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Study of maternal and neonatal outcome in pregnancy with heart disease

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ABSTRACT

Background: Pregnancy and child birth are part of the human development, which is affected by physical, biological, psychological and social factors. In pregnant women, maternal physiological state adapts to such an extent that it overcomes problems occurring in pregnancy, but still maternal and neonatal mortality and morbidity are seen in present conditions. As new advances in science, technology, research and improved socioeconomic status has given new methods and guidelines to control rate of maternal and neonatal mortality. In developing countries 75% maternal mortality are those resulting from direct obstetric causes and remaining are due to indirect causes like anemia , cardiac disease ,viral hepatitis , etc. In indirect causes, heart disease remains important cause of maternal mortality. Management of heart disease during pregnancy is challenging. Thorough knowledge of the expected natural history of the disease during pregnancy and of the possible treatment options is required for clinical decision making which will prevent maternal and neonatal complications. **Material and Methods:** This study was conducted in Department of Medicine with the help of Department obstetrics and Gynacology, at JIIU" Indian institute of medical sciences & research" Tq.Badnapur, Dist.Jalna.,Maharashtra state, India. From November 2012 to December 2015; consist of 71 women with heart disease in pregnancy admitted during the same period in this hospital. The study included both registered and unregistered cases. All pregnant women who attended antenatal clinic and found to have heart disease were referred to physician from Department obstetrics and Gynacology. After confirmation of diagnosis and grading of heart disease as per NYHA classification all patients were routinely followed with required investigation like electrocardiography, echocardiography, and chest radiography. Patients were followed in antenatal clinic regularly. In antenatal check-up counseling regarding risk of cardiac disease in pregnancy explained to patients and relatives. All patients detail information taken as per study Performa and after all data analyzed in the form of observations and results. **Observation & results:** Prevalence of heart disease in pregnancy was 0.87%. Most of the patients were registered 64 (90.15%) in our hospital or outside hospitals and 9 (9.85%) were totally unregistered. At the time of admission 13% cases were diagnosed as case of heart disease in pregnancy first time. Rheumatic heart disease 54 (76.05%) constituted the commonest type of heart disease. congenital heart disease constituted 11(15.49%) and arrhythmia found in patients 6 (8.45%).Pure mitral stenosis was found as commonest cardiac lesion in 28 cases out of 54 cases (51.85%) followed by mitral insufficiency in 13 (24.07%) patients. Out of 11 congenital heart disease patients atrial septal defect was most common lesion 7(63.63%) followed by ventricular septal defect 2 (18.18%), atrioventricular septal defect 1 (9.09%) and Patent ductus artreriosus in 1 (9.09%) case. According to NYHA classification we had class I 44 (61.77%) cases, class II 10 (14.08%) cases, class III 9 (12%) cases and class IV 8 (11.26%) cases. The most frequent symptom of heart disease in pregnancy was breathlessness 27 (38.02%). followed by cough and palpitations. Anemia and upper respiratory tract infection (URTI) remain most common risk factors. We delivered 18 (25.35%) patients by forceps application. LSCS was done for obstetric indication and none for cardiac reason. Most common indication for LSCS was fetal distress, followed by cephalopelvic disproportion and previous LSCS. Maternal morbidity seen in 30.98% patients. Maternal morbidity in NYHA class III and IV (82%) was six times more than in NYHA class I and II (13%). 5 (7%) patients developed CCF, 3 patients had Atrial fibrillation and 10 patients (14.08%) developed pulmonary edema. Neonatal outcome by Apgar score was four time better in NYHA class I/II as compare to NYHA class III/IV. Neonatal morbidity observed in 55.88% neonates. 27.94% neonates were preterm and 51.47% babies were admitted in NICU after delivery. Neonatal morbidity in NYHA class I and II was 56.60% and 64.28% in NYHA class III and IV. Two mothers with congenital heart disease had offspring with congenital heart disease. Maternal mortality observed in 4 patients out of 71 patients (5.63%) and neonatal mortality observed in 5 neonates (7.35%) out of 68 neonates. Out of 4 patients 3 maternal mortality were occurred in antenatal period and in 1 after 4hrs of delivery. All 4 maternal mortality occurred in NYHA class III and class IV. All four patients had CCF with atrial fibrillation. This maternal mortality were due to low socioeconomic status, illiteracy, lack of advanced facility in grass root level, low living standards and ignorance towards female regarding health issue. **Conclusion:** In conclusion, heart disease in pregnancy is associated with significant maternal and perinatal morbidity in NYHA class III & IV patients. Rheumatic heart disease was the predominant type. Patients in NYHA class I & II had a better maternal and fetal outcome than those in NYHA class III/IV. Surgical correction of the cardiac lesions prior to pregnancy was associated with better pregnancy outcome. Pregnancy in women with heart disease is associated with significantly higher maternal morbidity and adverse fetal outcomes and requires a team approach for optimal management.

Keywords: pregnancy with heart disease, Rheumatic heart disease, maternal and neonatal mortality and morbidity, maternal and neonatal outcome.

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Introduction

Pregnancy and child birth are part of the human development, which is affected by physical, biological, psychological and social factors. In pregnant women, maternal physiological state adapts to such an extent that it overcomes problems occurring in pregnancy, but still maternal and neonatal mortality and morbidity are seen in present condition. As new advances in science, technology, research and improved socioeconomic status has given new methods and guidelines to control rate of maternal and neonatal mortality. In developing countries 75% maternal mortality are those resulting from direct obstetric causes and remaining are due to indirect causes like anemia , cardiac disease ,viral hepatitis , etc. In indirect causes, heart disease remains important cause of maternal mortality [1]. In the last quarter of 20th century, in the developed countries with high quality preventive medicine and improved medical care, surgical correction of the congenital lesions and better obstetric care, the maternal mortality has reduced markedly [2]. **Kung and colleagues** reported that according to the centers of disease control and prevention still heart disease is the leading cause of death in women. Cardiac disorders of varying severity complicate approximately 1% pregnancies and contribute significantly to maternal morbidity and mortality rates. The maternal mortality rate in developing countries like India is still high due to low socioeconomic condition, early marriages; repeated pregnancies which induce stress and strain on cardiac condition which leads to increase in morbidity and mortality due to congestive cardiac failure [3]. In developed countries the incidence of rheumatic heart disease has drastically reduced and congenital lesions has taken over as the leading cause of heart disease[4]. Unfortunately developing countries have not managed to alter the ratio and rheumatic heart disease continues to be the leading cause of heart disease. So heart disease with pregnancy should be managed as team approach involving an obstetrician and cardiologist and other specialists such as anesthesiologist. Every patient should have counseling about optimum time to become pregnant, the effects of pregnancy on the heart condition, the general characteristics of their care during pregnancy, the neonatal, perinatal risks. So firm support, consistent information and reassurance to the patient are important [5].Heart disease in pregnancy also affects the neonatal outcome. There is an increased chance of preterm delivery, IUGR, neonatal ICU admission. The presence of maternal heart disease impacts on the fetus in a number of ways [6]. First, the risk of spontaneous miscarriage and therapeutic abortion is increased in women with heart disease. The offspring of a mother with congenital heart disease are also at increased risk of inheriting a congenital heart disease [7]. The overall risk of the offspring inheriting polygenic cardiac disease is

quoted as 3 % to 5%, compared with a 1% risk in the general population. The risk is, in fact, dependent on the affected parent's condition and there is an increased risk if a previous sibling has been affected [8]. .Certain cardiac medications can adversely affect the fetus. If one parent has congenital heart disease the incidence of congenital heart disease in offspring increases six fold over all [9].Management of heart disease during pregnancy is challenging. Thorough knowledge of the expected natural history of the disease during pregnancy and of the possible treatment options is required for clinical decision making which will prevent maternal and neonatal complications [10].

