

Maternal and neonatal outcomes in pregnant patients with cardiac diseases referred for labour in northwest Iran

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Abstract

Objective: To evaluate maternal and neonatal mortality and morbidity rates in women with different types of significant heart diseases.

Methods: The cross-sectional study was conducted at a tertiary heart care centre in Tabriz, Iran, and comprised 200 pregnant women between March 2007 and March 2012 who had different cardiac diseases and were admitted in labour wards first and then transferred to the heart center for child-bearing (vaginal delivery or caesarean section). They were categorised based on the underlying etiology into valvular heart disease, dilated cardiomyopathy, congenital heart disease and other etiologies. SPSS 18 was used for statistical analysis.

Results: The mean age of the 200 subjects was 29.4 ± 4.28 years. Caesarean section was performed on 152 (76%) cases, while 48 (24%) underwent vaginal delivery. There were 216 neonates as 16 (8%) women had twins. Overall, 164 (75.9%) were female, and 52 (24.1%) male. Maternal and neonatal mortality rates were 4.0% ($n=8$) and 10% ($n=22$) respectively. Pregnant women with Congenital heart disease experienced more maternal ($p<0.022$) and neonatal ($p<0.031$) mortality rates than other cardiac diseases.

Conclusion: Pregnant women with cardiac diseases are prone to higher maternal and neonatal mortality rates in northwest Iran.

Keywords: Maternal mortality, Neonatal mortality, High-risk pregnancy, Cardiac disease, Cesarean section. (JPMA 63: 1496; 2013)

Introduction

Pregnancy among females with heart disease is becoming more common in recent years. This is due to better care facilities, more women with congenital cardiac disease are surviving to reproductive age and, because of the increased tendency to postpone motherhood until the third decade.¹⁻³ The incidence of maternal heart disease in pregnancy ranges from 0.3 to 3.5% in Iran and around 1% globally.^{4,5} The most important causes of heart disease in pregnancy include rheumatic heart disease and congenital abnormalities. Cardiomyopathy and ischaemic heart disease (IHD) are considered the less common causes.⁶⁻⁸ Pregnancy contributes to significant haemodynamic changes i.e. 30 to 50% increase in cardiac output and blood volume which, in turn, could lead to clinical decompensation in mothers with a history of heart failure (HF) or other cardiovascular dysfunctions.⁹ However, some types of heart diseases could be acquired during pregnancy, e.g. peripartum cardiomyopathy.¹⁰⁻¹² Therefore, to provide suitable obstetric counselling and care, risk and incidence classification of each type of cardiac disease in pregnant women seems to be inevitable. The current study aimed at evaluating the

prevalence of different types of heart diseases and status of pregnancy outcome of pregnant women with cardiac disease admitted in labour wards in northwest Iran.

Patients and Methods

The cross-sectional study was conducted at a tertiary heart care centre in Tabriz, Iran, between March 2007 and March 2012, and comprised 200 pregnant women with different significant cardiac diseases admitted for labour (vaginal delivery or caesarean section). Patients admitted at an early pregnancy stage or with abortion or miscarriage were excluded from the study and only those with pregnancy duration of more than 28 weeks were included. A multi-disciplinary team consisting of obstetricians, a cardiologist, cardiothoracic surgeon and anaesthesiologist managed the patients. Full history, thorough cardiac examination, obstetric ultrasound, basic investigations and echocardiogram were taken for each patient. Later, the patients were categorised based on the underlying etiology into groups of valvular heart disease (VHD), dilated cardiomyopathy (DCM), hypertrophic cardiomyopathy (HCM), uncorrected or significant residual congenital heart disease (CHD), and aneurysm of aorta in patients with bicuspid aortic valve. In addition, the patients were also categorised according to New York Heart Association (NYHA) functional classification into classes I to IV. Medical treatment was reviewed by the

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cardiologist and, for women with previous cardiac surgery, by the cardiothoracic surgeon. After delivery, all subjects were admitted to the intensive care unit (ICU) for further monitoring. After acquiring the required discharge criteria, all patients were discharged to the obstetrics ward.

