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Original Research Article

Study of maternal and perinatal outcome in women with congenital heart disease

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ABSTRACT

Background: Pregnancy induced changes in cardiovascular hemodynamics are generally well tolerated. However, the reversible but prolonged hemodynamic stress of pregnancy can have negative effects on the diseased heart. In our study we studied various uncorrected and corrected congenital cardiac lesions and their antenatal, intrapartum course, their ability to withstand labor and postpartum complications.

Methods: Our study was a retrospective observational cross-sectional study conducted at KEM hospital, Mumbai with enrolment of total 27 subjects over a period of 18 months between August 2020 to December 2021. The study included all the registered and emergency patients either post-abort or post-delivery with congenital cardiac diseases including the ones who were surgically corrected.

Results: The present study was conducted to study demographic features and maternal and perinatal outcomes of pregnancy in these women. Majority of the subjects were diagnosed with heart disease at the age more than 20 years (40.74%) and very few at age less than 5 years. In the present study only 7.4% study subjects were aware about pre-marital counselling, and preconceptional counselling. Among the lesions ASD was commonest reported among 51.85% study subjects. ICU admission was required among 11.11% study subjects. Labour analgesia given to only 18.52% study subjects. We did not observe any association between surgically corrected CHD and ICU admissions, postnatal complications, and outcomes, $p > 0.05$.

Conclusions: This study concluded that pre-pregnancy diagnosis, counselling, appropriate referral, routine antenatal supervision and delivery at an equipped centre improve the overall outcomes.

Keywords: CHD, RHD, IHD, ASD

INTRODUCTION

ACHD is associated with a higher risk of maternal morbidity and mortality and increased risk of preterm birth, small-for-gestational-age (SGA) birth weight, and perinatal mortality.^{1,2} The risk of cardiovascular complications during pregnancy and peripartum depends on the type of the underlying defect, the extent and severity of residual hemodynamic lesions and comorbidities.³⁻⁵ Careful individualized multidisciplinary pre-pregnancy risk assessment and counselling including

assessment of risks in the offspring and long term outcomes of the underlying heart defects not only enables making informed decision but better antenatal, intranatal and postnatal care.⁶⁻⁹

The outcome of pregnancy and delivery is favorable in most women with CHD provided that functional class and systemic ventricular function are good.¹⁰ Comparing with other structured heart diseases, CHDs represent the most common cause of maternal morbidity. Better assessment and management of this group of patients is likely to make

a substantial improvement in outcomes for the mother and fetus.¹¹⁻¹⁴ There is a small group of patients with complex CHD or high-risk CHD in whom pregnancy is either dangerous or contraindicated owing to the very high-risk to the mother and fetus.^{15,16} If pregnancy occurs and continues in these patients, they should be managed and delivered in specialized centers with multidisciplinary expertise.¹⁷ A painless vaginal delivery or an assisted delivery is usually feasible and is preferable for women with CHD especially in moderately severe heart disease. Medications should be used only when necessary in any pregnant women with CHD. Certain medications are contraindicated during pregnancy, therefore those should be discontinued before pregnancy or early during pregnancy.¹⁸ Breast-feeding is feasible in most women with CHD, however, women requiring cardiovascular medications should be aware that many of the medications will be secreted in the breast milk and should clarify the potential effect of medications on the infant with a pediatrician.¹⁹ In women with complex CHD, progression and deterioration of functional changes during pregnancy and postpartum may be attributable to the longevity pattern of the CHD.²⁰⁻²⁴

In management of women with CHD and pregnancy, following points are mandatory: counselling and risk assessment; preconception medication and surgical adjustments, catheter intervention, arrhythmia ablation, or reparative surgery if feasible; maternal and fetal monitoring including fetal echocardiography; planning for labor and delivery, in women with more than moderate CHD, multidisciplinary approach is preferable; and cardiac monitoring and follow-up after post-partum period.

METHODS

For 99% confidence interval sample size was 27 With 10% attrition chance; a rounded of number of 30 was taken. We enrolled all patients in the duration between October 2019 to October 2021. We did a retrospective observational cross sectional study. We enrolled the participants from the gravid women who deliver or abort (spontaneously or by MTP) in King Edward Memorial Hospital in Mumbai

(including referrals and transfers from periphery). However, those with cardiac diseases such as ischemic heart disease, RHD, Cardiomyopathies were excluded from the study. Also, those with concurrent medical conditions thought to increase the cardiopulmonary load were excluded from the study. In retrospective cases (from the time of proposal submission till LOP), data was collected from case records of the patients with CHD in obstetric services. The study was conducted over a period of 2 years from the date of submission. The study began after permission from the institutional ethics committee. All women found to have congenital heart disease and fulfilling inclusion criteria were enrolled for this study after explaining them the study objectives and procedure and having taken a written informed valid consent from them.

