

## Heart Disease in Pregnancy: A Multi Disciplinary Approach

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### Abstract

**Background:** Cardiac Disease is an important cause of maternal morbidity and mortality both in antepartum and postpartum period. The overall incidence of heart disease in pregnancy is 2-4%. It can be congenital or acquired. In developing countries Rheumatic heart disease continues to be the major cause of morbidity and mortality. Objective of present study was to determine the maternal outcome in pregnant women with heart disease and early intervention. Outcome of the study will highlight the effectiveness of cardiac intervention in appropriate patients and its outcome both maternal and fetal.

**Method:** It is a prospective observational study. Conducted at Government Rajaji Hospital, Madurai for a period of 12 months from January 2020 to December 2020. Government Rajaji Hospital is a tertiary care referral centre, a Cernonc hospital where 216 pregnant woman with previously established or newly diagnosed during pregnancy were included in the study. They were registered and monitored from the time of registration and followed up till 12 months postpartum period.

**Results:** Incidence of heart disease in our hospital is 1.3%. Among 216 mothers, 85.6% cases are of Rheumatic heart disease. Most of them belongs to mild moderate valvular lesion. Among 59 severe mitral stenotic heart disease, percutaneous mitral valve commissurotomy (PTMC) done for 11 cases. 11 of them delivered successfully without any adverse intrapartum and postpartum events. Overall mortality rate of heart disease complicating pregnancy in our institution is 0.4%.

**Keywords:** Rheumatic heart disease pregnancy, severe mitral stenosis, percutaneous mitral valve commissurotomy. (PTMC)

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### Introduction

With a decrease in maternal death as a result of the classic causes of hemorrhage, hypertension and sepsis, the relative importance of cardiac disease has

increased. [1] During the last few decades, the etiology of heart disease in developed countries has shifted from primarily rheumatic to predominantly congenital.

The rate of maternal complications is related to several factors including maternal functional status, myocardial dysfunction, significant aortic or mitral valve stenosis and history of arrhythmias or a cardiac event. [2]

Maternal mortality secondary to heart disease is uncommon nowadays particularly in developed countries [3] because 1) most congenital lesions are diagnosed early allowing appropriate surgical repair. 2) The incidence of rheumatic heart disease has drastically decreased and 3) Patients who are at high risk for cardiac decompensation are offered sterilisation or termination.

Normal physiologic pregnancy related changes, can aggravate underlying cardiac disease leading to the associated morbidity and mortality.

Total body water increases progressively by 6-8 liters because an additional 500 to 900 mEq of sodium is retained. As a result, plasma volume increased throughout the first two trimesters and into the early third trimesters reaching a plateau at approximately around 32 weeks. In a singleton pregnancy at term, plasma volume is nearly 50% more than that in non-pregnant women. Maternal cardiac output begins to increase at 10 weeks reaches a plateau by the early third trimester at levels 30% to 50% above non-pregnant values. [4] This increased output results from increase in stroke volume and heart rate. The increase in heart rate peaks in the third trimesters at the rate of 10 to 15 beats / min over base line. These changes increase the demand on the heart which can become critical if function is already compromised. [5]

The midtrimester fall in blood pressure though offers some help to decrease cardiac work, in some cases the significant decrease in peripheral resistance can be deleterious for example it may reverse a left to right shunt resulting in cyanosis. [6] Normally systolic and diastolic pressure

fall throughout the first two trimesters reaching a nadir between 24 to 28 weeks before increasing to non-pregnant levels at term. Late in pregnancy, the gravid uterus may cause mechanical obstruction to aorta and vena cava in supine position, leads to hypotension. [7]

During cesarean section fundal pressure used to facilitate delivery causes vena caval compression and decreases preload. [8] Heart rate also decreases due to vagal stimulation. The net effect of the changes in preload and heart rate is a decrease in cardiac output. There is dramatic change in venous return immediately following delivery. [9] If there is more than estimated blood loss then venous return can be markedly reduced. Conversely delivery of the placenta and the rapid contraction of the uterus can result in blood being squeezed out of the uterus and sudden increase in venous return. This is particularly significant if placenta is manually removed and oxytocics are given to keep the uterus in a contracted state. Such manual removal is best avoided. Finally oxytocics commonly used have major effects on vascular tone. [10]

Colloid oncotic pressure decrease throughout gestation there is an accompanying increase in capillary hydrostatic pressure leading to a normal physiological edema of pregnancy most marked in lower extremities which pose difficulty to diagnose cardiac decompensation. [11]