Methods:

Study design: The study design for our project was a hospital based prospective study. This study design was selected because it is rapid, inexpensive and easy to carry out. This study also allows identification of several etiological factors for heart disease in pregnancy and their management in neonatal outcome in pregnancy with heart disease.

Aim and Objectives:

Aim:
- To Study Maternal And Neonatal Outcome In Pregnancy With Heart Disease.

Objectives:
- To find out prevalence of pregnancy associated with heart disease. .
- To find out type and grading of heart disease.
- To study management of pregnancy associated with heart disease.
- To evaluate maternal and neonatal mortality and morbidity in pregnancy with heart disease.
 To find out measures to prevent complication in pregnancy with heart disease

Study setting:Study duration: The duration of our study was from November 2012 to December 2015.

Sample size: The sample size was restricted to 71 cases.

Ethics: The sample of 71 cases was considered to be sufficient for this study, which adhered to the principles of the Declaration of Helsinki, and was approved by independent ethical committees of our college. We obtained written informed consent in all cases to participate in the study.

Data collection procedure: All patients who fulfilled the inclusion and exclusion criteria were included in this study. The consent was taken from the patients or attendants who were included in the study, for performing the necessary investigations or procedures. A Proforma was prepared which included detailed history, clinical examination and requisite investigations available in our hospital.

Observations and results

Table 1: Prevalence of Heart Disease in Pregnancy

Total no. of delivery	Total no. delivery of heart disease patients	Prevalence %
8140	71	0.87%

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 The prevalence of heart disease in pregnancy in this study was 0.87% .71 cases of heart disease with pregnancy admitted during study period.

Table 2:Registered and unregistered Cases

Groups		No. of patients	Percentage of patients
Registered	Our hospital	44	61.97%
	Outside hospitals	20	28.16%
Unregistered		07	09.85%

Thus most of cases were registered either in our hospital or outside hospitals.44 patients from 71cases were registered in our hospital and taken regular visits. In registered cases from outside hospital, most of them were referred from primary and secondary health care centers for further management.20 patients (28.16%) were registered in outside hospital.7 patients were totally unregistered came directly in labour.

Table 3: Diagnosed and undiagnosed cases at the time of admission

Group	No. of patients	Percentage of patients.
Diagnosed	62	87.32%
Undiagnosed	09	12.68%

At a time of admission 9 cases were diagnosed as case of heart disease in pregnancy first time. During clinical examination by signs or symptoms patients were diagnosed as heart disease and treated and managed considering only as heart disease and latter diagnosis was confirmed by physician consultation and investigations.

Table 4: Age Distribution

Age (in years)	No. of cases	Percentage%
<20	12	16.90%
21-25	45	63.38%
26-30	9	12.67%
31-35	4	0.56%
>35	1	0.14%

Maximum numbers of pregnant cardiac patients 45 from 71 (63.38%) were from 21-25 age group. In this study out of 71 cases12 (17%) patients were from 18-20 age group, 9 (12.67%) from 26-30age group, 4(0.56%) from 31-35 age group, 1(0.14%) from more than 35 year of age.

Table 5: Distribution of parity

Parity	Total No. cases	Percentage of patients
P1	31	43.66%
P2	27	38.02%
P3	10	14.08%
P4	03	4.22%

Maximum no. of cases admitted during study was primigravida followed by second gravid. In this study percentage of patients according to parity were as follow P_1-43%, P_2-38.02%, P_3-14.08%, P_4-04.22%.

Table 6 : Etiology Of Cardiac Disease

Type of heart disease	Total No. of patients	Percentage of patients
Rheumatic	54	76.05%
Congenital	11	15.49%
Arrhythmia	6	08.45%

Out of all cases 54(76.05%) patients had rheumatic heart disease and 11 (15.49%) patients had congenital heart disease and 6 cases had arrhythmia.

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Table 7:Cardiac Lesions In Rheumatic Heart Disease

Cardiac lesion	No. of patients	Percentage of patients
Mitral stenosis	28	51.85%
Mitral insufficiency	13	24.07%
Mitral Stenosis+ mitral insufficiency	4	07.40%
Mitral valve prolapse (MVP)	3	05.55%
Aortic stenosis +Mitral stenosis+ Mitral insufficiency	1	01.85%
Mitral insufficiency +Tricuspid insufficiency	1	01.85%
Mitral insufficiency +Aortic insufficiency + Tricuspid insufficiency	1	01.85%
Aortic stenosis +Mitral insufficiency +mitral stenosis	1	01.85%
Mitral insufficiency +aortic insufficiency	1	01.85%
Mitral insufficiency +mitral stenosis+Aortic insufficiency	1	01.85%

Mitral valve was most commonly involved in rheumatic heart disease .Mitral stenosis was most common lesion involved in 28 Cases out of 54 cases of rheumatic heart disease(51.85%) cases. Mitral insufficiency was next common lesion found in 13 (24.07%) patients.Multiple valve involvement was found in 10 patients in which most of the case presented with signs and symptoms of mitral valve involvement. Isolated aortic valve involvement not found but seen with other associated lesions. Isolated mitral valve prolapse was found in 3 cases (05.55%).

Table 8:Cardiac Lesions in Congenital Heart Disease

Cardiac lesion	No. of patients	Percentage of patients
Atrial septal defect	7	63.63%
Ventricular septal defect	2	18.18%
Patent ductus arteriosus	1	09.09%
Atrioventricular septal defect	1	09.09%

In congenital heart disease atrial septal defect (ASD) was most common lesion. 7 cases out of 11(63.63%) cases of congenital heart disease in pregnancy had ASD. Ventricular septal defect found in 2 cases, atrioventricular septal defect found in one case and patent ductus artreriosus in one case.

Table 9: Different types of arrhythmia

Cardiac lesion	No. of patients	Percentage of patients
Sinus tachycardia	2	33.33%
Complete heart block	1	16.66%
WPW Syndrome	1	16.66%
RBBB	1	16.66%
Sinus tachycardia+ LVH	1	16.66%

In our study 6 patients had arrhythmia especially defect in conduction pathway. Among 6 cases distribution was as follow 1 case of complete heart block, 3 cases of sinus tachycardia, 1case of RBBB, 1 case of WPW syndrome.

