

A Study to Assess the Maternal and Fetal Outcome in Women with Valvular Heart Disease or Prosthetic Heart Valve Replacement Secondary to Rheumatic Heart Disease: An Observational Study

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Abstract

Aim: The aim of the present study was to assess the maternal and fetal outcome in women with valvular heart disease or prosthetic heart valve replacement secondary to rheumatic heart disease.

Methods: This was a prospective study which included consecutive pregnant women with valvular heart disease or prosthetic heart valve replacement secondary to rheumatic heart disease referred at department of cardiology for the period of one year. 100 pregnant women with rheumatic heart disease or prosthetic heart valve visited the hospital.

Results: 42% women belonged to primigravida and 47% belonged to NYHA class II. 82% had known cases of RHD. The maternal adverse event rate was 2%, 2%, 34%, 27% and 35% in patients with modified WHO score risk stratification of I, II, II-III, III and IV respectively. The adverse event occurred in 4%, 36%, 54% in patients with CARPREG score of 0, 1 and ≥ 2 respectively. Pregnancy with predominant mitral regurgitation and mild to moderate mitral stenosis were tolerated well with no maternal or fetal event. Pregnancy with predominant mitral regurgitation and mild to moderate mitral stenosis were tolerated well with no maternal or fetal event. 4 patients of combined severe MS and MR were in NYHA IV, all underwent MVR during delivery. All 4 mitral valve replacement surgeries were done concomitant with lower segment caesarean section (LSCS) at the time of delivery. Abortion was induced in 5 cases due to fetal malformations and 3 due to underlying maternal cardiac disease (2 cases were of combined lesion of mitral stenosis with mitral regurgitation and severe pulmonary arterial hypertension and 1 case of DVR).

Conclusion: Women with rheumatic heart disease carry a high risk both for mother and fetus. Early diagnosis, close follow-up during pregnancy, early recognition of deterioration in symptoms and timely cardiac intervention can lead to good maternal or fetal outcome. Multidisciplinary evaluation by cardiologists and obstetrician, proper pre-conception and antenatal care are the key measures to improve the outcomes of these patients.

Keywords: maternal outcome, fetal outcome, rheumatic heart disease

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Introduction

Cardiac disorders complicate approximately 1-3% of pregnancies. [1] Because more women with heart disease are reaching childbearing age due to improved medical and surgical care, and desire children, the incidence and prevalence of cardiovascular disease in pregnancy is increasing. Rheumatic heart disease (RHD) continues to be a major cause of cardiac illness in developing countries. A multicentric epidemiologic study, published in 1996 by the Indian Council of Medical Research gave the national average of RHD prevalence as 6 per thousand in the age group of 5-

16 years. [2] In India, the rheumatic heart disease contributes to approximately 69% of cardiac disorders seen in pregnancy. [3] In many cases, the heart disease is diagnosed only at the time of pregnancy, as it is the first contact of the woman with a health care facility. The maternal mortality rate in women with cardiac disease is as high as 7%, and morbidity rate higher than 30% during pregnancy. [4]

Rheumatic heart disease (RHD) is a chronic acquired heart disorder resulting from acute

rheumatic fever. In developing countries, RHD continues to be a major cause of cardiac morbidity and mortality especially among young adult females. [5,6] In the presence of maternal heart disease, the circulatory changes of pregnancy may result in decompensation or death of the mother and/or the fetus. [7] The frequency of pregnancy complicated by maternal heart disease does not appear to have changed over the years. Heart disease complicates approximately 1% of all pregnancies. [8] The prevalence of pregnancy complicated by rheumatic heart disease (RHD) has decreased in developed countries and the former ratio of 3:1 for RHD to congenital heart disease (CHD) in patients with cardiac disease complicating pregnancy is now essentially reversed. Although rheumatic diseases are reported to be almost eradicated in developed countries, they still continue to contribute significantly to maternal morbidity and mortality in the developing world.

The aim of the present study was to assess the maternal and fetal outcome in women with valvular heart disease or prosthetic heart valve replacement secondary to rheumatic heart disease.

Materials and Methods

This was a prospective study which included consecutive pregnant women with valvular heart disease or prosthetic heart valve replacement secondary to rheumatic heart disease referred at department of cardiology, Rajendra Institute of Medicine Sciences (RIMS), Ranchi, Jharkhand, India for the period of one year. 100 pregnant women with rheumatic heart disease or prosthetic heart valve visited the hospital.

Detailed clinical history, symptomatic class, treatment history, 12 lead electrocardiogram (ECG), 2D echocardiography were done in all the patients. Obstetric ultrasound was done at the time of first antenatal visit and then at 12 weeks, 18-20 weeks and 24 weeks. Subsequent growth scans were done at interval of 4-6 weeks or earlier as per the clinical and obstetrical examination findings. Echocardiography was done on GE Vivid 7 ECHO machine (GE healthcare, Waukesha, WI, USA) with 3.5 Hz probe. Assessment of valvular lesions were done according to the European Association of Echocardiography and American Society of Echocardiography recommendations. Heart failure was defined according to American College of Cardiology/American Heart Association guidelines.

