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Original Article

Foetomaternal Outcome In Heart Disaese During Pregnancy

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ABSTRACT

The incidence of cardiac disease in pregnancy is around 1%. Pregnancy complicated with cardiac disease is associated with increased risk of maternal morbidity & mortality. This study was conducted at Department of Obstetrics & Gynaecology, Government Medical College, Kottayam from September 2020 for one year. It was a prospective observational study done in 97 women who satisfied the inclusion criteria. Patients were classified as per modified WHO (World Health Organisation) pregnancy risk scoring.84.5% belonged to the age group of 20-34 years. Valvular heart disease(VHD) constituted 52.6% and congenital heart disease(CHD) 41.2%. Among VHD, mitral stenosis was most common, 23.5%.WHO class I,II,III&IV constituted 37.1%, 37.1%, 15.5% &10.3% respectively. Among 97 patients, 10 (10.3%) had to undergo MTP,31 (31.9%) underwent LSCS &56 (57.7%) underwent normal labour. The incidence of preterm labour was 5.7%, hypertension 11.5% and IUGR 8% which were more in WHO class IV. Congestive cardiac failure was the common complication which was observed in 4.1% of cases again observed in WHO risk IV cases.18 babies had birth weight less than 2500 g(20.7%). Low APGAR score<7 was observed in 5.7% of newborn and 5.7% of required NICU admission which was found to have significant association to modified WHO risk classification.1 case of stillbirth was observed (1.1%). There was no neonatal death. The incidence of congenital heart disease in neonate among patients with CHD was 5%.There was one case of maternal death.

Key Words: *Valvular Heart Disease, Congenital Heart Disease, WHO(World health Organisation) risk classification, Congestive Cardiac Failure, Preterm labour, IUGR*

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INTRODUCTION

Cardiovascular disorders are one of the important non obstetric cause of maternal morbidity & mortality[1].In India cardiac disease complicates 2% of pregnancies and contributes to one fifth of all maternal deaths[2].There are two groups of heart disease namely congenital and acquired heart disease. The acquired heart disease includes valvular heart disease (VHD),cardiomyopathies and ischemic heart disease. Congenital heart disease (CHD) is the major type seen in developed countries[3].

The cardiac output increases by 40- 50% during pregnancy and further in labour. This poses additional stress to a diseased heart leading to complications and death. More patients with complex heart disease are now reaching reproductive age due to newer therapeutic options. Development of anaemia, preeclampsia and preterm labour can further worsen the outcome[4].This study was conducted to find out the association of severity of heart disease as per modified WHO risk score[5] and foetomaternal outcome.

AIMS AND OBJECTIVES

1. To estimate the foetomaternal outcome in heart disease complicating pregnancy as per modified WHO risk score
2. To estimate the types of heart disease

MATERIALS AND METHODS

The study was conducted in the Department of Obstetrics & Gynaecology, Government Medical college, Kottayam for a period of one year from September 2020 after getting approval from Institutional Review Board (IRB No:61/2020). It was a prospective observational study.

Sample size was calculated based on study by Salam et al[5]. According to this study, the proportion of women with heart disease with low birth weight was 27.8%.

$N = Z\alpha^2 PQ/d^2$

$Z\alpha = 1.96$(at 5% alpha error)

$P = 27.8\%$

$Q = 100 – P = 72.2$

D = Relative precision 20% of P = 5.56

Sample size = 250

Due to covid 19 pandemic and restricted admissions, the calculated sample size could not be achieved. Hence only 97 patients could be included in the study.

Inclusion criteria

1. All pregnant women with heart disease which was previously diagnosed or diagnosed during pregnancy
2. All referred cases of heart disease complicating pregnancy in the intrapartum & postpartum period.

Exclusion criteria

1. All patients with symptoms of heart disease, where heart disease was excluded after evaluation
2. All patients with cardiac failure due to noncardiac causes.

All patients were evaluated with detailed history, general, cardiovascular and obstetric examination. Functional grading was done according to NYHA classification. The patients were grouped as per modified WHO risk scoring. All patients were evaluated by cardiologist by ECG & ECHO cardiography. Combined management decisions were taken according to the severity of disease. The pregnant patients chosen for continuation of pregnancy were followed up under joint supervision of obstetrician and cardiologist. Antepartum, intrapartum and postpartum events were observed. The maternal variables noted were type of heart disease, gestational age at delivery, cardiac and obstetric complications in different WHO groups. The foetal variables noted were birth weight, APGAR score, NICU admissions, still birth &neonatal death. Patients were discharged after a minimum of 5 days after delivery. Details were entered in the proforma.