Table 10: Functional Class

NYHA class	No. of cases	Percentage of patients
I	44	61.77%
II	10	14.08%
III	9	12.67%
IV	8	11.26%

All patients cardiac status was evaluated according to the classification of New York Heart Association. Most of them i.e. 54 (76%) among 71 patients belong to either class I or class II. 9 (12.67%) patients were from NYHA class III and 8 (11.26%) were belong to NYHA class IV at the time of admission.

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Table 11: Symptoms presented by the patients

Symptoms	No. cases	Percentage
Breathlessness	27	38.02%
Palpitation	10	14.02%
Cough	10	14.08%
Giddiness	07	09.85%
Edema over legs	06	08.45%
Fever	04	05.63%
Chest pain	03	04.22%
Hemoptysis	02	02.81%
Syncope	01	01.40%
Asymptomatic	27	38.02%

Most common symptom was breathlessness 27(38.02%) followed by cough and palpitations. In this study 27 (38.02%) patients had no symptoms regarding heart disease.

Table 12: Signs detected in patients

Signs	No. of cases	Percentage
Murmur	46	64.78%
Pallor	17	23.94%
Tachycardia	13	19.71%
Bilateral basal rales	10	14.08%
Arrhythmia	5	07.04%
Pedal edema	5	07.04%
Cardiomegaly	5	07.04%
Wheeze	2	02.81%
Cyanosis	1	1.40%
Bradycardia	1	1.40%

Most of the cases were diagnosed by presence of murmur on auscultation .46 (65%) patients presented with characteristic murmur of particular lesion on auscultation. Bilateral crepitation was present in 10(14.08%) patients on auscultation suggestive of pulmonary edema .Tachycardia was present in 13 cases and bradycardia was in 1 case. Cyanosis was present in single case. ECG changes showing irregular heart rate and pulse were present in 5 cases. Cardiomegaly was present in 5 cases on clinical and radiographic findings.

Table 13: Associated Risk Factors

Medical and obstetrical risk factor	No. of cases	Percentage
Anemia	17	23.94%
URTI	11	15.49%
Pregnancy induced hypertension	04	05.63%
Twins	03	04.22%
Breech	02	02.81%

In this study anemia and upper respiratory tract infection (URTI) remain most common risk factors .Anemia was present in around 24% patients and URTI found in 11(15.49%) patients.3 cases of twins and 2 cases of breech were seen in this study.

Table 14: Surgery for cardiac pathology

Name of surgery	No. of patients
Pre-pregnancy valvotomy	03
ASD Closure	03
Pacemaker implantation	01
Radio ablation	01
Angioplasty	01

3 patients of severe mitral stenosis underwent balloon mitral valvotomy before pregnancy. 3 patients were operated for septal defect correction surgery before conception. For WPW Syndrome in 1 patient radio ablation was done. Angioplasty was done in one patient for cardiac ischemia before conception.

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Table 15: Medications used in heart disease in pregnancy

Name of medicine	No. of cases	Percentage
Diuretics	10	14.08%
Digoxin	06	08.45%
Beta- blocker	03	04.22%

Digitalis therapy used in 6 patients for management of CCF. T.Digoxin used as digitalis preparation. Diuretics were used in 10 patients for management of pulmonary edema and congestive cardiac failure. Beta blocker used in 3 patients as to control heart rate and arrhythmia.

Table 16: Duration of pregnancy at the onset of labour

Duration of gestation	No. of cases	Percentage
<32 WKS	**12**	**16.90%**
32-36 WKS	**13**	**18.30%**
37-42 WKS	**46**	**64.78%**
>42 WKS	**00**	**-**

Maximum patients were full term from 37-42 wks (65%).preterm onset of labour were present in 25 (35%) cases.

Table 17:Mode of delivery

Mode of delivery	No. of cases	percentage%
1)Vaginal	34	47.88%
Forceps	18	25.35%
Full term vaginal	08	11.26%
Preterm vaginal	07	09.85%
Ventouse	01	01.40%
2)LSCS	32	45.07%
3)Abortion	02	02.81%
4)Not delivered	03	04.22%

Out of 71 patients 34 (11.26%) patients delivered vaginal delivery. 18 babies delivered by forceps application for cut short second stage of labour and 1 delivered by ventouse application.8 patient had full term vaginal delivery and 7 had preterm vaginal delivery. LSCS was done in 32 cases (45.07%). Abortion happened in 2 cases. In 07 (09.85%) cases preterm vaginal delivery happened.

Table 18: Indications of LSCS

Indication	Total no. cases
Fetal distress	11
Cephalopelvic disproportion	07
Previous LSCS with associated indication	07
Failure of progression of labour	02
Malpresentation	02
Placenta previa	02
Abruption of placenta	01

Most common indication for LSCS was fetal distress, followed by cephalopelvic disproportion.

Table 19: Maternal morbidity

Morbidity	No of cases	Percentage of patients
Congestive cardiac failure	05	07.04%
Atrial fibrillation	03	04.22%
Pulmonary edema	10	14.08%
Deterioration of NYHA class	09	12.67%

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In this study 5 (7%) patients developed CCF, 3 patients had atrial fibrillation, and 10(14.08%) patients developed pulmonary edema. Worsening of NYHA class by >2 classes occurred in 9 of 71(12.67%)pregnancies in which baseline NYHA class was I or II.42 cases of 71 were without any maternal morbidity**.**

Table 20: Neonatal assessment by Apgar score

APGAR score	No. of neonates		Percentage of neonates	
	At 1 min.	At 5min.	At 1min.	At 5min.
0-4	10	03	14.70%	04.41%
5-7	08	05	11.76%	07.35%
8-10	50	60	73.52%	88.23%

In this study 73.52% babies had APGAR score above 8 and 15% babies had APGAR less than 4 at the time of birth, at1 min. At 5 min APGAR score, only 3 babies had APGAR less than 4 and 60 babies (88%) had APGAR >8.

Table 21: Neonatal assessment by weight

Weight in kg	No. of neonates	Percentage of neonates
<1.5	08	11.76%
1.6-2.0	06	08.82%
2.1-2.5	22	32.35%
2.6-3.0	18	26.47%
3.1-3.5	13	19.11%
>3.6	01	01.47%

In fetal assessment by weight, most of the babies 32.35% were from 2.1-2.5 kg group.36 babies from low birth weight group.8 babies from very low birth weight. 1 baby had extremely low birth weight.

Table 22: Neonatal morbidity

Cause	No. of cases	Percentage of neonates
NICU admission	35	51.47%
Prematurity	19	27.94%
Neonatal jaundice	08	11.76%
Small for gestational age	06	08.82%
Neonatal hypoglycemia	06	08.82%
Neonatal sepsis	05	07.35%
Meconium aspiration syndrome	05	07.35%
Respiratory distress	05	07.35%
Congenital anomalies	03	04.41%

In this study out of 71 cases 65 patients had given live birth to 68 babies in whom three patients had twin pregnancy and one baby stillbirth. Neonatal morbidity observed in 38 babies out of 68 neonates (55.88%). 35 babies were admitted in NICU after delivery (51.47%). 19 out of 68 live births were preterm (27.94%).6 babies were small for gestational age (08.82%). In 3 babies congenital anomaly were found, 1 baby had ectopia cardis and 2 babies had ASD. So in this study 2 mothers with congenital heart disease had offspring with congenital heart disease. 10 cases of RDS and meconium aspiration were seen. In NICU admissions 8 babies had neonatal jaundice, 6 babies had neonatal hypoglycemia and 5 neonates had neonatal sepsis.

