Original Article

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Evaluation of Pregnancy Outcome in Women with Rheumatic Mitral Valve Stenosis

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Abstract

Background and Aims: Rheumatic heart disease is still one of the most common heart lesion in developing countries. The maternal and fetal hazards increase with the severity of Mitral stenosis. This study was aimed to determine the fetomaternal outcome in women with mitral stenosis during pregnancy.

Methods: This was descriptive cross-sectional study which included all pregnant patients with isolated rheumatic mitral valve stenosis. Major adverse outcomes studied were cardiac failure, thromboembolic event, admission in cardiac care or intensive care unit, atrial fibrillation, endocarditis, pulmonary hypertension and cardiac death.

Results: Out of 3194 pregnant women, 31 had mitral stenosis. Their mean age was 27 years, mean mitral valve area 1.43cm^2 and majority were primigravida (61.29%). Among them, symptomatic cardiac failure was present in 6.66%, 30% and 66.66% of mild, moderate and severe mitral stenosis respectively. The chances of cardiac failure, atrial fibrillation, preterm delivery and small for gestational age babies was high in all patients without having percutaneous trans-luminal mitral commissurotomy than those who underwent the procedure for moderate to severe mitral stenosis during pregnancy.

Conclusion: There were high chances of adverse fetomaternal outcome in pregnant women with mitral stenosis. Cardiac failure was found to be increased with the severity of mitral stenosis. PTMC during pregnancy resulted in decreased cardiac failure, atrial fibrillation, preterm delivery and small for gestational age babies.

Keywords: Cardiac failure, Fetal outcome, Maternal outcome.

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Introduction

In emerging countries, rheumatic valve disease is the most common cardiac disease in pregnant women and the most important cause of maternal death[1-4] and rheumatic mitral valve stenosis (MS) among them is a high risk condition.[5] Women with moderate and severe MS face life threatening complications during pregnancy and management of such patients has always been quite challenging for obstetricians and cardiologists. Untreated MS contributes to significant morbidity and mortality.[6]

Various cardiovascular changes in pregnancy like increased cardiac output, increased heart rate and progressive increase in blood volume all together make the pregnancy outcome worse with MS. Iris M et al reported mortality of 1.9% among women with MS during pregnancy and 50% of the patients with severe rheumatic MS developed heart failure during pregnancy[7]. Similarly, Silversides CK et al stated that complications like pulmonary oedema and arrhythmia occurred in 35% of pregnancies with MS, while incidence of the other maternal cardiac complications correlates with severity of the mitral stenosis.[8]

MS also affects fetus. Adverse fetal outcomes associated with MS include preterm delivery, intrauterine growth retardation, low birth weight and neonatal death.[9]

Interventions like percutaneous trans-luminal mitral commissurotomy (PTMC) might improve the outcome. PTMC is safe and efficacious in managing pregnant women with severe mitral stenosis.[10] The aim of this study was to determine the pregnancy outcome in patients with isolated mitral valve stenosis.

Methods

This was a descriptive, single centre, observational study conducted in the Department of Obstetrics and Gynaecology of Tribhuvan University Teaching Hospital (TUTH) from 1st April to 30th June 2022. This study was conducted after taking ethical approval from the Institutional Review Committee of the same institution (reference number:321(6-11)E2,079/080). All the patients after 28 weeks of gestation who delivered here in our hospital with isolated mitral valve stenosis with or without PTMC with mitral valve area diameter of < 2 cm^2 were included in the study. Pregnant women with valve other than MS, prosthetic valves and other acquired cardiac lesions were excluded from the study.

Mitral valve disease was defined according to the European Association of Echocardiography and American Society of Echocardiography recommendations for echocardiographic assessment of valve stenosis[11]. Using older guideline in our study,

mild MS was defined as valve area >1.5 cm^2 or mean gradient 2-6 mm Hg, moderate with valve area of 1.0-1.5 cm^2 or mean gradient of 6-12 mm Hg and severe as valve area of <1.0 cm^2 or mean gradient of >12 mm Hg.

All women with MS were managed as per hospital protocol. They were followed twice weekly till 36 weeks and weekly thereafter. Women were admitted early in case of development of adverse events, grade III/IV NYHA status or worsening cardiac failure. Digoxin and metoprolol were continued as per indication. Diuretics were given only in case of development of pulmonary oedema. Induction of labour and cesarean section was done as per obstetric indications. Antibiotic prophylaxis with ampicillin and gentamycin was given in all patients during active stage of labour for endocarditis prophylaxis and was continued till 5 days postpartum as per our hospital protocol. The second stage of labour was cut short so as to relieve the stress of labour with either forceps or vacuum delivery. Furosemide was given 20 mg intravenously immediately following delivery and patient were kept under observation for 4 hours in labour room and shifted to postoperative ward or CCU/ICU as per requirement.