Data analysis was done using IBM SPSS software version 2020. Chi Square test was applied to check the association between the severity of heart disease and maternal & foetal outcome. The results were evaluated with a significance level of $p< 0.05$

RESULTS

Total 97 patients satisfying inclusion criteria were studied.

Table 1: Age distribution

Age group	Frequency	Percentage
≤ 19	2	2.1
20- 24	36	37.1
25- 29	22	22.7
30- 34	24	24.7
35-39	10	10.3
≥ 40	3	3.1
Total	97	100

Majority of patients (37.1%) belonged to 20-24 years age group. 44 (45.4%) were primigravida, 38 (39.2%) primipara, 12 (12.4%) multiparous patients, 2 nulliparous patients and 1 was grandmultipara.

Table 2: Type of Heart disease

Type of heart disease	Frequency	Percentage
Congenital heart disease	40	41.2
Valvular heart disease	51	52.6
Cardiomyopathies	1	1.0
Arrhythmias	4	4.1
Coronary artery disease (CAD)	1	1.0
Total	97	100

Valvular heart disease (VHD)was found to be more frequent (52.6%) followed by congenital heart disease (41.2%). Mitral Stenosis (MS) was the commonest VHD (12 patients,23.53%) followed by Mitral Regurgitation (MR), with 7 patients (13.73%). 5 patients (9.8%) had Tricuspid Regurgitation (TR) and one patient had Aortic Regurgitation (AR). The majority of patients had different combinations of valvular lesions like MS+MR, MS+AR, MR+AR, MR+MVP, MR+TR& TR+MVP(total 26 patients 50.19%).

Out of 40 Congenital heart disease(CHD) patients 24(60%) were having Atrial Septal Defect (ASD). 6 (15%) had Ventricular Septal Defect (VSD). Tetralogy Of Fallot(TOF) was identified in 2 patients, complex heart disease in 2, Pulmonary stenosis(PS) in 4 and bicuspid aortic valve in 2 patients.

50 (51.5%) patients were diagnosed to have heart disease prior to pregnancy. 46(47.42%) were diagnosed during pregnancy. In 1 patient the diagnosis was made postpartum.

Table 3: NYHA Classification of participants

NYHA CLASS	Frequency	Percentage
CLASS I	78	80.4
CLASS II	14	14.4
CLASS III	2	2.06
CLASS IV	3	3.1
Total	97	100

Majority of patients in NYHA class I & II were booked cases except 5 patients. All cases of NYHA class III & IV were unbooked and had irregular antenatal care.

Table 4: Distribution of participants according to Modified WHO risk scoring

WHO Risk Class	CHD n = 40	VHD n = 51	Cardiomyopathy n = 1	Arrhythmias n =4	CAD n = 1	Total n = 97
Class I	28(70%)	8(15.7%)	0	0	0	36(37.1%)
Class II	9(22.5%)	23(45.1%)	0	4 (100%)	0	36(37.1%)
Class III	2 (5%)	12 (23.5%)	1 (100%)	0	0	15(15.5%)
Class IV	1 (2.5%)	8 (15.7%)	0	0	1(100%)	10(10.3%)

Majority of CHD & VHD patients belonged to WHO risk class I & II. The case of CAD had severe left ventricular dysfunction. Among the VHD in WHO class IV were 6 cases of severe MS with severe left heart obstruction, one case of severe MR and moderate AR with NYHA class IV and one case of severe MS with pulmonary artery hypertension (PAH). CHD in WHO class IV was a case of complex heart disease (VSD+ ASD+ PS+ TOF+ Dextrocardia) with severe left heart obstruction.

33(34.02%) cases had history of prior cardiac surgery. 20 cases had done ASD repair/closure, 4 cases with VSD repair,2 cases with TOF correction, 3 patients with mitral valve replacement, 2 cases with mitral valvuloplasty,2 cases with bidirectional shunt procedures for complex heart disease.

Table 5: Association between modified WHO risk and pregnancy outcome

Pregnancy outcome Total = 97	Class I n = 36	Class II n = 36	Class III n = 15	Class IV n = 10	p
Vaginal Delivery n = 56 (57.7%)	24(66.7%)	23(63.8%)	7(46.6%)	2(20%)	0.001
LSCS (Lower Segment Caesarean Section) n = 31(40%)	12(33.3%)	11(30.5%)	3(20%)	5(70%)	
MTP(Medical Terminationof Pregnancy) n = 10 (10.3%)	0	2(5.6%)	5(33.3%)	3(30%)	