Table 23: Perinatal and maternal mortality

Mortality	Total no of mortality / Total no of cases	Percentage
Maternal mortality	4 /71	05.63%
Perinatal mortality	5/68	07.35%

In this study maternal mortality observed in 5.63% patients and neonatal mortality observed in 7.35% neonates**.**

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Table 24: Contraceptive advice

Contraceptive	No. of cases	percentage
Barrier	48	71.64%
IUCD	02	2.98%
Tubal ligation done	02	2.98%
Sterilization advice	16	23.88%
a)Tubectomy/Vasectomy	12	17.91%
b)Vasectomy only	04	05.97%

Contraceptive advice was given to 67 patients. Tubal ligation was done in 2 patients during LSCS. Vasectomy advised to 4 patients due to maternal high risk cardiac status and high risk in operative procedure.

Discussion

Pregnancy and peripartum period are associated with important cardio- circulatory changes that can lead to marked clinical deterioration in the women with heart disease. However, women who receive adequate antenatal care generally fare well and have favorable maternal as well as neonatal outcome. **Lang and Borrow** [83] **(1985)** reported that during pregnancy and labour, significant hemodynamic changes have been observed which are tolerated well by most healthy women. **Sullivan and Ramanathan**[126]**(1985)** said that an additional strain is caused in cardiovascular system of mother during pregnancy if they suffer from organic heart disease, leading to high morbidity in them. It is natural to expect that the fetus also would be compromised in these mothers especially in presence of cardiac decompensation. With improving facilities for diagnosing and evaluating cardiac disorder, pregnancy with its tremendous cardiovascular implication is no longer the ominously hazardous condition that it used to be in the past. Early identification, better stabilization, intensive monitoring and prompt management of any complication have all greatly contributed in reducing the morbidity and mortality from this serious disorder. The present study aimed at analyzing the prevalence, etiology, management, complication and outcome of heart disease in pregnancy. The study includes 71 pregnant cardiac patients out of total 8140 admissions who delivered during a 3 year study period. The aim of present study is to evaluate maternal and neonatal outcome in pregnancy with heart disease at tertiary health care center.

Prevalence of pregnancy with heart disease: The present study has shown 0.87% prevalence of pregnancy with heart disease in our hospital admissions. As shown in table no.1, out of 8140 delivered patient 71 patient had heart disease.

Table 25: Prevalence of pregnancy with heart disease

Name of Author	Year	Prevalence
Deshmukh and coworkers	1979	0.55%
Pinto rosaria and coworkers	1979	0.15%
Rush and coworkers	1979	0.46%
De swiet and coworker	1981	0.5-1.8%
C.B.Purendare and Daftary	1984	0.29%
Malhotra and coworkers	2000	1%
Sawhney .H and coworkers	2003	1.20%
Doshi HU and coworkers	2010	1.00%
In present study	2011	0.87%

The reported prevalence of heart disease with pregnancy is 0.2 to 3.6% in Indian study. Prevalence varies with different workers; it varies with geographical location, seasons and incidence of rheumatic fever like prevalence is more in developing country as compare to developed country. Prevalence rate in different countries as follow in USA it is 1-3%, in London 0.5 to 1.8%, in South Africa o.8%. The prevalence of pregnancy with heart disease at our hospital is in same range as compared to other authors as shown in Table 26

Registered and Unregistered cases: In our study most of cases were registered either in our hospital or outside hospitals. As shown in table No.2, 44 patients from 71 cases were registered in our hospital and taken regular visits. In registered cases from outside hospitals, most of them were referred from primary and secondary health centers for further management. 20 patients (28.16%) were registered in outside hospital. In present study 7 Patients were totally unregistered came directly in labour. Thus most of our patients were diagnosed cardiac patients. Most of them were under treatment by cardiologist before & for pregnancy. Due to better awareness and increased use of available facilities enabled these patients to go through the pregnancy smoothly. But still 7 patients out of 71 (10%) patients were not registered with any hospital and they were

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unaware regarding risk associated with heart disease and this is most common cause for morbidity and mortality in developing country. Maternal mortality reported in 2 cases out of 7(28%) unregistered cases. which is nine times higher compare with mortality in booked cases (3%) in pregnancy with heart disease. Reasons behind this high rate of mortality are different as low socioeconomic status, illiteracy, lack of advanced facility in grass root level, low living standards and ignorance towards females regarding health issue. Also maternal and neonatal outcome is better in registered cases as compared with unregistered cases.

Diagnosed and Undiagnosed cases at the time of admission: At a time of admission 9(12.68%) cases were diagnosed as case of heart disease in pregnancy first time (table no 3). During clinical examination by its signs and symptoms like, dyspnea, palpitation, chest pain, diastolic murmur, systolic murmur of IV-V grade patient diagnosed as heart disease patient first time. Then diagnosis is confirmed by doing investigation and physician consultation. So in heart disease patients clinical examination have important role in diagnosis and management. Merz WM **and colleagues**[94]**(2010)** reported that 14.3% women presented with first manifestation of heart disease in pregnancy and 85.7% women had pre-existing cardiac condition.

Age Distribution: Majority of pregnant cardiac patients in our study were from age group of 21 to 30 years (75%) as it is commonest age group for pregnancy.

Daftary *et al* [38] **(1986)** at Bombay reported that 75% of the patients in the age group of 20 to 29 years. **Swarajya** *et al*[129] **(1995**) reported that 71% of the cases were in the age group of 21- 30 years. As shown in table no.4. In present study 12 (16.90%) patients were from < 20 year of age, 4 patients were from age group 31-35 years. One patient's age was 40 year.

Parity Distribution: Present study primiparas and 2nd paras together formed 81% of the patients. Only 18% of the patients were from Parity 3 and 4. Maximum no. of cases admitted during study was primigravida followed by second gravida. In this study percentages of patients observed according to parity were as follow P1-43%, P2-38.02%, P3-14.08%, P4-04.22 %.(table no.5).**Sui sc and colleagues** [120] **reported 2001** heart disease in 58% primigravida 1% in multipara. So still awareness regarding complication due to heart disease in pregnancy and multiparity is needed in society

Types of cardiac disease: (Table No. 6) In our series analysis of the types of cardiac pathology showed preponderance of rheumatic heart disease. Rheumatic heart disease seen in 54 patients out of 71 patients(76.05%), congenital heart disease in 11(15.49%) patients and arrhythmia in 6 patients (8.45%). Most of the studies in pregnancy with heart disease have reported that rheumatic fever forms the major cause of heart disease. The following data shows etiology and percentages with other authors.

