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Original Article

Maternal and Neonatal Outcomes in Pregnant Patients with Mitral Stenosis as a Result of Rheumatic Heart Disease

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ABSTRACT

Background: The lack of accurate and timely diagnosis and treatment of mitral stenosis (MS) during pregnancy can lead to irreparable consequences for mother and neonate. The present study aimed to determine maternal and neonatal outcomes of pregnant patients with MS due to rheumatic heart disease.

Methods: This prospective cohort study was performed on 35 pregnant women with MS as a result of rheumatic heart disease referred to the prenatal clinic at Shariati Hospital in Tehran in 2015. On first admission, fetal growth status was evaluated with ultrasound and clinical examination. The mothers were also examined in terms of symptoms and complications, and their New York Heart Association functional capacity was determined. The severity of MS was determined using clinical and transthoracic echocardiographic assessments.

Results: Maternal mortality and pulmonary edema each occurred in 2.9% of the patients. Termination of pregnancy was required in 17.1%. Mean area of mitral valve was significantly lower in the women with post-delivery complications than in the other women. All the women with post-delivery complications had severe MS, while this defect was revealed only in 53.1% of those without complications (P=0.046). All the neonates delivered as a result of the termination of pregnancy suffered severe MS, whereas this anomaly was detected in 48.3% of the neonates with normal delivery (P=0.044).

Conclusions: MS can predict maternal post-delivery events (pulmonary edema and need for mitral replacement therapy) and neonatal complications (termination of pregnancy). The progressive reduction in functional capacity during pregnancy can also predict adverse post-delivery events in patients with MS. ***(Iranian Heart Journal 2016; 17(1): 45-50)***

Keywords: ■Mitral stenosis ■ Pregnancy ■ Outcome ■ Fetal

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The overall prevalence of complicated pregnancies due to maternal cardiovascular disorders has remained high in the last decade.[1,2] In fact, although recent reports have highlighted the downward trend of these abnormalities in developed countries, these disorders have been identified as one of the main causes of disabilities and maternal mortalities.[3] According to the reports of the American Heart Association, the maternal mortality rate due to mitral stenosis (MS) has been estimated as 1% in New York Heart Association (NYHA) class I, which rises to 5% in higher NYHA classes.[4] Moreover, prenatal mortality in low NYHA functional class is significantly low, but it is in the range of 12% to 31% in high function classes.[5] MS is the most common valvular defect secondary to chronic rheumatismal disease and leads to a reduction in the tolerance of pregnant patients for changes faced during pregnancy due to compliance with pregnancy-related cardiovascular physiological changes.[6,7] This valvular abnormality may lead to an increase in right ventricular pressure and pulmonary vein as well as increase in the risk of pulmonary edema.[8] Also, right-heart failure may occur due to increased right ventricular pressure.[9] It is clear that in pregnant women with MS, deterioration of heart failure is predictable and it may lead to increased risk for pulmonary edema.[7]

Along with the effect of MS on maternal outcome during pregnancy, neonatal outcome can be potentially affected as well, leading to increased risk of prematurity, intrauterine growth retardation (IUGR), and low birth weight.[10,11]

According to the above-mentioned points, the lack of accurate and timely diagnosis and treatment of MS caused by rheumatic heart disease during pregnancy can lead to irreversible consequences for mother and neonate. The present study aimed to determine maternal and neonatal outcomes of MS due to rheumatic heart disease.

METHODS

This prospective cohort study was performed on 35 pregnant women with MS due to rheumatic heart disease referred to the prenatal clinic at Shariati Hospital in Tehran, Iran, in 2015. The diagnosis of MS was confirmed by 2D transthoracic echocardiography. The exclusion criteria were the presence of artificial heart valve, history of cardiac invasive procedures, serious defects of the other cardiac valves, therapeutic abortion due to any obstetrics or gynecologic problem, and lack of patient follow-up.

On first admission, fetal growth status was evaluated with ultrasound and clinical examination. The mothers were also examined in terms of symptoms and complications, and their NYHA functional capacity was determined. The severity of MS was determined using clinical and echocardiographic assessments and was categorized as mild, moderate, and severe. The patients were visited once per month up to 30 weeks of pregnancy, and then every 2 weeks until delivery time. If atrial fibrillation occurred during the study period, the patients were treated with anticoagulants. In order to prevent endocarditis, we commenced antibiotic prophylaxis for the patients. The maternal outcome assessed comprised the progression of NYHA functional class, maternal death, cardiac disability signs (such as heart failure and pulmonary edema), valvular thrombosis, and need to surgical intervention within the pregnancy.

After delivery, the neonates were examined by a neonatologist. Neonatal outcomes consisted of low birth weight, prematurity, congenital malformations, NICU admission, and abortion or still birth.

Statistical Analysis

The results are reported as means ± SDs for the quantitative variables and percentages for the categorical variables. The groups were compared using the Student *t*-test for the continuous variables and the chi-square test (or the Fisher exact test if required) for the categorical variables. P values ≤0.05 were considered statistically significant. All the statistical analyses were performed using SPSS, version 16.0 (SPSS Inc., Chicago, IL, USA), and SAS, version 9.1, for Windows (SAS Institute Inc., Cary, NC, USA).