Major adverse cardiac events were defined as cardiac failure, thromboembolic event, endocarditis, admission in cardiac care or intensive care unit, pulmonary hypertension and cardiac death.

Obstetric complications were defined as preterm delivery, and preclampsia whereas fetal complications were defined as small for gestational age <10th percentile, intrauterine fetal death, neonatal death within 1 week of delivery .The data was retrieved from the labour room confinement book, partograph , paediatrician record book and from the cardiac department of Manmohan teaching hospital. All pregnant women with isolated mitral valve stenosis who delivered here in our hospital during the study period were included.

The collected data was entered and analyzed using IBM SPSS Statistics version 22.0 and descriptive analysis was done. Percentage, frequency, Odds ratio and relative risk were calculated of major adverse events.

Results

Out of total 3194 pregnant women during our study period, 31 fulfilled the criteria and were enrolled in the study. The mean age of the patients was 27 years (range:20-34 years) and majority were primigravida15 (61.29%). The mean mitral valve area among them was 1.43cm^2. The degree of MS was mild in 48.38% , moderate in 32.24% and severe in 19.35% of women. (table 1,2).

Cardiac failure was 24.80% among women with MS, which was 6.66%,30%,66.66% in mild, moderate and severe MS respectively. About 22.58% women were of NYHA III/ IV and 35.48% of women had moderate to severe pulmonary hypertension (table 3).

Table 1: Types of isolated Rheumatic mitral valvular stenosis with or without mitral regurgitation in pregnant women.

S/N	Cardiac pathology	Number of patients N=31(%)
1	Mitral valve stenosis Associated with /or without MR	
	Mild MS	15 (48.38%)
	Moderate MS	10 (32.24%)
	Severe MS	6 (19.35%)
2	PTMC during pregnancy with suboptimal residual mitral stenosis	8(25.80%)
	MS without PTMC/or before pregnancy	23(74.19%)
3	Total	31(100%)

Table 2: Obstetric outcomes in women with MS.

S/N	Cardiac pathology	Number =31(%)
1	Age (years)	
	18-24	8(25.80%)
	25-31	17(54.83%)
	32-38	6(19.35%)
2	Gravidity	
	Primigravida	19(61.29%)
	Gravida ≥2	12(38.70%)
3	Gestational age	
	28-32	3(9.6%)
	33-37	10(32.25%)
	>37	18(61.29%)
4	Preterm labour	13(41.93%)
5	Pre-eclampsia	5(16.12%)
	Mode of delivery:	
	Vaginal	14(45.16%)
	Cesarean	12(38.70%)
	Instrumental	5(16.1%)

Table 3: Fetal outcome in women with MS.

S/N	Fetal parameters	N=31(100%)
1	Birth weight (Kg)	
	<2 Kg	5(16.12%)
	<2.5 kg	7(22.58%)
	2.5-<3.0kg	8(25.80%)
	>3.0 kg	11(35.48%)
2	Low birth weight babies <2.5 kg	12 (38.70%)
3	Intrauterine fetal death	-----
4	Still birth	1(3.22%)
5	Neonatal death	4(12.90%)

Table 4: Non cardiac and cardiac complications in pregnant women with MS.

S/N	Complications	Number of women (%) N=31
Non-cardiac complications		
1	Anemia	6(19.35%)
2	Pregnancy induced hypertension	5(16.12%)
3	Abruptio placenta	2(6.45%)
4	Prelabour rupture of membranes(PROM)	7(22.5%)
Cardiac complications		
5	Cardiac failure	8(25.80%)
6	Atrial fibrillation	7(22.55%)

7	Pulmonary hypertension	9(29.03%)
8	Cardiac care unit/ Intensive care unit admission	17(54.83%)
9	Maternal death	-
10	Pulmonary embolism	-
11	Endocarditis	-

Table 5: Maternal and fetal outcome in relation to MVA in pregnant women with MS.

