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Original Research Article

Pregnancy outcome in rheumatic mitral stenosis patients with and without surgical correction: a prospective cohort study

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ABSTRACT

Background: The aim of the current study is to assess the maternal and fetal outcomes of pregnant females with and without surgically corrected mitral stenosis (MS).

Methods: A cross sectional study was carried out at Assiut Women's Health Hospital, Egypt between February 2016 and December 2016. All pregnant women diagnosed with rheumatic heart disease attending the antenatal care clinic were enrolled in the study. They were divided into two groups according to previous surgical correction of MS or not. All women were followed up during pregnancy till the end of puerperium. The primary outcome of the study was the difference in the rate of maternal cardiac complications during pregnancy between both groups.

Results: The study included 48 patients (39%) with surgically corrected MS and 75 patients (61%) with uncorrected MS. All cardiac complications were significantly higher in the uncorrected MS group ($p < 0.05$). No difference between both groups in the mode of delivery ($p = 0.52$). Postpartum hemorrhage is more common with the corrected MS group than the uncorrected group (25% vs. 9.3% respectively, $p = 0.003$), while the need for postpartum admission to ICU was significantly higher in the uncorrected group ($p = 0.006$). The mean birth weight was higher in the corrected MS group ($p = 0.000$). The percentage of stillbirths and the rate of admission to PCU was higher in the uncorrected MS group ($p = 0.003$).

Conclusions: Surgical correction of MS significantly improves the maternal and fetal outcomes of rheumatic heart pregnant females with MS.

Keywords: Maternal morbidity, Mitral replacement, Perinatal outcome, Rheumatic heart disease

INTRODUCTION

Pregnancy is associated with several hemodynamic changes that can significantly affect a preexisting cardiac disease; including sodium and water retention which increase the cardiac output, and decrease the systemic vascular resistance and systemic blood pressure.¹ These changes start in the first five to eight weeks of pregnancy, maximize during the late second trimester, and then remain relatively steady until delivery.

Heart disease is one of the important medical complications in pregnant females as it is a common

indirect obstetric cause of maternal morbidity and mortality. About 2-4% of pregnant females are suffering from cardiac disease.² Rheumatic heart disease (RHD) is a consequence of acute rheumatic fever. It stills a major cause of cardiac morbidity and mortality in developing countries particularly among young adult women.^{3,4}

The most common valvular lesion in females with RHD is mitral stenosis (MS). It remains the most common acquired valvular lesion in pregnant females and the most common cause of maternal death from cardiac causes.^{5,6} Even though mortality is not high in rheumatic pregnant females, the rate of fetal morbidity is positively

correlated with the severity of MS from as it increases from 14% in pregnant females with mild MS to 28% in those with moderate MS and 33% in females with severe MS.^{7,8}

Surgical correction of MS includes mitral commissurotomy and percutaneous balloon valvuloplasty in mild and moderate cases.⁹ Lastly, valve replacement is reserved for the severe cases.¹⁰ Pregnancy after mitral valve replacement is very risky for both mother and fetus as a result of the aggravation of maternal heart function and adverse effects of anticoagulation therapy. Potential risks include maternal heart failure, arrhythmia, infective endocarditis, and high risk of maternal mortality with advancing gestational age.¹¹

The aim of the current study was to assess the maternal and fetal outcomes of pregnant females with and without surgically corrected mitral stenosis.

METHODS

Study type, setting and duration

The current study was a prospective cohort study conducted at Assiut Women's Health Hospital, Egypt between February 2016 and December 2016. The Assiut Medical School Ethical Review Board approved the study. The non-interventional nature of the study and respect of patients' confidentiality were clear to the patient and their written consent to participate had been obtained.

Study population

All pregnant women diagnosed with rheumatic heart disease attending the antenatal care clinic of the aforementioned hospital during the study period were invited to participate in the study. The inclusion criteria were; age 15-40 years, pregnant at any trimester, proven diagnosis of MS by recent echocardiography or patient had a full surgical report confirming the intervention done for correction of MS. We excluded women with other valve lesions, those who had chronic medical illnesses as diabetes and hypertension, women with congenital or ischemic heart diseases and those who declined participation in the study.

Intervention

One of the study investigators collected the basic data including; age, parity, previous miscarriages and body mass index (BMI). Then, a detailed history was taken regarding the antenatal visits, anticoagulation regimen, use of long acting penicillin, obstetric history, previous heart failure and history of intensive care unit (ICU) admission before.

Thorough clinical examination was done to find out the type of cardiac lesion, any signs of failure and stage of

pregnancy. Cases were graded as per NYHA classification of grade of heart disease. Cases were referred to a cardiologist for confirmation of cardiac disease; know the functional status of the heart through evaluation by echocardiography to evaluate the presence of pulmonary hypertension. All included patients were classified into two groups; surgically corrected cases and surgically uncorrected cases.