New York Heart Association (NYHA) classification was used to define whether patients were asymptomatic (NYHA class I) or symptomatic (NYHA class \geq II). The patients were risk stratified according to modified World Health Organisation (WHO) score and Cardiac Disease in Pregnancy (CARPREG) I score.

Patient was advised to follow up every 3 months or early if there was any change in symptomatic class till 36 weeks. Post-partum follow-up was done for 1 week after delivery, by visit to our hospital or telephonically. Depending on clinical status and NYHA class cardiac medications were modified and if needed patient was advised hospitalization. BMV was performed in pregnant patients with symptoms, MVA \leq 1 cm² or systolic pulmonary artery pressure \geq 50 mmHg despite medical therapy. Patients on warfarin, were changed to unfractionated heparin (UFH) from 6 to 12 weeks of gestation after detailed counselling regarding risks and benefit of continuing warfarin versus switching over to UFH and taking written informed consent. Warfarin was restarted after 12 weeks with switchover to UFH 36 weeks of gestation or earlier in patients with threatened preterm labour or any other complication requiring early delivery.¹⁸

Outcome

A maternal adverse outcome was defined as cardiac death, new onset arrhythmia, heart failure, thromboembolic event, hospitalization for other cardiac reasons or cardiac intervention, aortic dissection, infective endocarditis and acute coronary syndrome. Fetal adverse outcome was defined as fetal death, preterm birth, and low birth weight.

Statistical Analysis

Demographic data were described as mean (standard deviation) for continuous variables and number (%) for categorical variables. Univariate and multivariate logistic regression analysis were performed to assess the predictors of adverse maternal and fetal outcomes.

Pregnancy outcomes were also compared between symptomatic (NYHA I) and asymptomatic patients (NYHA $>$ II). Odds ratios and 95% confidence intervals were calculated. Statistical tests were considered significant if a P value was $<$ 0.05 (2-sided). All statistical analyses were performed using IBM SPSS Statistics 20.

Results

Table 1: Baseline demographic, clinical and echocardiographic characteristics

Parameters	N (%)
Mean age (years)	29.6 ± 5.5
Primigravida	42 (42%)
Mean gestational age at presentation (weeks)	19.1 ± 8.8
NYHA class	
I	19 (19%)
II	47 (47%)
III	29 (29%)
IV	5 (5%)
Prior cardiac intervention	64 (64%)
BMV	40 (40%)
Prosthetic valve	26 (26%)
Hypertension	3 (3%)
Diabetes Mellitus	6 (6%)
Hypothyroid	14 (14%)
Preeclampsia	3 (3%)
Atrial fibrillation	6 (6%)
Known case of RHD	82 (82%)
Mean dose of drugs	
Warfarin (mg)	3.3 ± 1.4
Metoprolol (mg)	38.2 ± 14.6
Atenolol (mg)	35.2 ± 12.6
Furosemide (mg)	16.4 ± 8.7
Verapamil (mg)	125 ± 56.4
Thyroxine (mg)	52.5 ± 15.5
Predominant Mitral stenosis	50 (50%)
Mild	2 (2%)
Moderate	18 (18%)
Severe	32 (32%)
Predominant Mitral regurgitation	7 (7%)
Mild	1 (1%)
Moderate	3 (3%)
Severe	4 (4%)
Combined MS and MR	12 (12%)
Predominant aortic valve disease	0
Combined aortic and mitral valve disease	6 (6%)
Mean RVSP (mmHg)a	47 ± 23
Mean EF (%)a	56 ± 1.5
Prosthetic valve	
MVR	22 (22%)
AVR	1 (1%)
DVR	4 (4%)
Modified WHO risk score	
I	2 (2%)
II	2 (2%)
II-III	34 (34%)
III	27 (27%)
IV	35 (35%)
CARPREG score	
0	4 (4%)
1	36 (36%)
2	54 (54%)
3	6 (6%)

42% women belonged to primigravida and 47% belonged to NYHA class II. 82% had known cases of RHD. The maternal adverse event rate was 2%, 2%, 34%, 27% and 35% in patients with modified WHO score risk stratification of I, II, II-III, III and IV respectively. The adverse event occurred in 4%, 36%, 54% in patients with CARPREG score of 0, 1 and ≥ 2 respectively.

Table 2: Maternal outcome

Maternal outcome	N (%)
Maternal mortality	2 (2%)
Cardiac intervention	29 (29%)
MVR	4 (4%)
New onset AF	3 (3%)
Heart failure hospitalization	9 (9%)
Infective endocarditis	2 (2%)
Mean gestational age of delivery (weeks)	36.2 ± 1.8
Thromboembolic event	0

Pregnancy with predominant mitral regurgitation and mild to moderate mitral stenosis were tolerated well with no maternal or fetal event. Pregnancy with predominant mitral regurgitation and mild to moderate mitral stenosis were tolerated well with no maternal or fetal event. 4 patients of combined

severe MS and MR were in NYHA IV, all underwent MVR during delivery. All 4 mitral valve replacement surgeries were done concomitant with lower segment caesarean section (LSCS) at the time of delivery.