Table 26: Data showing etiology and percentages with other authors

Author's name	Year	RHD	CHD
Siu s. and colleagues	2001	22%	74%
Hameed A and colleagues	2001	90%	10%
Agrawal and colleagues	2003	63%	27%
stangl and colleagues	2008	10.80%	81%
Doshi HU and colleagues	2010	68.62%	21.57%
Merz WM and colleagues	2011	18.40%	53.10%
In present study	2011	76.05%	15.49%

The prevalence of etiology varies considerably between countries and strongly related with socioeconomic condition. Now since last decade incidence of pregnancy with congenital heart disease is increased as compared with rheumatic heart disease in developed countries. This is secondary to improvement in diagnostic, surgical and medical techniques, which in turn have resulted in more women with congenital heart disease reaching Up to Child bearing age. However in India rheumatic heart disease still accounts for the majority of cardiac lesion detected during pregnancy. In **Indian study**[56]prevalence of rheumatic heart disease is as follow, Devi and subhadra 1997 -87.8%, Punjabi 1996-83%, Parvathi and Anjanyelu 1976- 90%, Sidar 1980-93.2%, chadha and colleagues 1981-90.3%, allahbadia and colleagues 1989-88%. So in present study prevalence of rheumatic heart disease in pregnancy was slightly

reduced and that may be good sign indicating improvement in health status of society in last decade.

Cardiac Lesions in rheumatic heart disease: (Table No.7) Rheumatic heart disease is still the major cause of heart disease in pregnancy. Mitral stenosis is the commonest cardiac lesion. In our series pure mitral stenosis constituted in 28(51.85%) patients out of 54 patients of RHD & 24.07% were of mitral incompetence. Multiple valve involvement was found in 10 patients. Combined mitral stenosis and mitral incompetence reported in 4 (7.40%) patients. Purely isolated aortic stenosis and aortic regurgitation not found but associated with mitral valve lesion found. So in all cases mitral valve involvement observed. **Hameed A and colleagues**[64]**(2001)** found dominant mitral stenosis in 90% patients, mitral incompetence in 6.6%, aortic incompetence in 2.5%, and aortic stenosis in 3%.

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Table 27: Authors with respect to their AS, MS, MI, AR in respective years

Authors' name	Year	MS	MI	AS	AR
Hameed A and colleague	2001	90%	7%	3%	2.50%
Stangl and colleagues	2008	50.00%	12%	17.10%	5.30%
Doshi HU and colleagues	2010	80.00%	12.00%	_	_
In present study	2011	51.85%	24.07%	1.85%	1.85%

Cardiac lesions in congenital heart disease: In this study in congenital heart disease atrial septal defect (ASD) was most common lesion. 7 cases out of 11(63.63%) cases of congenital heart disease in pregnancy had ASD. Ventricular septal defect found in 2 cases, atrioventricular septal defect found in one case and Patent ductus artreriosus in one case (Table no. 8). These observations are equivalent with other studies. **Malhotra M and colleagues** [90] **(2003)** reported ASD were more common in congenital heart disease. **Varena stangle and colleagues** [124] (2008) reported prevalence of different cardiac lesion as follow ASD in 9.2%, VSD in 10.5%, atrioventricular septal defect in 5.3%, Transposition of great vessels 2.6%, TOF in 9.2%, ebstein anomaly in 3.9%. **Devabhaktuni pratibha and colleagues** [45] **(2010)** reported ASD -29.46%, VSD- 25%, PDA- 6.25% TOF-2.68%.

Different types of arrhythmia: In present study 6 patients had arrhythmia especially defect in conduction pathway. Among 6 cases distribution was as follow 1 case of complete heart block, 3 cases of sinus tachycardia, 1case of RBBB, 1 case of WPW syndrome (Table no.9). **Merz WM and colleagues** [94] **(2011)** reported 16.3% prevalence of arrhythmia in their study. Premature extra beats and sustained tachyarrhythmia's become more frequent and may even manifest for the first time during pregnancy. Symptomatic exacerbation of paroxysmal supraventricular tachycardia (SVT) occurs during pregnancy in 20 to 44% of cases.

Grading of heart disease: In our study 76% of the patients were compensated so they were either in functional class I or class II. 9 (12%) patients were in class III, 8(11%) patients were in functional class IV (table no10), so our series most of them were compensated. This is because of early detection, good antenatal follow-up and good awareness among patients themselves. **Siu s. and colleagues**[120] **(2001)** reported that the risk of pulmonary edema, sustained arrhythmias, strokes, cardiac arrest, CCF, death was substantively increase with NYHA class III or IV. He reported 19%pregnancies complicated by pulmonary edema occurred in women with baseline NYHA class III. Maternal morbidity and maternal mortality was high in class III & IV as compared to class II and I. 4 maternal deaths reported during present study was from NYHA class IV. In this study 7 out of 10(70%) case of pulmonary edema, all 5(100%) cases of congestive cardiac failure, all 3(100%) case of atrial fibrillation were from NYHA class III and IV.

Bhatla N and colleagues [16] **(2003)** reported patients in NYHA class I/II (n=175, 84.54%) had fewer maternal complications and their babies had a higher birth weight than those in NYHA class III/IV (n=32, 15.45%). **Doshi HU and colleagues** [48] **(2010)** reported that cardiac complications developed in 17.02% of the women, most

common being congestive cardiac failure. It was found more in New York Heart Association grades III and IV. In this present study maternal morbidity observed in 7 patients out of 54 (13%) patient of NYHA class I and II and neonatal morbidity was present in 30 out of 53 (56.60%) neonates of mother from NYHA class I and II. In NYHA class III and IV maternal morbidity was present in 14 cases out of 17(82%) patients and neonatal morbidity was present in 9 neonates out of 14(64.28%) neonates.

Symptoms and signs presented by the patients: most frequent symptom of heart disease in pregnancy is breathlessness. In this study most common symptom was breathlessness 27(38.02%) followed by cough and palpitations (Table no.11). In this study 27(38.02%) patients had no symptoms regarding heart disease. **Wood P. reported** [144] in 1954 that patients of mitral stenosis present with fatigue, dyspnea, or frank pulmonary edema, in others, the initial manifestation of MS is the onset of atrial fibrillation or an embolic event. **Jessup and Brozena**[75] **(2003)** said that first warning sign is likely to be persistent basilar rales, frequently accompanied by a nocturnal cough. A sudden diminution in ability to carry out usual duties, increasing dyspnea on exertion, or attacks of smothering with cough is symptoms of serious heart failure. In this study bilateral basilar rales were present in 10 (14.08%) patients on auscultation suggestive of pulmonary edema (table no.12). **Leatham A.** [84] **1958** described that cardiac auscultation remains the most widely used method of screening for heart disease. **Shaver JA** [115] **(1995)** said that most systolic heart murmurs do not signify cardiac disease, and many are related to physiological increases in blood flow velocity. In other instances, a heart murmur may be an important clue to the diagnosis of undetected cardiac disease (e.g., valvular aortic stenosis) that may be important even when asymptomatic or that may define the reason for cardiac symptoms. Diastolic murmurs virtually always represent pathological conditions and require further cardiac evaluation. In this study most of cases were diagnosed by presence of murmur on auscultation .46 (65%) patients presented with characteristic murmur of particular lesion on auscultation (table no.12). **Silversides CK and colleagues** [73] **(2006)** reported that premature extra beats and sustained tachyarrhythmia's become more frequent and may even manifest for the first time during pregnancy. Symptomatic exacerbation of paroxysmal supraventricular tachycardia (SVT) occurs during pregnancy in 20–44% of cases. In this study tachycardia was present in 13 cases and bradycardia was present in 1 case [19.1%]. **Samule c. Siu and colleagues** [120] **(2001)** reported cyanosis is one of the predictor of risk in pregnancy with heart disease in cardiac, neonatal and

postpartum haemorrhage. In our study 1 patient had cyanosis and maternal mortality reported in same patient