The enrolled women were offered a structured questionnaire asking about their current obstetric details including details of cardiology OPD visits after antenatal registration if any, previous obstetric history in details with history of cesarean section if any and anaesthetic interventions in previous pregnancies All these data were recorded in the case record form. A detailed analysis of all the parameters were done including their perinatal outcomes including perinatal losses or live births with congenital cardiac defects or early pregnancy losses, and the postpartum maternal outcomes including need for cardiology intervention or need for intensive care.

Statistical analysis

Descriptive analysis was done in the form of calculation of mean, median, mode. Chi-square test used as test of significance.

RESULTS

Majority of the study subjects belonged to the age group of 20-29 years (86%), followed by 30 to 35 years (10%). Majority were primigravidae (48%), followed by 46% had 2 pregnancies, 3% had 3 and 4 pregnancies each. In the present study we assessed Education of study subjects.

Table 1: Correlation of educational status of patients with their pregnancy and birth planning.

Parameters	Education N (%)			
	Illiterate	Primary	Secondary	Graduate and above
Age at diagnosis (years)	9	15.57	15.81	14
Surgical treatment of heart disease	2 (100)	1 (14.28)	9 (75)	2 (33.33)
Premarital counselling	0	0	2 (16.66)	0
Pre-conceptstional counselling	0	0	1 (8.33)	1 (16.66)
ANC registration	2 (100)	4 (57.14)	12 (100)	6 (100)
Acceptance of contraception	0	0		

We observed that majority completed secondary education (44.44%), followed by primary education among 25.93%. Regarding Consanguinity among the study subjects. We

observed that 11.11% subjects had consanguineous marriage. Regarding socio economic distribution, majority of subjects belonged to lower middle class (as per modified kuppuswamy scale).

Table 2: Signs of failure among different heart lesions.

Type of heart lesion	Clinical presentation N (%)				ICU admission
	Breathlessness	Palpitations	Syncope	Chest pain	
ASD	2 (14.28)	1 (7.14)	1 (7.14)	1 (7.14)	1 (7.14)
VSD	2 (33.33)	1 (16.66)	0	0	0
PDA	1 (100)	1 (100)	0	0	0
TGA	2 (100)	2 (100)	0	1 (50)	1 (50)
TOF	1 (50)	1 (50)	0	1 (50)	1 (50)

Table 3: Table depicting correlation of 2d echo findings, complications and need for ICU Admission in patients with surgically corrected vs. uncorrected congenital heart lesions.

Echo findings and complications	No cardiac surgery	Surgery done	
2d Echo during pregnancy	Grades of residual shunt	13	14
	Mild residual shunt	8	11
	Moderate residual shunt	3	3
	Severe residual shunt	2	0
Heart failure	3	0	
ICU admission	3	0	

About 11% were diagnosed at birth whereas majority about 41% of the subjects were diagnosed at age more than 20 years.

Table 4: Symptoms observed during various periods of pregnancy.

Symptoms observed during period of pregnancy	N	%
1st trimester	3	11.11
2nd trim	6	22.22
3rd trim	3	11.11
Postnatal	3	11.11

Table 5: CVS /RS examination findings amongst subjects.

CVS/RS examination	N	%
Murmur	17	62.96
Basal crepitations	4	14.81

In the present study we observed that pre-marital, pre-conceptual counselling was conducted among 7.41% study subjects and 88.89% subjects were registered for ANC checkups. However, the deficiency of this category; amongst the 4 out of 27 patients who received pre-conceptual counselling, there was no increased incidence of contraception usage or antenatal checkups and no difference in incidence of ICU admissions or perinatal complications. In the present study we assessed Surgery done among the study subjects. We observed that surgery was conducted among 51.85% study subjects. Hence no significant correlation between those who had no surgical correction and greater need for ICU admissions was found, p value>0.05.

Table 6: Correlation between use of labor analgesia and obstetric outcomes in terms of vaginal delivery and LSCS.

Number of patients who received labor analgesia (Epidural anaesthesia)	Outcome	
	Vaginal delivery	LSCS
6 subjects	2	4
	Indications of LSCS	N
	Foetal distress	3
	Non progress of labor	1

Table 7: Correlation between maternal and foetal CHD findings.

N	Type of congenital heart lesion in patient	Foetal 2d Echo finding
1	VSD	AVSD (complex cardiac anomaly)
1	VSD	VSD

In the present study we assessed general examination among the study subjects. We observed that pallor was found in 51.85% study subjects, cyanosis among 11.11% study subjects, clubbing was noted among 7.41% study subjects, JVP raised was reported among 11.11% study subjects, edema was reported among 22.22% study subjects.