Table 3: Fetal outcomes

Fetal outcome	N (%)
Abortion	8 (8%)
Spontaneous	2 (2%)
Induced	7 (7%)
Intra-uterine fetal death	2 (2%)
IUGR	6 (6%)
Oligohydramnios	14 (14%)
Live birth	90 (90%)
Preterm	24 (24%)
Term	66 (66%)
Mode of delivery	
Vaginal	30 (30%)
LSCS	60 (60%)
Emergency LSCS for cardiac reason	10 (10%)
Mean Birth weight (kg)	2.36 ± 0.44
Low birth weight (<2.5 kg)	52 (52%)
Very low birth weight (<1.5 kg)	4 (4%)
Warfarin embryopathy	3

Abortion was induced in 5 cases due to fetal malformations and 3 due to underlying maternal cardiac disease (2 cases were of combined lesion of mitral stenosis with mitral regurgitation and severe pulmonary arterial hypertension and 1 case of DVR).

Discussion

1-3% of pregnancies have underlying cardiac diseases. [9,10] In developing countries rheumatic heart disease (RHD) continues to be a major cause of cardiac illness. [11,12] In India, RHD contributes to approximately 69% of cardiac disorders seen in pregnancy. [13,14] Since pregnancy is the first contact of the woman with a health care facility in many cases, the heart disease is diagnosed only at the time of pregnancy. The maternal mortality rate in women with cardiac disease is as high as 7% and morbidity rate higher than 30% during pregnancy. [15] There has been decline in maternal mortality in

the past decade, but there has been no change in cardiac maternal death. [16]

42% women belonged to primigravida and 47% belonged to NYHA class II. 82% had known cases of RHD. The maternal adverse event rate was 2%, 2%, 34%, 27% and 35% in patients with modified WHO score risk stratification of I, II, II-III, III and IV respectively. The adverse event occurred in 4%, 36%, 54% in patients with CARPREG score of 0, 1 and ≥ 2 respectively. Pregnancy with predominant mitral regurgitation and mild to moderate mitral stenosis were tolerated well with no maternal or fetal event. Pregnancy with predominant mitral regurgitation and mild to moderate mitral stenosis were tolerated well with no maternal or fetal event. 4 patients of combined severe MS and MR were in NYHA IV, all underwent MVR during delivery. All 4 mitral valve replacement surgeries were done concomitant with lower segment caesarean section (LSCS) at the time of delivery. The mitral valve was the most involved lesion with 50% had predominant

mitral stenosis which is similar to previous studies. [17,18] Left sided stenotic lesions were more symptomatic as compared to regurgitant lesions. During pregnancy there is expansion of the plasma volume, which is poorly tolerated in the presence of severe left-sided stenosis. [19,20]

The association of the pre pregnancy functional class with the risk of maternal events raises attention to the possibility of reducing these complications in pregnant women with mitral stenosis by means of early interventions aimed at improving their functional class. The mitral valve area was also strongly significantly associated with the risk of maternal events. If the mitral valve area was the only determining risk factor for events in these patients, the correction of high-degree stenosis should correspond to a pronounced reduction of the occurrence of maternal complications during pregnancy and puerperium. Abortion was induced in 5 cases due to fetal malformations and 3 due to underlying maternal cardiac disease (2 cases were of combined lesion of mitral stenosis with mitral regurgitation and severe pulmonary arterial hypertension and 1 case of DVR).

This study showed that cardiac intervention in severe valvular disease helped women to tolerate pregnancy well with good fetal outcome. BMV being a less invasive procedure is effective and relatively safe during pregnancy and is preferred over a surgical procedure. [21,22] Post-surgical procedure there is increase maternal and fetal events having a risk of fetal death up to 20%. [23] The best timing for BMV has been suggested to be after the fourth month. [24] In our study the mean timing of BMV was 24.7 ± 6.3 weeks. There have been few case reports of combined surgery (simultaneous LSCS and MVR) described in literature. [25,26] This strategy of simultaneous caesarean and open-heart surgery seems reasonable and can be successfully employed and lifesaving for severely symptomatic women who are unfit for percutaneous intervention and are unable to bear the stress of labor and delivery.

Conclusion

Women with rheumatic heart disease carry a high risk both for mother and fetus. Early diagnosis, close follow-up during pregnancy, early recognition of deterioration in symptoms and timely cardiac intervention can lead to good maternal or fetal outcome. Multidisciplinary evaluation by cardiologists and obstetrician, proper pre-conception and antenatal care are the key measures to improve the outcomes of these patients.

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