Associated co-morbidities: In our study anemia and upper respiratory tract infection (URTI) remain most common risk factors .Anemia was present in17 patients (24%) and URTI found in 11(15%) patients(table no13).3 cases of twin pregnancy and 2 cases of breech presentation were seen in study. Anemia was present in 17 cases out of 71 patients. out of this 17 cases 4 patients required blood transfusion other patients were managed with oral iron preparation. To all patients with URTI antibiotic course were given. Anemia in pregnancy mimic like heart disease so while evaluating patient precaution was taken. Anemia increases cardiac workload and should be avoided by regular use of hematinics. Prognosis in cardiac diseases worsens when it is complicated by anemia, where the hyperdyanamic circulation puts more load on the already damaged heart**. William N.P, Gregory A.L** [142] reported that anemia is a common problem in pregnancy and should be avoided in the patient with cardiac disease through the judicious use of iron, prenatal vitamins, and dietary counseling. In present study among four maternal mortality cases one had severe anemia which worsen preexisting cardiac failure and one patient had URTI which was trigger factor for cardiac failure.

Surgery for cardiac pathology: Early experience with balloon valvotomy as published by **Palacios (1987)** and **Mckay** *et al* [93] **(1987)** has been favorable for the treatment of pregnant patients with severe mitral stenosis. The other advantages of this technique is decrease in morbidity, avoidance of anesthesia and risk associated, fast recovery and short hospital stay. In our study 3 patients of severe mitral stenosis underwent balloon mitral valvotomy before pregnancy (Table No.14). Out of 3 patients 2 patients are from NYHA class III and deterioration of NYHA class reported, LSCS done in 2 for obstetrical indication and 1 patient went in preterm labour. **M. Malhotra and colleagues** [90](**2003**) reported that mitral valve surgery before or during pregnancy did not significantly improve maternal and fetal outcomes but decreased adverse events such as congestive heart failure and cardiac arrhythmias. **Datta Ray Chaitali and colleagues** [40] (**2004) reported** that there were statistically significant differences in the period of gestation attained, mode of delivery and post-delivery hospital stay but differences in weight of the babies and Apgar scores were not significant. The prognosis improved after surgery. Mortality was more in the non-operated group. Therefore it should be performed only in selected cases. As we had only three patients who underwent cardiac surgery, so conclusion regarding its advantage could not be made. 3 patients out of 7 patients of ASD underwent through closure of primary lesion of septal defect. **Mark maberry** [91] (**1989**) quotes that the frequency of congenital heart disease encountered during pregnancy has increased over the last two decades. This is secondary to improvement in diagnostic, surgical and medical techniques, which in turn have resulted in more women with congenital heart disease reaching up to Child bearing age. All three patients were from NYHA

class I and no maternal mortality and morbidity reported except one operated patient had 8 wks abortion. So in operated cases maternal and neonatal outcome in present study was better as compared to non -operated cases.

Medications used in heart disease in pregnancy.
 Digitalis therapy used in 6 patients for management of CCF. T.Digoxin used as digitalis preparation. It started with loading dose of 1-1.5mg in 24 hrs period and maintenance dose as 0.25mg daily. Diuretic frusemide was used in 10 patients for management of pulmonary edema and congestive cardiac failure (table no16). Intravenous dose of frusemide started initially as 40 mg and dose adjusted with B.P., urine output and clinical findings. Beta blocker used in 3 patients as to control heart rate and arrhythmia. In the **DIG trial** [117] 1997 said that digoxin therapy was most beneficial in patients with ejection fractions of 25 % or lower, patients with enlarged hearts (cardiothoracic ratio of greater than 0.55) and patients in NYHA functional class III or IV. The findings of the DIG trial also indicated that digoxin was clinically beneficial in subgroups of patients with less severe forms of heart failure. Agents with negative chronotropic properties such as B-blockers or calcium channel blockers may be of benefit in patients in sinus rhythm who have exertion symptoms and if these symptoms occur with high heart rates. **Blomstrom-Lundqvist C and colleagues** [119] (**2004**) said that digoxin or selective β-blocking agents (metoprolol) are the first-line agents in management of supraventricular tachycardia. **Showkat a and colleagues** [120] (**2000**) reported that the goal of digoxin therapy in patients with congestive heart failure is to improve quality of life by reducing symptoms and preventing hospitalizations. In this study diuretics were used in 10 patients as management of CCF. **Devabhaktuni P. and colleagues** [45] (**2010**) reported in their study that 18 women (16.07%) were on tablet Digoxin 0.25 mg; 6 (5.36%) were on diuretics.

Duration of pregnancy at onset of labour: Maximum patients were full term from 37-42 wks (65%).preterm onset of labour were present in 25 (35%) cases (Table No.16). 42 patients out of 71 were from 37 to 42 wks of gestation. Merz WM **M** [94] **and coworker** found that mean gestational age at delivery was 36+6 wks in there study. *Datta Ray Chaitali and coworker* [40] *2004 said that* the mean period of gestation attained at delivery in the operated group was 37.9 ± 1.96 weeks while in the nonoperated group it was only 36.3 ± 4.59 weeks. In this study mean gestational age at delivery was 35 ±3 weeks which corresponds with other study.

Mode of delivery: Out of 71 patients 34 (47.88%) patients delivered vaginaly. 18 babies delivered by forceps application to cut short second stage of labour and 1 delivered by ventouse application.8 patient had full term vaginal delivery and 7 had preterm vaginal delivery. LSCS was done in 32 cases (45.07%). Abortion happened in 2 cases. While three patients died undelivered. **Datta Ray Chaitali and coworker** [40] (**2004**) reported *that* in the operated group prevalence of lower segment cesarean section (LSCS) was 82%. While in the nonoperated group it was only 57% (25/44).

Table 28:Authors with respect to their LSCS

Author's name/ Year		LSCS	Vaginal
Samule c Siu and colleagues	**2001**	27%	73%
Devabhaktuni P. and colleague	**2010**	37.61%	62.39%
Doshi HU and colleagues	**2010**	31.91%	68.08%
Merz WM M and colleagues	**2011**	77.50%	22.50%
In present study		45.0	47.48%

We had 18 deliveries (25.35%) by forceps application as maternal indication to cut short second stage of labour. **Devabhaktuni P. and colleagues** [45] **(2010)** reported 9.17% rate of forceps application. In our study percentage of LSCS is on higher side as compared with other study. In most of cases epidural or general anesthesia was preferred. **Christopher James et al** [31] **(1992**) states that for caesarean section delivery, lumbar epidural anesthesia in indicated for patients with mild mitral stenosis. General anesthesia may be the preferred method for patients with severe mitral stenosis as long as drugs that induce tachycardia are avoided like ketamine, pancuronium and anticholinergics.