Table 8: Table depicting mode of delivery.

Mode of delivery	N	%
NVD	11	40.7
Vacuum	1	3.7
Forceps	4	14.81
LSCS	11	40.7
Total	27	100.00

Table 9: LSCS and its indications in subjects.

LSCS	N	Indication of LSCS
Elective LSCS	2	Previous LSCS not willing for trial of labor after cesarean
	1	Transverse lie at term
	1	Placenta previa
	1	Breech presentation
Emergency LSCS	3	Foetal distress
	2	Non progress of labor
	1	Failure of induction

Table 10: Statistical correlation between post natal complications in patients with surgically corrected vs. uncorrected lesions.

Post natal complications	Surgery done	
	Yes	No
Yes	2	1
No	12	12
Total	14	13
Significance	p>0.05	

Table 11: Statistical correlation between NND in patients with surgically corrected vs. uncorrected lesions.

NND	Surgery done	
	Yes	No
Yes	0	1
No	14	12
Total	14	13

In the present study we assessed ejection fraction among the study subjects. We observed that less than 60% ejection fraction was observed among 14.81% study subjects. In the present study we assessed occurrence of MR/AR/TR among the study subjects. We observed that AR was reported among 7.41% study subjects, AR+PS was reported among 3.70% study subjects, MR was reported among 25.93% study subjects, MR+AR was reported among 3.70% study subjects, PR+TR was reported among 3.70% study subjects, TR was reported among 18.52% study subjects, TR+MR was reported among 3.70% study subjects. In the present study we assessed residual shunt among the study subjects. We observed that mild residual shunt was reported among 44.44% study subjects, moderate residual shunt was reported among 22.22% study subjects, severe residual shunt was reported among 7.41% study subjects. About

admission to ICU among the study subjects, we observed that ICU admission was required among 11.11% study subjects. Regarding labor analgesia among the study subjects it was found that labour analgesia was given to 18.52% study subjects. Hence no significant relation between use of labor analgesia and increased incidence of LSCS for Labor abnormalities protracted labor or arrest of labor OR Foetal distress could be noted. Although no patient suffered intrapartum or postpartum cardiac failure but the use of epidural to prevent the cardiac overload due to pain induced release of catecholamines should be encouraged. Out of 27; only 2 patients had foetal 2d echo suggestive of CHD. Hence foetal 2 d echo advisable for these patients to look for congenital cardiac anomaly in babies. In the present study we assessed trend of abortions among the study subjects. 1 subject-induced abortion in view of high risk of threat to maternal life. 6 pts had history of prev 1 abortion sporadic unrelated to cardiac cause, 3 pts had history of prev 2 abortions unknown cause. In the present study we assessed no. of NND among the study subjects. We observed that 3.7% had NND-1 patient, cause late onset sepsis. In the present study we observed that 44.44% had underwent LSCS. Acceptance of Contraception among the study subjects. We observed that inj. DMPA was accepted among 22.22% study subjects, CUT among 7.41% study subjects, Tubal ligation among 25.93% study subjects and barrier among 37.04% study subjects. Post natal complications were noted among 14.81% study subjects.

DISCUSSION

Cardiac disease has remained the leading cause of maternal mortality since the 2000 to 2002 triennium and these women present a challenge to manage to anaesthetists, obstetricians, and cardiologists, and there are increasing numbers of patients with more complex disease surviving to adulthood. Due to the advances in modern imaging, surgical techniques, and postoperative care, the survival of patients with CHD has improved significantly.

The present study was conducted to study demographic features of women with congenital heart disease. To study maternal and perinatal outcome of pregnancy in women with congenital heart diseases and to study the pregnancy and family planning related choices of the couples with maternal congenital heart disease. Khan et al in their study observed that the mean age of women with heart disease was 27.58±5.6 years and the mean age of controls were 25.14±4.825 years (p>0.05).²⁵ The maximum number of cases were multigravida 50.91% and 52.73%, followed by primigravida 38.18% and 40% both in the cases and the control group respectively (p>0.05). In the western population, various studies proved that the principal cardiac lesion was congenital. Siu et al recorded congenital lesions in 445 pregnancies (74%), acquired in 127 pregnancies (22%), and arrhythmic in 27 pregnancies (4%).²⁶ Khan et al in their study observed that the most frequently involved valve was mitral valve (47.27% of all cases) followed by aortic 21.81%. The most widespread

congenital lesion was ventricular septal defect (VSD) (16.36%). A total of 10 (18.18%) patients had undergone corrective cardiac surgery. Atrial septal defect (ASD) closure was most common corrective surgery done (9.09%).