Follow-up

All women were followed up during pregnancy till the end of puerperium according to the hospital protocol. Any cardiac or obstetric complications occurred during pregnancy was recorded. Data at delivery was obtained including; gestational age at delivery, mode of delivery and use of anesthesia. Additionally; fetal weight, gender, Apgar score at delivery, presence of congenital malformations and need for pediatric care unit admission (PCU) were recorded.

The need for postpartum admission to ICU, duration of hospital stay and cases of maternal mortality were also recorded.

Study outcomes

The primary outcome of the study was the difference in the rate of maternal cardiac complications during pregnancy as heart failure, arrhythmia between both groups. The secondary outcomes were the difference in the rate of obstetric complications, mode of delivery, fetal birth weight, rate of neonatal complications, perinatal and maternal mortality.

Statistical analysis

The collected data was coded; tabulated and analyzed using the statistical package for social science programs (SPSS) Chicago, IL, USA, version 22. Quantitative variables were expressed as mean and standard deviation. Qualitative variables were expressed as frequency and percentage. Comparison between groups was done using Student's T-test for quantitative variables and chi-square test for qualitative variables. Level of significance "P" value was evaluated, where P value <0.05 was considered statistically significant.

RESULTS

One hundred and forty-eight women were approached to participate in this study. Twenty-five women were excluded due to presence of different exclusion criteria or their refusal to participate in the study. The remaining 123 women were stratified into two groups; 48 patients (39%) with surgically corrected MS and 75 patients (61%) with uncorrected MS. Of the 48 surgically corrected cases; 34 women (70.8%) had performed mechanical mitral valve replacement and 14 women (29.2%) with balloon valvuloplasty.

Table 1: The basic and clinical data of the study participants.

Variables	Rheumatic MS (n=123)				p-value
	Corrected		Uncorrected		
	n=48	%	n=75	%	
Age (years) #	29.4±5.5		29.2±5.2		0.25
Parity #	2.0±1.6		2.3±1.7		0.31
BMI #	22.9±1.9		22.8±2.6		0.76
Previous miscarriages #	0.70±0.9		0.52±0.9		0.32
Regular ANC	42	87.5	66	88	0.57
Medications					
Long acting penicillin	32	66.7	53	70.7	0.69
Heparin	28	58.3	4	5.3	0.000*
Oral anticoagulants	9	18	3	4	0.04*
History of ICU admission	2	4.2	5	6.7	0.70
Previous heart failure	2	4.2	7	9.3	0.48
NYHA classification					
Grade 1	33	68.8	21	28	0.000*
Grade 2	12	25	32	42.7	
Grade 3	2	4.2	19	25.3	
Grade 4	1	2.1	3	4	

MS; mitral stenosis, BMI; body mass index, ANC; antenatal care, ICU; intensive care unit, (*) statistically significant difference, (#) Data are presented as mean ± standard deviation

Table 1 show that both groups were homogenous in their basic and clinical data on admission. Patients in the corrected MS group were more receiving anticoagulants in the form of oral tablets or subcutaneous heparin than

the uncorrected group (18% vs. 4% and 58.3% vs. 5.3%, respectively) with a statistical significant difference. More than two-thirds of patients (68.8%) in the corrected MS group were NYHA class I, while most of uncorrected MS group (42.7%) were NYHA class II (p=0.000).

Table 2: The maternal outcomes during pregnancy, labor and puerperium.

Outcomes	Rheumatic MS (n=123)				p-value
	Corrected		Uncorrected		
	n=48	%	n=75	%	
Cardiac complications					
Heart failure	1	2.1	15	20	0.003*
Mild pulmonary hypertension	9	18.8	23	30.7	0.008*
Severe pulmonary hypertension	0	0	8	10.7	0.000*
Arrhythmia	0	0	2	2.7	0.01*
Infective endocarditis	0	0	0	0	---
Mode of delivery					
Spontaneous vaginally	20	41.7	31	41.3	0.52
Induced vaginally	2	4.2	5	6.7	
Elective CS	19	39.6	25	33.3	
Urgent CS	7	14.5	14	18.7	
Anesthesia during CS					
	n=26		n=39		
Spinal	22	84.6	29	74.4	0.06
General	4	15.4	10	25.6	
Postpartum hemorrhage	12	25	7	9.3	0.003*
Postpartum Admission to ICU	6	12.5	36	48	0.006*
Duration of postpartum hospital stay (days) #	2.9±2.1		4.9±4.5		0.001*
Maternal deaths	1	2.1	2	2.7	0.59

MS; mitral stenosis, CS; cesarean section, ICU; intensive care unit, (*) statistically significant difference, (#) Data are presented as mean±standard deviation

Table 3: The neonatal outcomes of the study participants.