S/N	Complications	Mild MS (MVA <1.5-2.0cm2) N=15 (48.38%)	Mod MS (MVA) :1.0-1.5cm2) N=10 (32.25%)	Severe MS (MVA <1.0 cm2) N=6 (19.35%)
Maternal complications				
1	Cardiac failure	1(6.66%)	3(30%)	4(66.66%)
3	Atrial fibrillation	-	3(30)	4(66.66%)
4	Pulmonary hypertension, (moderate to severe)	2(13.33%)	3(30%)	4(66.66%)
5	Mortality	-	-	-
Fetal complications				
6	Preterm delivery	2(13.33%)	5(50%)	6(100%)
7	Iow birth weight baby <2.5 kg	3(20%)	4(40%)	5(83.33%)
8	Neonatal death	None	2(20%)	3(50%)

About 17(54.83%) women required admission in Cardiac care or intensive care unit. The main reason of admission among 11(35.48%) of them was heart failure or worsening of NYHA status. The risk of heart failure was high in severe MS, where all patients developed heart failure followed by moderate MS (table 4). About 4(50 %) of women developed heart failure during pregnancy while others 4(50%) immediately after delivery.CF was treated by diuretics, beta blockers and ACE inhibitors and immediate cesarean section after stabilization of the patient.

Table 6: Maternal and fetal outcome in relation to PTMC done during pregnancy for moderate to severe mitral stenosis.

S/n	Complications	MS with PTMC during pregnancy N=8	MS without PTMC during pregnancy N=23	Odds Ratio	Relative risk
1	Cardiac failure	1 (12.5)	7 (30.43%)	2.47	2.088
2	Atrial fibrillation	1 (12.5%)	6 (26.08%)	2.47	2.087
4	CCU/ICU admission	2 (25.0%)	15	2.64	2.608
5	Maternal mortality	--	--	-	-
6	Pulmonary hypertension (moderate to severe)	--	9 (39.13%)	-	-
7	Preterm delivery	1 (12.5%)	12 (52.1%)	7.63	4.17
8	Low-birth weight babies<2.5kg	1 (12.5%)	11 (47.82%)	6.42	3.82

Among 31 cases of isolated mitral valve disease, there were 11 cases of PTMC, 8 had PTMC during the pregnancy at 24-28 weeks of gestation for severe MS except one which was done at 34 weeks of gestation and rest 3 cases had PTMC before the pregnancy.

Table 7: Maternal and fetal outcome in relation to NYHA functional class in pregnant women with MS.

S/N	Outcome	NYHA -I N=14 (45.16%)	NYHA-II N=8 (25.80%	NYHA-III N=4 (12.90%)	NYHA-IV N=5 (16.12%)
Maternal					
1	Cardiac failure	1(7.1%)	2(25%)	2(50.0%)	3(60%)
2	Atrail fibrillation	-	2(25%)	2(50.0%)	3(60%)
3	Pulmonary hypertension	1(7.1%)	2(25%)	3(75%)	3(60%)
4	Mortality	-	-	--	-
Fetal					
5	Low birth weight baby	1(7.1%)	1(12.5%)	4(100%)	5(!00%)
6	Neonatal death	-	-	2(50.0%)	3(60%)

Discussion

Management of MS is always challenging as most patients present in labour in CF without prior antenatal checkup. Usually patients with mild MS tolerate pregnancy well, but problem arise in those with moderate and severe MS. These patients are usually associated with atrial fibrillation, pulmonary hypertension and fetal complications with high maternal mortality.

Among 31 women, 25.80% of patients developed cardiac failure in our study, however there was no mortality due to cardiac cause (table 1). The incidence of maternal death was 6.8% in a study from Ethiopia[12] as they had majority of patients with severe MS, whereas it was negligible in studies from California[13] and 2% in a study from Pakistan.[14] The negligible maternal mortality could be because of immediate management of Cardiac failure in our centre in collaboration with team of obstetricians and cardiologists. Patients were followed twice weekly after 28 weeks and weekly thereafter, metoprolol and digoxin were started in case of tachycardia. Patients were admitted in CCU in case of adverse events or worsening of NYHA status and PTMC was done at 24 weeks of gestation for moderate to severe mitral stenosis.