In comparison to previous Indian studies on the topic, interesting finding of Khan et al study is that congenital heart disease constituted the most commonly encountered lesion (49.09%) followed by RHD (41.83%). Peripartum cardiomyopathy was observed in 7.27% of cases and arrhythmia (Wolff-Parkinson-White syndrome) was present in 1.82%. However, there were no patients with ischaemic heart disease. In the present study we assessed Surgery done among the study subjects. We observed that surgery was conducted among 51.85% study subjects. Khan et al in their study observed that, a total of 10/55 (18.18%) patients had undergone corrective cardiac surgery. ASD closure was most common corrected heart lesions (9.09%). In another study, a total of 1321 cases were studied and 65.85% of the patients, had surgical intervention done (579 for congenital lesion and 291 valvular interventions). In the present study we assessed occurrence of MR/AR/TR among the study subjects. We observed that AR was reported among 7.41% study subjects, AR+PS was reported among 3.70% study subjects, MR was reported among 25.93% study subjects, MR+AR was reported among 3.70% study subjects, PR+TR was reported among 3.70% study subjects, TR was reported among 18.52% study subjects, TR+MR was reported among 3.70% study subjects. Khan et al in their study observed that the most common valvular lesion was found to be mitral regurgitation (34.5%), followed by mitral stenosis (10.91%). In the present study we assessed labor analgesia among the study subjects. We observed that labour analgesia was required among 18.52% study subjects. Khairy et al in their study observed that spontaneous abortions occurred in 11 pregnancies at 10.8±3.7 weeks, and 7 underwent elective pregnancy termination. There were no maternal deaths.²⁷

Khan et al in their study observed that There was no significant association found between the two groups in term of mode of delivery ($p=0.4415$). However, the proportion of instrumental delivery was higher among the cases than in the controls with $p=0.0296$. Khairy et al in their study observed that primary maternal cardiac events complicated 19.4% of ongoing pregnancies, with pulmonary edema in 16.7% and sustained arrhythmias in 2.8%. Univariate risk factors included prior history of heart failure, NYHA functional class ≥ 2 (OR, 5.4), and decreased subpulmonary ventricular ejection fraction. They concluded that Maternal cardiac and neonatal complication rates are considerable in pregnant women with congenital heart disease. Patients with impaired subpulmonary ventricular systolic function and/or severe pulmonary regurgitation are at increased risk for adverse cardiac outcomes. Khan et al in their study observed that out of 52 pregnancies among cases only 88.46% had live birth. This is in contrast to controls where 100% had live

birth. The foetal outcome was better in controls and showed a statistical significance with p value of 0.0113. There was more neonatal intensive care unit (NICU) admission among the cases (15.38%) vis-a-vis controls (7.27%), (p value 0.2284). The most common indication for NICU admission was prematurity (38%) among the case and Neonatal jaundice (25%) in the controls. There was no neonatal mortality. There were 6 (11.53%) intrauterine foetal death cases among cases and none in control group (p value 0.0113). Similar study was conducted by Puri et al where 86% had live birth and 14% had stillbirths.²⁸

On the contrary western literature showed lower foetal mortality due to better antepartum and intrapartum care. The maternal mortality is used as a measure of the quality of a healthcare system. With the increase in prevalence of heart diseases in pregnant women, it has emerged as an important cause of maternal mortality especially so in the developing countries. In the present study we did not reported any maternal mortality. Khan et al in their study observed that heart disease was attributed in 10.34% of cases of maternal mortality. Konar et al stated that heart diseases associated with pregnancy accounted for 15% of pregnancy related mortality.²⁹ Multidisciplinary approach with careful monitoring of high risk cases which is apparently the reason for lesser number of women dying due to cardiac related causes at our institute. In the present study we assessed Post natal complications among the study subjects. We observed that post-natal complications were noted among 14.81% study subjects. Khairy et al in their study observed that adverse neonatal outcomes occurred in 27.8% of ongoing pregnancies and included preterm delivery (20.8%), small for gestational age (8.3%), respiratory distress syndrome (8.3%), intraventricular hemorrhage (1.4%), intrauterine fetal demise (2.8%), and neonatal death (1.4%). In this study when we analysed Comparison between ICU admissions and surgery done. We did not find any association between surgery done and ICU admissions, $p>0.05$.

In this study when we analysed Comparison between postnatal complications and surgery done. We did not find any association between surgery done and postnatal complications $p>0.05$.

CONCLUSION

Overall general outcomes in patients with congenital heart disease are better with multidisciplinary management and neonatal outcomes are also satisfactory without added small for gestation age babies. Hence to conclude Preconceptional counselling and cardiac assessment before the onset of pregnancy should be a must as a part of care of these patients and for patients with complex cardiac diseases, the management should definitely start preconceptionally to avoid serious complications.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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