Outcomes	Rheumatic MS (n=123)				p-value
	Corrected		Uncorrected		
	n=48	%	n=75	%	
Birth weight (gram) #	3304.8±365.6		2553.6±544.7		0.000*
Apgar score #	9.45±0.74		7.65±2.82		0.000*
Neonatal gender					
Male	26	54.2	41	54.7	0.85
Female	22	45.8	34	45.3	
Stillbirths	0	0	6	8	0.003*
Congenital malformations	0	0	0	0	-----
Admission to PCU	1	2.1	12	16	0.003*

MS; mitral stenosis, PCU; pediatric care unit, (*) statistically significant difference, (#) Data are presented as mean ± standard deviation

Table 2 summarizes the maternal outcomes of rheumatic MS patients during pregnancy, labor and puerperium. Apart from infective endocarditis, all cardiac complications were significantly higher in the uncorrected MS group ($p < 0.05$). No difference between both groups in the mode of delivery ($p = 0.52$). Postpartum hemorrhage is more common with the corrected MS group than the uncorrected group (25% vs. 9.3% respectively, $p = 0.003$), while the need for postpartum admission to ICU was significantly higher in the uncorrected group ($p = 0.006$).

Table 3 demonstrates a statistical significant difference between both groups as regard the neonatal outcome. The mean birth weight was higher in the corrected MS group ($p = 0.000$). The percentage of stillbirths and the rate of admission to PCU was higher in the uncorrected MS group ($p = 0.003$).

DISCUSSION

The current study demonstrated that the surgically corrected MS patients have better maternal and neonatal outcomes during the course of pregnancy and labor than the uncorrected MS patients. Postpartum hemorrhage is the only concern in the corrected MS patients which is attributed to the unadjusted use of anticoagulants during pregnancy.

Typical pregnancy hemodynamic changes include a 40-50% increase in blood volume and cardiac output by midterm, accompanied by vasodilation and an increase in heart rate of 10-15 beats/min.¹² Labor and delivery pose an additional cardiovascular burden due to contractions, pushing and the auto transfusion that occurs after delivery.¹³ Although these changes are well tolerated by most women, in those with significant RHD, there may be adverse cardiovascular effects that can result in maternal or fetal morbidity or even death.¹⁴

The most common heart valves affected by RHD and non-RHD causes are the mitral and aortic valves, less

commonly the tricuspid and rarely the pulmonary valve. Rheumatic valve disease most commonly leads to regurgitation and less commonly to valve stenosis or mixed regurgitation and stenosis.¹⁵⁻¹⁷ Although the majority of rheumatic valve disease cases are only mildly affected, a minority progress to more severe disease requiring valve surgery.¹⁸

MS remains the most common acquired valvular lesion in pregnant women and the most common cause of maternal death from cardiac causes worldwide.⁶ The rate of fetal morbidity, including fetal growth restriction and preterm birth, rises with the severity of MS from 14 % in pregnant patients with mild MS, to 28 and 33% in pregnant patients with moderate and severe MS, respectively.¹⁹

In present study, there were 34 patients (27.6%) of 123 rheumatic pregnant females included were undergone mitral valve replacement, and 14 patients (11.4%) were undergone valvoplasty (balloon dilatation). Regarding the mode of delivery and antenatal care, there was no significant difference between modes of delivery in both groups.

Madazli et al reported in a retrospective analysis including 144 pregnancies in women with cardiac disease that there were no cases of maternal mortality and cardiac women with no intervention have poorer maternal outcome with more complications as heart failure, arrhythmias, and admission to cardiac ICU when compared to those with intervention.²⁰ We are keeping in the same track with their results. However; in our study, postpartum hemorrhage is more common in surgically corrected patients (33.3%) than those with no surgery (9.3%). This can be attributed to their use of warfarin and heparin more than those with no intervention (58.3 % vs. 5.3%) and (18% vs. 4%) respectively.

In present study, patients with no intervention had significantly higher rate of cardiac complications during pregnancy as heart failure and arrhythmia after termination of pregnancy than those with intervention.

There are 3 cases of maternal mortality, one case in surgically corrected patients and 2 cases in those with no intervention.

The physiological changes of pregnancy can precipitate symptoms of cardiac disease in women who were previously asymptomatic. In our study, surgically corrected patients are less symptomatic than those with uncorrected MS. Additionally, patients with no intervention have poorer neonatal outcome as birth weight and Apgar score than those in patients with intervention. Pediatric care unit admission and stillbirths were significantly ($p = 0.000$) more in patients with no intervention.

In conclusion, surgical correction of MS either by valve replacement of valvoplasty improves the maternal and fetal outcomes in rheumatic heart pregnant females. Optimization of the received anticoagulants doses can decline the rate of postpartum hemorrhage in those patients.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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