Fetal complication in pregnancy with maternal heart disease commonly cause fetal growth retardation, preterm labour.[12] Though the risk of low birth weight is there, overall perinatal mortality is not significantly greater than in the general population. When a pregnant patient has a congenital heart disease, the fetus is at increased risk to acquire congenital lesion ranging from 0% to 18% depending on the lesions.[13] When the fetus is affected approximately 50% have the same anomaly as the mother. The risk

increases further when other first degree family member has a congenital heart lesion. [14]

The most important predictive indicators were NYHA classification more than grade II or Cyanosis, left ventricular obstruction, cardiac dysfunction, previous arrhythmias and previous cardiac complications. [15]

### Aim & Objective

To determine the maternal outcome in pregnant women with valvular heart disease and early intervention.

### Materials & Methods

It was a prospective observational study. The study was conducted at Government Rajaji Hospital, Madurai for the period of 12 month from January 2020 to December 2020. Government Rajaji Hospital is a tertiary care referral hospital, a comon center where 216 pregnant women with heart disease were included for this study after informed consent. Patients were registered, examined, serial monitoring by echocardiography done, patients were put

on cardiac drugs depending upon the lesions and functional status. PTMC was done for severe mitral stenosis valve patients with consent and followed up with close monitoring for maternal and fetal outcome.

### Inclusion Criteria:

- 1) Patients with previously established or newly diagnosed Mild, Moderate and severe valvular heart disease.
- 2) Uncorrected Congenital heart diseases.

### Exclusive criteria:

- 1) Peripartum cardiomyopathy. Previous history or currently diagnosed
- 2) Repaired congenital heart diseases.

### Statistical Analysis:

The data obtained were input into the SPSS statistical software version 20.0. A descriptive statistical analysis was performed. P value was set significant at < 0.05

### Results

**Table 1: Clinical Parameters**

<b>I. Age</b>	<b>No. of Cases</b>	<b>Percentage</b>
18-20	46	21.29%
20-30	154	71.29%
>30	16	7.4%
	216	
<b>II. Type of Lesion</b>		
Congenital	31	14.35%
Acquired	185	85.64%
Mild	33	17.83%
Moderate	93	50.27%
Severe	59	31.89%
<b>III. Gravida</b>		
Primi	137	63.42%
Multi	79	36.57%
	216	
<b>IV. Gestational Age</b>		
< 12 Wks	33	15.27%
12 – 28 Wks	91	42.12%
> 28 Wks	92	42.59%
	216	

Mode of Delivery		
Vaginal	97	44.90%
Cesarean	112	51.85%
	216	

**Table 2: PTMC Outcome**

Gestational Age	No. of Cases
25-28 Wks	5
28-34 Wks	6
<b>Total</b>	<b>11</b>
Mode of Delivery	
Vaginal	5
Cesarean	6
<b>Total</b>	<b>11</b>
Birth weight	
< 2.5 Kg	1
2.5 – 3 kg	9
>3kg	1
Success Rate	100%
MMR	Nil

In our study 216 pregnant women with heart disease admitted in Government Rajaji Hospital, Madurai were included in the study period.

Among these 216, 59 patients have severe acquired heart disease. Out of 59 patients, 11 Patients underwent, PTMC procedures after detailed evaluation and informed consent.

21.29% of patient were between 18-20 years, Majority (71.29%) patients belong to 20-30 years, only 7.4% belonged to more than 30 years.

Out of 216, 14.35% of patients had uncorrected congenital heart disease majority 85.64% patients had rheumatic heart disease. Among RHD 50.27% were moderate valvular lesion and 59 patients (31.89%) had severe valvular lesion.

Associated comorbidities were moderate anemia 13.3%, Gestational diabetes mellitus 6%, Gestational hypertension 6.6%, hypothyroidism 6.6%, residual polio 6.6%.

There was no maternal mortality among post PTMC patients.

Post PTMC complication were trivial MR in 15%, 13.3% of patients had mild MR.

Average fluoroscopy time 9 to 10 minutes in our study. Patient symptomatically improved. The procedure was done with pelvic and abdominal shielding. The procedure was done with 2 D Echo Doppler guided stepwise mitral valve dilatation with Accura double balloon. The mitral valve area after PTMC increased from 0.7 to 1.5 cm<sup>2</sup>. There was no mortality or significant morbidity.

#### Follow-up:

All post PTMC patients were followed up regularly in cardiology and antenatal OPD for a period of 12 months post-delivery.