About 8(25.80%) patients with MS had cardiac failure in our study which is low in contrast to study by Gebremedhin Y et al, where heart failure was found to be 69% . This may be as majority

of patients in their study were of severe MS. The cardiac failure (30.43%) was also high in our study among patients without PTMC during pregnancy. Majority of patients who developed cardiac failure were of class NYHA III and IV (table 6,7). The cardiac failure was 41.17 % in NYHA functional class ≥2, quite similar to study in Ethiopia. NYHA class ≥ 2 is an independent predictor of maternal cardiac events during pregnancy.[7]

It is not surprising to have such finding of cardiac failure in pregnancy. Mitral stenosis leads to obstruction to left ventricular inflow and increased heart rate. Cardiac output remains elevated 24 hours postpartum[15] along with the extra 300-500 ml blood which is auto transfused from the placenta to the systemic circulation. Each contraction makes patient more prone to cardiac failure. Moreover, systolic and diastolic blood pressure also increase during each contraction.[12,13] All these changes can lead to pulmonary congestion, pulmonary hypertension, right sided dilatation and tricuspid regurgitation. These cardiovascular changes contribute to decompensation of a previously asymptomatic MS. The additional atrial fibrillation also contributes to worse outcome as the irregular heart rate increases the left atrial pressure and precipitates heart failure symptoms.

In present study, cardiac failure was found to be increased with the severity of mitral stenosis. similar to many studies[7,8,12,16] (table 5). Mitral valve area was the main determinant factor for maternal and fetal outcomes of pregnant women with MS in various studies.[8,12] This all is due to haemodynamic shifts occurring during pregnancy and immediately postpartum .

The cardiac failure (30.43%) excluding the PTMC intervention in our study was comparable to study done in south Africa[17] where pulmonary oedema developed in 31% of patients, and all cases were successfully managed. However in a study from Indonesia,[16] high percentage of cardiac failure (50%) was seen, which was probably due to more number of cases of severe MS with arrival in late trimester and delayed PTMC, which was done >34 weeks of gestation. Thus optimal medical management is the key in minimizing such complications with low maternal mortality, though the risk of maternal death always exists. Timely management in collaboration with cardiologists and obstetricians team can be life saving.

The case control study by hammed et al[14] found that hemodynamically significant mitral stenosis increased the rate of IUGR and resulted in lower birth weights. Low birth weight babies is due to associated uteroplacental insufficiency leading to low uteroplacental blood flow. In our study the chances of lowbirth weight babies is high in comparison to study by Gebremedhin Y et al[12], although the still birth rate is similar. This may be as majority of patients arrived late without any prior antenatal check up with small for gestational age babies and mostly had preterm delivery .

Cardiac intervention like PTMC resulted in significant less fetal morbidity and mortality in a study by Souza et al.[18] Similarly in our study the odds of having preterm delivery, low birth weight babies is7.63, 6.42 times respectively in patients with MS without having PTMC in comparison to those who underwent PTMC for moderate to severe mitral stenosis during pregnancy (table 6). This is in contrast to study done in Northern India[10] where although there was significant improvement in clinical symptoms and echocardiographic parameters following PTMC, but there was high chances of low birth weight babies (67.21%). This may be as among 47 patients out of 70 patients in their study, PTMC was done for critical MS, after 24 weeks of gestation due to late arrival of patients. Whereas in our study nearly in all patients PTMC was done < 24 weeks of gestation except in one in whom it was done at 34 weeks of gestation. The course of pregnancy was uneventful in these patients in present study. Presence of cardiac failure, low birth weight babies and increased risk of infections in such patients increase the chances of preterm delivery. Thus women with intervention of PTMC during pregnancy usually has good perinatal outcome and fewer cardiac events than those without PTMC. After PTMC adverse fetomaternal consequences are minimized, cardiac functional status and parameters are improved leading to decreased morbidity and mortality.

Severity of stenosis is an important predictor of maternal fetal consequences like cardiac failure and atrial fibrillation. Such patients should be counseled either prior to conception or in first trimester of pregnancy. Proper management should be started early in collaboration with team of obstetricians and cardiologists such as diagnosis of cardiac failure and treatment of atrial fibrillation. Despite the medical therapy PTMC should be considered in patients with moderate or severe MS so as to improve the maternal and fetal outcome. Extra maternal care should be given in puerperium as there is increased risk of pulmonary oedema in the immediate postpartum period

Limitations

It is a single center study with small sample size and also majority of women with MS arrived late in pregnancy .Thus more studies are needed with adequate sample size so as to get the exact data regarding the adverse fetomaternal consequences. Further studies should also be conducted on fetomaternal outcome in relation to PTMC during pregnancy.

Conclusion

Mitral stenosis is associated with increased chances of adverse fetomaternal consequences such as cardiac failure, atrial fibrillation, preterm delivery and small for gestational age babies. Cardiac failure was found to be increased with the severity of MS and NYHA functional class. PTMC for indicated MS patients resulted in decreased adverse cardiac and fetomaternal events.

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