RESULTS

In total, 35 patients were assessed with a mean (SD) age of 32.29 (±4.50) years (range =22 to 43 y). Mean (SD) gestational age was 32.40 (±10.49) weeks. Overall, 65.7% of the study participants were multigravida. Regarding underlying morbidities, 17.1% had peripheral edema, 42.9% dyspnea, and 14.3% palpitation. Before pregnancy, 74.3% of the study participants were in NYHA class I and the others were in NYHA class II. NYHA classes I, II, and III within pregnancy were reported in 34.3%, 42.9%, and 22.9% of the study population, respectively, indicating 1 and 2 NYHA score increase in 45.7% and 8.6%, correspondingly. According to echocardiography reports, mean (SD) left ventricular ejection fraction was 54.57% (±1.42). Only 5.7% had mild right ventricular dysfunction. Mean MV score was 7.86 (±1.14) and ranged from 6 to 10. Also, the peak gradient of MS was 17.17 (±7.27), and mean MS gradient was 10.43 (±5.15). Regarding the status of mitral regurgitation (MR), the severity was graded as mild in 48.6%, mild to moderate in 34.3%, moderate in 8.6%, moderate to severe in 5.7%, and severe in 2.9% of the subjects. Also, MS was mild in 14.3%, mild to moderate in 2.9%, moderate in 20.0%, moderate to severe in 5.7%, and severe in 57.1% of the subjects. Mean pulmonary artery pressure was 41.11 (±17.42) mm Hg. The mean area of the mitral orifice was 1.29 (±0.36) cm^2. Regarding the other valvular disorders, the most common simultaneous defects included mild tricuspid regurgitation (TR) in 31.4%, followed by moderate TR in 11.4%, mild to moderate TR in 11.4%, and mild aortic insufficiency with TR in 11.4% of the patients.

With respect to maternal outcome, 91.4% of the subjects had normal post-delivery condition, while maternal mortality occurred in 2.9%. Pulmonary edema occurred in 2.9%. In total, maternal mortality and morbidity was reported in 8.6% of the patients. Regarding neonatal outcome, 82.9% experienced normal delivery, while the termination of pregnancy was reported in 17.1%.

The mean area of the mitral valve was significantly lower in the women with post-delivery complications than in the other women (0.93 [±0.06] vs. 1.33 [±0.35]; P<0.001). All the women with post-delivery complications had severe MS, while this defect was revealed only in 53.1% of those without complications (P=0.046). Also, all the neonates from the termination of pregnancy suffered severe MS, whereas this anomaly in the neonates from normal delivery was detected in 48.3% (P=0.044). As is shown in Figure 1, the severity of MR was significantly higher in the patients with post-delivery complications than in the other patients (P=0.034); however, no difference was found in MR severity between the neonates delivered by termination and the other neonates (P=0.096). As is indicated in Figure 2, although the baseline NYHA score was comparable between the patients with and without complications after delivery, the increase in the NYHA score increased more in those with complications (P=0.004). Mean NYHA score before delivery was significantly higher in the neonates delivered by termination than in the other neonates (1.67 [±0.52] vs. 1.17 [±0.38]; P=0.011), but no relation was found between the change in NYHA score within pregnancy and the occurrence of neonatal complications (P=0.122).

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The severity of MS was adversely associated with gestational age (r= - 0.364; P=0.032), but it was positively associated with NYHA score before (r=0.357; P=0.035) and after delivery (r=0.665; P<0.001). In total, there was an adverse association between gestational age and change in NYHA score (r= - 0.365; P=0.031). The change in NYHA after delivery was also adversely associated with MV score (r= - 0.365; P=0.031), mitral peak gradient (r= - 0.453; P=0.006), and mitral gradient (r= - 0.492; P=0.003), but it was positively associated with the area of the mitral valve (r= 0.536; P=0.001).

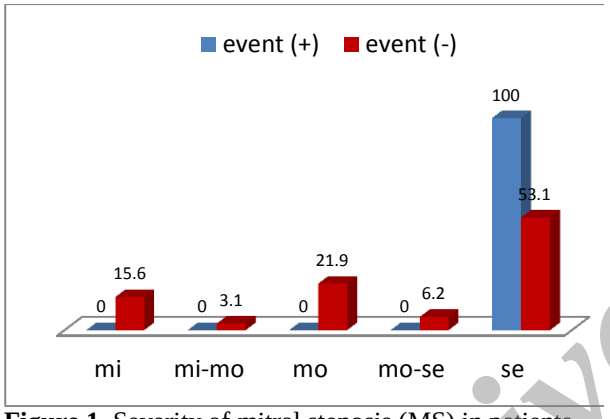

Figure 1. Severity of mitral stenosis (MS) in patients with and without post-delivery maternal and neonatal complications.