Indications of LSCS: In all 32 cases LSCS was done for obstetric indication and none for cardiac reason. Most common indication for LSCS was fetal distress, followed by cephalopelvic disproportion and previous LSCS (table no.18). **Samule c Siu and colleagues** [120] **(2001)** reported that in their study 96% caesarean

deliveries were for obstetric indications, cardiac status was the indication in 4%. **Merz and colleagues** [94] **(2011)** reported that the LSCS rate was 77.5% and 31.6% were performed for cardiac lesion.

Maternal morbidity in pregnancy with heart disease: In this study 5 (7%) patients developed CCF, 3 patients had atrial fibrillation and 10 patients (14.08%) developed pulmonary edema. Worsening of NYHA class by >2 classes occurred in 9 of 71(12.67%)pregnancies in which baseline NYHA class was I or II.42 cases were without any maternal morbidity(table no.19). Maternal morbidity seen in 22 cases out of 71 cases so maternal morbidity in this study was 30.98%. Maternal morbidity in NYHA class III and IV is more than in NYHA class I and II. In this study maternal morbidity was present in 7 patients out of 54 (13%) patient of NYHA class I and II and in NYHA class III and IV maternal morbidity was present in 14 cases out of 17(82%) patients.

Table 29: Authors with respect maternal morbidity

Name /Year	Maternal Morbidity
Samule c. SIU and colleagues 2001	13.00%
Doshi HU and colleagues 2010	17.02%
Bhatla n and colleagues 2003	29.95%
In present study	30.98%

In this study congestive cardiac failure occurred in 5 cases all are from NYHA class III and IV. In 3 patients CCF was associated with atrial flutter and pulmonary edema and maternal mortality occurred in these three patients. One patient of CCF responded to medical management with digoxin and diuretics. Pulmonary edema was documented by chest radiography in all but 3 patients, in these three patients; the diagnosis is

established by clinical finding of acute respiratory distress in the early post partum period with bilateral pulmonary crackles. 7 out of 10 (70%) pregnancies complicated by pulmonary edema occurred in women with NYHA class III and IV. so maternal morbidity in this study is slightly on higher side compare to other studies.

Table 30: Authors with respect to their CCF and TE

Author's name and year	CCF	TE
Sawhney 2003 PGI Chandigarh	02.00%	0.80%
Asghar 2005 Pakistan	21.20%	2.00%
D.Prathiba et al 2007 Hyderabad	11.00%	2.00%
In present study	07.00%	_Nil

Fetal assessment by Apgar score: In this study 73%% babies had APGAR score above 8 at birth at 1 min. and 15% babies had APGAR less than 4 at time of birth1

min. At 5 min APGAR score only 3 babies had APGAR less than 4 and 60 babies (82%)had APGAR >8. **Datta Ray Chaitali and coworker**[40] **(2004)** said that Apgar

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at birth in both the groups was similar with means of 8.81 in operated cases of heart disease and 8.45 non-

operated cases of heart disease. 3 neonates 0ut of 14 neonates (21.42%) had Apgar <4 in NYHA class III and IV as compare to NYHA class I and II which had 3 neonates out of 54 neonates (5.55%) with Apgar < 4. **Malhotra and colleagues** [90] **(2003)** reported that perinatal outcome was more adverse in the valvular heart disease group than normal patients, which had higher incidence of APGAR scores less than 8 (8.3% vs. 4%).so neonatal outcome by APGAR score is four time better in NYHA class I/II as compare to NYHA class III/IV.

Fetal assessment by weight: In this study mean birth weight of the babies was 2.54± 0.44 kg. Mean birth weight in NYHA classes I/II was 2.64± 0.44 kg and mean birth weight in NYHA class III/IV was 2.34± 0.44 kg. Fetal assessment done by weight most of the babies 30.98% were from 2.1-2.5 group.34 babies from low birth weight group.7 babies from very low birth weight. 1 baby had extremely low birth weight infant (table no.21).N. **Bhatla and colleagues** [17] **(2003)** said that patients in NYHA class I/II (*n*=175, 84.54%) had fewer maternal complications and their babies had a higher birth weight than those in NYHA class III/IV (*n*=32, 15.45%). *Datta Ray Chaitali and coworker* [40] (**2004**) said that *the* mean birth weight of the babies of operated mothers for

cardiac lesion was 2.72 ± 0.33 kg while that of the non-operated mothers for cardiac lesion was 2.53 ± 0.44 kg.

Neonatal morbidity: In this study out of 71 cases 65 patients had given live birth to 68 babies in which three patients had twin pregnancy. Neonatal morbidity observed in 38 babies out of 68 neonates (55.88%). 35 babies were admitted in NICU after delivery (51.47%). 19 out of 68 live births were preterm (27.94%).6 babies were small for gestational age (08.82%). In 3 babies congenital anomaly were found, 1 baby had ectopia cardis and 2 babies had ASD. So in study 2 mothers with congenital heart disease had offspring with congenital heart disease. 10 cases of meconium aspiration syndrome and RDS were seen. 4 cases from 71 had IUD in which 3 cases had IUD due to maternal mortality and 1 case IUD due to congenital anomaly to baby. So neonatal morbidity is in similar range with other Indian studies. In NICU admissions 8 babies had neonatal jaundice, 6 babies had neonatal hypoglycemia and 5 neonates had neonatal sepsis. In this study neonatal morbidity was present in 30 out of 53 (56.60%) neonates of mother from NYHA class I and II. In NYHA class III and IV neonatal morbidity was present in 9 neonates out of 14 (64.28%) neonates.

Table 31: Author with respect to number of cases,LBW,IUD and preterm

Name and year	No. cases	Preterm %	LBW %	IUD %
Sawhney 2003 PGI Chandigarh	500	-	-	2
Hameed 2001 California USA	66	21	21	2
Asghar 2005 Pakistan	33	42.55	-	-
D.Prathiba *et al* **2007 Hyderabad**	200	9.35	37.4	0.9

Siu *et al* [90] **(2001)** in their prospective longitudinal study of pregnancy outcomes in women with heart disease reported neonatal outcomes in 302 pregnancies. Neonatal complications occurred in 18% of pregnancies. Preterm delivery occurred in 15%, fetal growth restriction in 4%, respiratory distress syndrome or intraventricular hemorrhage in 2% and neonatal death in 3% of pregnancies. Predictors of adverse neonatal outcomes were NYHA class greater than II, cyanosis, maternal left ventricular obstruction, maternal smoking, maternal age under 20 years or over 35 years, multiple gestation and anticoagulation during pregnancy. **N .Bhatla** [17] **2003** said that a fetal complications seen in 42 (20.28%) pregnancies with heart disease. **Doshi   HU** [48] reported that there were more preterm babies (27.7%) and babies with intra-uterine growth restriction (48.9%) in pregnancy complicated by heart disease. **Malhotra and**

colleagues [90] (**2003**) reported that perinatal outcome was also more adverse in the valvular heart disease group than in the control group, with increased preterm delivery rate (48.3% vs. 20.5%), reduced birth weight (2434±599 g vs. 2653±542 g), and a higher incidence of APGAR scores less than 8 (8.3% vs. 4%). **Sawhney and coworkers** [112] **(2003)** described that the incidence of preterm birth and small for gestational age newborns was 12% and 18.2%, respectively.

