Heart Journal. 2018; 70(1): 82-6.
6. Bhatla N, Laid S, Behera G, Kriplani A, Mittal S, et al. Cardiac disease in pregnancy. International Journal of Gynec and Obstet. 2003; 82: 153-59.
7. Kovavisarach E, Nualplot P. Outcome of pregnancy among patients with parturients complicated with heart disease in Rajavithi Hospital. J Med Assoc Thai. 2007; 90(II): 2253-59.
8. Siu SC, Colman JM, Sorensen S, Smallhorn JF, Farine D, Amankwah KS, et al. Adverse neonatal and cardiac outcomes are more common in pregnant women with cardiac disease. Circulation. 2002; 105: 2179-84.
9. Whittmore R, Hobbins JC, Eagle MA. Pregnancy and outcome in women with and without surgical treatment of congenital heart diseases. Am J Cardiol. 1982; 50: 641-51.
10. Shime J, Mocarski EJ, Hastings D, et al. Congenital Heart Diseases in Pregnancy- Short and long term implications. Am J Obstet Gynecol. 1987; 156: 313-22.
11. Patel A, Asopa S, Ohri S, et al. Cardiac surgery during pregnancy. Texas Heart Institute Journal. 2008; 35(3): 307-12.
12. Kowalik E, Klisiewicz A, Biernacka EK, Hoffman P. Pregnancy and long - term cardiovascular outcomes in women with congenitally corrected transposition of great arteries. International Journal of Gynaecology and Obstetrics. 2014; 125(2): 154-57.
13. Malhotra M, Sharma JB, Tripathi R, Arora P, Arora R. Maternal and fetal outcome in outcome in valvular heart disease. International Federation of Gynec and Obstet. 2001; 84: 11-6.
14. Fesslova VM, Villa L, Chessa M, et al. Prospective evaluation from single centre of pregnancy in women with CHD. Int. Journal Cardiol. 2009; 131: 257-64.
15. Drenthen W, Pieper PG, Ploeg M, et al. Risk of complications after pregnancy in after Senning or Mustard Repair of Complete Transposition of the Great Arteries. Eur Heart J. 2005; 26: 2588-95.
16. Oakley CM. Pregnancy and congenital heart diseases. Heart. 1997; 78: 12-4.
17. Arora N, Kisar H, et al. Congenital heart disease in pregnancy in a low- income country. Int J Gynecol Obstet. 2015; 128: 30 – 2.

Briji S Panicker [1], Sheila Balakrishnan [2]

[1] Assistant Professor, Department of Obstetrics and Gynaecology, Jubilee Mission Medical College and Research Institute, Thrissur, Kerala, India; [2] Additional Professor, Department of Obstetrics and Gynaecology, Government Medical College, Thiruvananthapuram, Kerala, India.