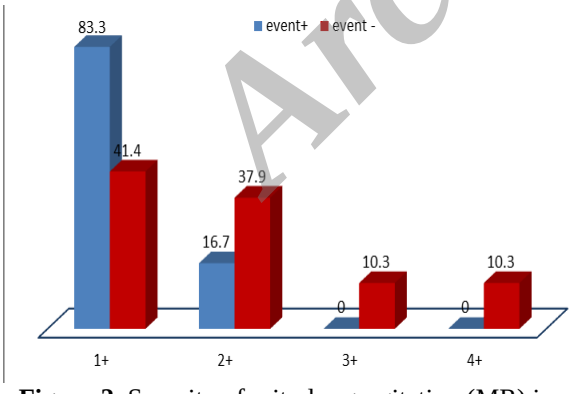

Figure 2. Severity of mitral regurgitation (MR) in patients with and without post-delivery maternal and neonatal complications.

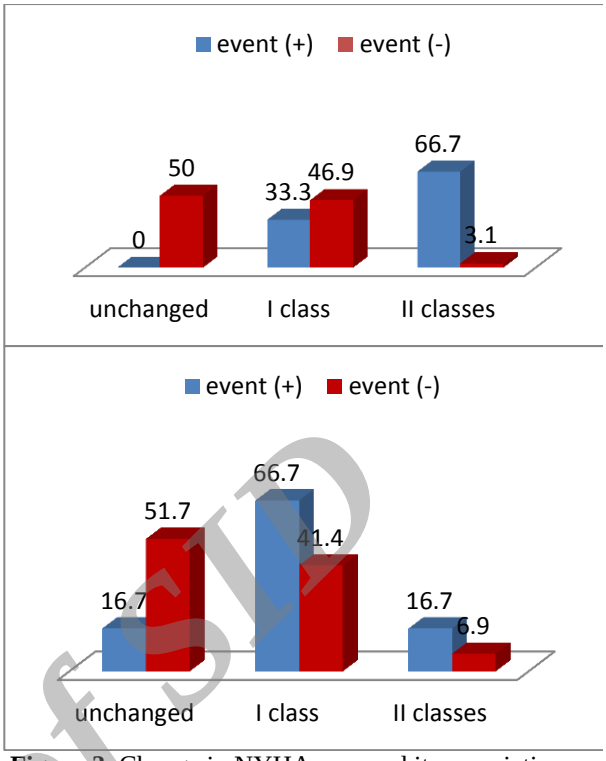

Figure 3. Change in NYHA sore and its association with post-delivery maternal and neonatal complications.

DISCUSSION

The present study aimed to assess the prognostic value of the presence and severity of MS in predicting both maternal and neonatal consequences in pregnant women. We first tried to assess MS severity as well as other valvular heart involvements in pregnant women and then to assess the relation between MS severity and pregnancy outcome. First, we showed that all MS cases were found in those with a history of rheumatic heart diseases; however, more than half of the women suffered from severe MS. Moreover, simultaneous tricuspid involvement was also found in half of the patients and no ischemic events were revealed in the cases. In fact, the main source of valvular heart disease was completely rheumatologic. More importantly, in the patients with severe MS, a considerable increase in NYHA classification score was predictable within the pregnancy period. In

other words, a progressive decrease in the circulatory supply along with an increase in demand could result in a progressive decrease in functional capacity in pregnant women with severe MS.

The main purpose of our study was to determine the association between MS severity and outcome of pregnancy. The main maternal outcome was defined as the presence of post-delivery complications such as mortality, pulmonary edema, and increase in mitral valve replacement. Regarding neonatal outcome, a combination of neonatal-related complications was considered as the termination of pregnancy. We first found that both MS and MR could predict both maternal and neonatal adverse outcomes. In fact, the severity of MS and MR could predict maternal mortality, pulmonary edema, and need for mitral valve replacement surgery. Also, both MR severity and MS severity were predictors for the early termination of pregnancy. In this regard, an increase in NYHA class during pregnancy was able to predict post-delivery complications; nonetheless, this variable had no sufficient power for predicting the risk of termination.

In line with the previous reports, a strong association was revealed between NYHA function class within pregnancy and severity of MS. In this regard, a direct association was found between NYHA score and MS severity. In fact, the effect of MS and its severity on pregnancy outcome could be mediated by the effect of MS on the reduction in functional capacity during pregnancy.

Our literature review yielded similar findings on the effects of MS on the improper outcome of pregnancy. In a study by Demir et al.,[12] the mean area of the mitral valve was 1.11 in the women with an adverse pregnancy outcome and 1.6 in the other women without these events. The authors also reported that the most frequent maternal complication was the deterioration of functional capacity and the most prevalent neonatal complications were prematurity and low birth weight. In a study by Barbosa et al.,[13] as compared with level 1 mitral valve area, the relative risk of maternal events was 5.5 for level 2 area and 11.4 for level 3 mitral area. Pre-pregnancy functional capacity was also associated with the risk of maternal events. In other words, in pregnant women with MS, mitral valve area and functional capacity are strongly associated with maternal complications but are not associated with fetal/neonatal events.

In conclusion, both MS and MR can predict maternal post-delivery events (pulmonary edema and need for mitral replacement) and neonatal complications (termination of pregnancy). The progressive reduction in functional capacity during pregnancy can also predict adverse post-delivery events in patients with MS. In this regard, a positive association is predicted between MS severity and a decrease in functional capacity.

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