Maternal mortality: In this study maternal mortality was observed in 4 (5.63%) out of 71 patients. Out of 4 patients 3 maternal mortality were occurred in antenatal period and in 1 after 4 hrs of delivery (Table No.23). Out of four maternal mortality cases 2 had sever mitral stenosis, 1 had ASD and 1 had PDA. All 4 maternal mortality occurred in NYHA class III and class IV. All four patients had CCF with atrial fibrillation. This

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maternal mortality were due to low socioeconomic status, illiteracy, lack of advance facility in grass root level, low living standards and ignorance towards female regarding health issue because out of four cases 2 were unregistered and 1 was registered outside and they admitted in hospital in stage of cardiac failure from where recovery of patients were difficult. Out of 3 antenatal mortality first case was unregistered gravida two with 20 wks pregnancy not in labor, with severe mitral stenosis in CCF, patient came in critical condition from where recovery were not possible. Second case was 34 wks primigravida with PDA with PHT with atrial flutter, she was registered with us and cardiologist advised her corrective surgery for it at higher center but patient not followed advice and medication results in

maternal mortality. Triggering factor for CCF was URTI. Third patient was unregistered 24 wks gravida two admitted with severe mitral stenosis with CCF and atrial fibrillation, patient expired with in hour after admission. Fourth case was outside registered 34 wks gravida two with ASD with PHT admitted as case of severe anemia with breathlessness in latent labour. Due to anemia and stress of labour patient developed CCF during active labour and after forceps delivery in postpartum period patients CCF deteriorated and expired within 4 hrs after delivery. **Sawhney and colleague**[112] **(2003)** reported in their study10 (2.05%) maternal death of which 8(80%) patient were NYHA III-IV patients

Table 32: Authors with respect to percentage of maternal mortality

Author's name and year	Percentage of maternal mortality
M.malhotra and colleagues 2004	[0.64%]
Sawhney and colleagues 2003	[2.05%]
D.Prathiba and colleagues2007	[0.89%]
In present study	[5.63% }

Neonatal mortality: Neonatal mortality was seen in 5 neonates (7.35%) out of 68 neonates, all are due to preterm delivery. In neonatal mortality 3 neonate's mothers were from NYHA class III and IV .**Paul Khairy and colleagues** [49] **(2004)** stated neonatal mortality in 4.2% neonates**. Wilem Drenthen and colleagues** [79] said that neonatal mortality occurred in 2.3% neonates. So in present study neonatal and maternal mortality is slightly higher than other studies mentioned above.

Contraceptive advice: During pre and post natal counseling, contraceptive advise given to all patients. Contraceptive advice was given to 67 patients. Tubal ligation was done in 2 patients during LSCS. Vasectomy advised to 5 patients due to maternal high risk cardiac status and high risk in operative procedure. Barrier contraceptive advised to 29 primigravida and IUCD advised to two patient of arrhythmia. In 13 patients tubectomy advised after six weeks of delivery or when she becomes hemodynamically stable for surgery and anesthesia.

Preventive measures: As said that prevention is better than cure, to reduce maternal and neonatal morbidity and mortality preventive measure are must from beginning. To reduce prevalence of rheumatic heart disease in developing country proper management and timely treatment of rheumatic fever in school age group children is necessary. For that regular interval school health check up and mass education regarding health care should be conducted. Early detection of heart

disease patients in childhood is one of the important factor in preventive measure. It will prevent deterioration of heart condition if timely treatment or corrective surgery done in childhood only. Second most important preventive measure is preconceptional counseling. Preconceptional counseling will improve knowledge, attitude and behavior of men and women related to health. Women with severe heart disease will benefit immensely from counseling before deciding to become pregnant. In some women, life-threatening cardiac abnormalities can be reversed by corrective surgery, and subsequent pregnancy is less dangerous. All pregnancy with heart disease should be registered in tertiary health care center and 100% hospital delivery of such patients will reduce maternal and neonatal mortality significantly. Lastly proper postnatal care of patient and neonates followed by contraception advice will reduce complication rate. The presence of adequate systems for early detection, appropriate referral to specialist centers, and timely delivery with multidisciplinary support can minimize the serious consequences of poorly controlled heart disease in pregnancy. So heart disease with pregnancy should be managed as team approach involving an obstetrician, cardiologist and anesthesiologist will improve maternal and neonatal outcome. So "100% antenatal registration, 100% diagnosis and treatment of lesion and 100% hospital delivery" are key factors for prevention of maternal and neonatal mortality and morbidity.

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Conclusion

In conclusion, heart disease in pregnancy is associated with significant maternal and perinatal morbidity in NYHA class III/IV patients. Rheumatic heart disease was the predominant type. Patients in NYHA class I/II had a better maternal and fetal outcome than those in NYHA class III/IV. Surgical correction of the cardiac lesion prior to pregnancy was associated with better pregnancy outcome. Pregnancy in women with heart disease is associated with significantly higher maternal morbidity and adverse fetal outcomes and requires a team approach for optimal management.

Table 33: List of abbreviations used

1	ACC /AHA	American College of Cardiology /American heart association.	18	NYHA	New York Heart Association.
2	AF	Atrial fibrillation	19	PAH	pulmonary arterial hypertension
3	AR	Aortic insufficiency	20	PDA	Persistent ductus arteriosus.
4	AS	Aortic stenosis	21	PIH	Pregnancy induced hypertension.
5	ASD	Atrial septal defect	22	PVR	Peripheral vascular resistance.
6	CCF	Congestive cardiac failure.	23	RBBB	Right bundle branch block
7	CHD	congenital heart disease	24	RF	Rheumatic Fever
8	ECG	Electrocardiogram	25	RHD	Rheumatic heart disease
9	INR	International normalized ratio	26	RV	Right ventricle
10	IUD	Intrauterine death.	27	SVT	Supraventricular Tachycardia
11	IUGR	Intrauterine growth retardation.	28	TOF	Tetrology of fallot.
12	LMWH	Low molecular weight Heparin	29	UFH	Unfractionated heparin
13	LSCS	Lower segment cesarean section	30	URTI	Upper respiratory tract infection.
14	LV	Left ventricle	31	VSD	Ventricular septal defect
15	MR	Mitral insufficiency	32	WHO	World health organization.
16	MVP	Mitral valve prolapse	33	WPW	Wolff-Parkinson-White syndrome
17	NICU	Neonatal intensive care unit	34	LVH	Left ventricular hypertrophy

Reference

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