It can be noted that the rate of LSCS &MTP are significantly increased in WHO class III & IV groups. Out of the 10 patients who underwent MTP 6 of them had severe MS, one had MS+ MR, one had MS+ AR, one patient had complete heart block and one had bicuspid aortic valve. All were first trimester MTPs. The rest 34 cases of WHO class II, 10 patients of class III and 7 patients of class IV were followed up. All patients in WHO class III & IV and 10 patients from class II underwent forceps delivery (21.8%)

Table 6: Association between WHO risk classification and gestational age at delivery

Category	Class I n = 36	Class II n = 34	Class III n = 10	Class IV n = 7	p value
Preterm <37 weeks n = 6 (6.9%)	2 (5.6%)	2 (5.9%)	0	2 (28.6%)	0.177
Term >37 weeks n = 81(93.1%)	34 (94.4%)	32 (94.1%)	10(100%)	5(71.4%)	

In class IV both were extreme preterm deliveries where LSCS were done for unstable maternal cardiac status. But the association was not found to be statistically significant.

Table: Association between obstetric complications and Modified WHO risk classification

Obstetric complication	Class I n =36	Class II n = 34	Class III n = 10	Class IV n = 7	p value
Preterm labour n = 5 (5.7%)	2 (5.6%)	2 (5.9%)	0	1 (14.2%)	0.326
IUGR n = 7 (8.0%)	1 (2.8%)	3 (8.8%)	1 (10%)	2 (28.6%)	0.122
Hypertensive Disorders n = 10 (11.5%)	5 (13.9%)	3 (8.8%)	1 (10%)	1 (14.2%)	0.952
Gestational Diabetes n = 9 (10.3%)	5 (13.9%)	2 (5.9%)	1 (10%)	1 (14.2%)	0.853
Hypothyroidism n = 5 (5.7%)	2 (5.6%)	1(2.9%)	1 (10%)	1 (10%)	0.561
Postpartum Haemorrhage n = 1 (1.1%)	1 (2.8%)	0	0	0	1
IUGR+ Preterm n = 1 (1.1%)	0	0	0	1 (10%)	0.08

None of the obstetric complications had any significant association to risk classification of heart disease.

Table7: Association between WHO risk classification and cardiac complications during pregnancy

Cardiac complication	Class I n =36	Class II n = 36	Class III n = 15	Class IV n = 10	p value
Congestive cardiac failure (CCF)	0	0	0	2 (20%)	<0.001
Pulmonary Artery Hypertension	0	0	0	1 (10%)	
CCF& Cardiac arrest	0	0	0	1 (10%)	
None	36 (100%)	36 (100%)	15 (100%)	6 (60%)	

All patients who had significant association between severity of heart disease and cardiac complications were having valvular heart lesions.

Table 8: Association between modified WHO risk classification and foetal outcome

Variables	Categories	Class I n = 36	Class II n =34	Class III n = 10	Class IV n = 7	p value
Birth weight	<2.5 kg	5(13.9%)	7(20.6%)	2(20%)	4(57.1%)	0.095
	≥ 2.5 kg	31(86.1%)	27(79.4%)	8(80%)	3(42.9)	
Birth status	Live birth	36(100%)	34(100%)	10(100%)	6(85.7%)	0.009
	Still birth	0	0	0	1(14.3%)	
1 minute APGAR	8 - 9	35(97.2%)	33(97.1%)	10(100%)	4(57.1%)	0.001
	<7	1(2.8%)	1(2.9%)	0	3(42.9%)	
NICU admission	Yes	2(5.6%)	1(2.9%)	0	2(28.6%)	0.049
	No	34(94.4%)	33(97.1%)	10(100%)	5(71.4%)	
Congenital Heart disease	Present	0	1(2.9%)	0	1(14.3%)	0.100
	Absent	36(100%)	33(97.1%)	10(100%)	6(85.7%)	

One case of still birth occurred to mother having severe MS with CCF who belonged to WHO risk class IV. The incidence of low APGAR score was found to be more in WHO class IV which was found to be significant. One mother had thick meconiumstained liquor and one was extreme preterm and one baby had APGAR score 0, fresh still born whose mother expired due to cardiac decompensation at 33 weeks of gestation.

Table 9: Association between maternal death and WHO risk classification

Maternal death	Class I n = 36	Class II n = 36	Class III n = 15	Class IV n = 10	p value
Yes	0	0	0	1(10%)	0.032
No	36(100%)	36(100%)	15(100%)	9(90%)	

One case of maternal death occurred in an unbooked second gravida with no history of antenatal care at 33 weeks 2 days of gestation. She presented with acute CCF with MS. Emergency LSCS done in view of unstable cardiac status. She developed intraoperative cardiac arrest and was on mechanical ventilation, inotropic support, betablockers and diuretics, but did not survive. The association was found to be significant.