#### Discussion

Over the last several decades of, a significant decline in the incidence and severity of rheumatic heart disease has occurred in developed countries. [1] In a multicenter report of 562 women with heart disease managed during pregnancy, only 14% had acquired valvular lesions. The changes were attributed in part to improved socioeconomic conditions. [2] In many parts of the world however

rheumatic heart disease remains a significant public health problem. Asia, Africa and South America have high prevalence rates. [3]

Rheumatic heart disease is a complication of rheumatic fever, cardiac valve damages results from an immunologic injury initiated by a group A, beta hemolytic streptococci infection. During pregnancy the increased maternal blood volume and heart rate can lead to heart failure and pulmonary edema, [4] Arrhythmias also frequently complicate pregnancy, Not surprisingly, poor maternal functional class (NYHA class III & IV) was associated with worse maternal and fetal outcome. Rates of IUGR and prematurity are increased with complicated rheumatic heart disease. [5]

#### **Mitral Stenosis:**

##### **Maternal & Fetal Risks**

Mitral stenosis either alone or in combination with other lesions is the most common valvular disorder associated with rheumatic heart disease. Mitral stenosis is the abnormality in 90% of cases. Hemodynamically mitral stenosis is a state of fixed cardiac output caused by left atrial outflow obstruction. Pressure in the left atrium and pulmonary vasculature are increased. [6] Long standing severe disease may be complicated by secondary pulmonary hypertension and atrial fibrillation. [7] In pregnancy the increased intravascular volume can further elevate pressures and lead to pulmonary edema, arrhythmias, even in previously asymptomatic patients. [8]

The risk of cardiac compromise is further aggravated by an increased maternal heart rate and decreased left ventricular filling time which leads to a decrease in cardiac output. The severity of the stenosis is the best predictor of cardiac compromise. [9]

#### **Management:**

Transoesophageal Echocardiography forms an important corner stone to

determine cardiac function and the degree of stenosis. [10] It allows noninvasive evaluations and decrease the need for cardiac catheterisation. Severe stenosis is defined by a mitral valve area less than 1cm. In symptomatic patients or those with severely stenotic valves, surgical correction should take place before conception. Surgical commissurotomy is the traditional treatment modality. [11] Percutaneous mitral valve commissurotomy (PTMC) has emerged as an effective alternative in patients without calcified valves or significant regurgitation. Percutaneous method is safe and as effective as the open surgical approach in appropriate patients. In addition it is less invasive, less expensive and the preferred therapy in many centers across the world. [12]

#### **Prenatal:**

Special attention should be paid to volume status. Weight gain should be closely monitored. Heart failure findings should be evaluated promptly. Restriction of physical activity can aid to avoid maternal tachycardia. Beta blockade may be used to control heart rate. Atrial fibrillation can be managed with digoxin (Category-C) or cardioversion. [13] If the atrial fibrillation is persistent or long standing, these patients may require anticoagulation to prevent left atrial thrombus.

Serial echocardiography is indicated to follow cardiac function. Several series have reported symptomatic improvement with good maternal outcomes in women managed with balloon valvotomy for severe mitral stenosis during pregnancy. In experience hands with abdominal shielding fluoroscopy time and fetal radiation exposure can be minimal. Neonatal outcomes all also reported to be better when compared with closed mitral valvotomy or valve replacement.

#### **Labour and Delivery:**

During intrapartum and postpartum periods, volume status and cardiac output

are of critical concern. In patients with NYHA class III or IV disease, central hemodynamic monitoring have to be used. PCWP can warn of the potential for pulmonary edema. Beta blockade (Category C) may be necessary to control heart rate and maintain cardiac output during labour. [14]

Epidural analgesia is both safe and effective. Slow administration of anaesthetic agents is necessary to prevent hypotension. Drugs such as atropine, pancuronium, meperidine can cause tachycardia and should be avoided. Cesarean delivery is typically reserved for obstetric indications. Prophylactic outlet forceps delivery is advocated to shorten the second stage of labour. Endocarditis antibiotic prophylaxis should be given prior to cesarean section as per American Heart Association guidelines. (AHA) [15]

### Conclusion

In pregnant patients who have severe mitral stenosis and persistent congestive heart failure symptoms despite conventional optimal medical treatment when feasible. Percutaneous balloon mitral valvotomy (PTMC) is the best treatment. Percutaneous mitral valvotomy during pregnancy is safe and provides excellent symptomatic relief and hemodynamic improvement. This should be considered as the treatment of choice when managing pregnant women with severe mitral stenosis. Maternal and fetal outcome are much better with intervention.

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