DISCUSSION

The present study on foetomaternal outcome in heart disease complicating pregnancy was conducted at Department of Obstetrics and Gynaecology, Government Medical College, Kottayam for one year starting from September 2020. The calculated sample size of 250 could not be achieved due to restrictions of covid pandemic. Total 97 patients were included in the study.

In this study, 84.5% of patients belonged to the age group 20-34 years.45.4% were primi gravidas and 39.2% were primiparas. Majority were booked cases (87.6%). Similar results were observed in the study by Salam Set al[6]. 80.4% of cases of present study belonged to NYHA Class I who were booked cases. Those belonged to NYHA Class III &IV (5.16%) were un booked cases with irregular antenatal care. In the study by Pandey K et al[7]66.6% were booked cases and 71.8% belonged to NYHA class I & II. Patients were classified according to modified WHO classification. 74.2% belonged to WHO class I & II,25.8% belonged to class III & IV. Santacesarea[8]et al in their study reported that 68% of cases were in WHO class I & II,32% in III& IV. This stresses the role of regular antenatal care and multidisciplinary care in the management of heart disease patients during pregnancy to improve the functional class.

Valvular heart disease constituted 52.6% in which MS (23.3%) was the commonest lesion. CHD accounted for 41.2% of cases among which ASD (62.5%) was the commonest. This result was consistent with the other studies by Mainak Sen et al[9] & Mehta LR et al[10]. In contrast to these findings, in the study by Dina Aisha Khan et al[11]CHD

constituted 49.9% and RHD 41.8% of heart disease. CHD was the commonest form of heart disease in western world as per Canadian Cardiac Disease in Pregnancy(CARPREG) registry (74%) and European Registry on Pregnancy and Cardiac Disease (ROPAC) registry[12]. However in developing countries like India, VHD is common probably of rheumatic in origin which is proved by many studies[13]. This could be due to the neglected streptococcal infections with inadequate treatment.

Out of 97 cases, 10 patients underwent MTP which were in WHO class III &IV. 87 patients continued the pregnancy. Majority of WHO Class I,II & III underwent vaginal delivery (66.7%, 63.8%, 46.6% respectively). Except for WHO class IV, all LSCS were done for obstetric indications. In the study by Bhatla et al[13],79.9% had vaginal delivery and 24.45% underwent instrumental delivery. LSCS (20.29%) were done for obstetric indications. Majority of vaginal delivery was at term gestation in our study (93.1%)

The extreme preterm delivery in 3 patients occurred in WHO class IV which could be due to maternal hypoxia. The rate of preterm delivery in our study was 6.9% which was lower than in other studies, Mainak et al (15%) &Suwanrath et al[14] (16.6%). The incidence of hypertensive disorders, gestational diabetes, IUGR and preterm labour was observed more in WHO class IV though statistically not significant.

The incidence of cardiac complication was 4.1%(4 patients) in the present study. All cases belonged to WHO class IV. The common complication was CCF. This was associated with anaemia in one case and frequent infections in one case. Except for one patient, all others were cases with irregular ANC. All had valvular heart disease. The increase in intravascular volume during pregnancy results in increased in left atrial pressure and increased pulmonary venous filling in patients with MS or MR. This in long run leads to pulmonary artery hypertension. In presence of anaemia or infection, CCF may easily set in such patients. Moreover, atrial fibrillation in patients with severe MS and PAH leads to right heart failure, CCF and systemic thromboembolism[14, 15, 16]. In the study by Pandey et al the incidence of cardiac failure was 19.6%. The lower incidence of CCF in our study could be due to the lesser number of cases than calculated sample size. Ruys et al[17] observed that the rate of heart failure was 13.1%. 14% had peripartum cardiomyopathy. The incidence of cardiomyopathy in our study was less which could be due to inadequate sample size.

The incidence of IUGR, prematurity and low APGAR score was higher in WHO class IV group. Hemodynamic compromise in severe stenotic lesions may be the cause for IUGR. Prematurity was the predominant cause for NICU admission. Similar observations were made in other studies too[8, 14,15]

CONCLUSION

This study concludes that valvular heart disease is still the predominant cardiac lesion in Kerala. Favourable outcome in patients with heart disease depends on socio demographic factors, functional capacity of heart, good antenatal care and multidisciplinary approach in management of pregnancy. This study also confirms that modified WHO risk classification is a useful tool for predicting cardiovascular risk and risk of adverse pregnancy outcome.

CONFLICTS OF INTEREST: No conflicts of interest to be declared.

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