For the purpose of the study, maternal age was defined as the mother's age at the time of the infant's birth; gestational age as completed weeks of gestation according to the estimated date of delivery; and pre-term delivery as for those between 24 and 36 weeks of gestation.

Left ventricular ejection fraction (EF) was determined by Simpson method in echocardiography. Also, systolic pulmonary artery pressure (PAP) was evaluated echocardiographically by measuring tricuspid valve pressure gradient adding to the left atrial pressure.

Data analysis was performed using the SPSS 18. Categorical variables were compared with Chi square or Fischer's exact test. Continuous variables were analysed with independent samples t-test. Mann-Whitney test was used as a non-parametric test. All tests were two-tailed and the level of significance was set at $p \leq 0.05$.

Results

The mean age of the 200 pregnant women in the study was 29.4 ± 4.28 years, ranging between 21 and 42 years.

The parity was between 1 and 6. Cesarean section was carried out on 152 (76%) cases, whereas 48 (24%) cases had vaginal delivery. There were 216 neonates as 16 (8%) women had twins. Overall, 164 (75.9%) neonates were female, and 52 (24.1%) were males. Cardiac diseases in the subjects included VHD 128 (64%); DCM 38 (19%); HCM 2 (1%); non-corrected or significant residual CHD 28 (14%); and aortic aneurysm 4 (2%) (Tables 1-3). Besides 55 (27.5%) patients had left ventricular ejection fraction (LVEF) $\leq 25\%$ and 72 (36%) had pulmonary hypertension (systolic pulmonary artery pressure [PAP] ≥ 40 mmHg). Women with PAP ≥ 40 mmHg had higher maternal (8.33% vs. 1.56%; $p=0.027$) and neonatal (16.88% vs. 6.47%; $p=0.038$) mortality rates compared to women with PAP < 40 mmHg (Table-4). Maternal and neonatal outcomes

Table-1: Various types of valvular* and congenital heart disease in pregnant women.

Valvular heart disease n=128		Congenital heart disease n=28	
Mitral stenosis	76 (59.4%)	Coarctation of aorta	10 (35.7%)
Aortic valve insufficiency	34 (26.6%)	Atrial septal defect	7 (25.0%)
Aortic valve stenosis	11 (8.6%)	Patent ductus arteriosus	6 (21.4%)
Mitral regurgitation	7 (5.5%)	Ventricular septal defect	5 (17.9%)

*Some patients had combined valvular pathology and we mentioned the most prominent valvular lesion in each patient.

Table-2: Clinical characteristics of women and neonates in different cardiac diseases.

	VHD n = 128	CHD n = 28	DCM n = 38	Other n = 6	p
Age (year)	29.8 ± 5.1	25.4 ± 4.3	28.3 ± 7.1	29.6 ± 8.0	0.912
Parity	3.4 ± 1.4	2.5 ± 0.5	3.8 ± 1.8	2.0 ± 1.0	0.894
Gestational age of foetus (week)	36.1 ± 3.3	30.6 ± 4.1	35.8 ± 3.2	34.5 ± 2.5	0.322
NYHA functional class (I-II/III-IV)	109/19	18/10	27/11	4/2	0.097
Ejection fraction (%)	46 ± 10	38 ± 11	32 ± 8	51 ± 9	0.041
Systolic pulmonary artery pressure (mmHg)	40.4 ± 9.8	45.1 ± 10.5	35.7 ± 8.2	25.9 ± 5.2	0.016
Vaginal delivery	30%	0%	15%	16.7%	0.004

VHD: Valvular Heart Disease. CHD: Congenital Heart Disease. DCM: Dilated Cardiomyopathy.

*Considering 8% Twin delivery rate, the total number of neonates was 216.

Table-3: Peripartum outcomes of women and neonates in different cardiac diseases.

	VHD n = 128	CHD n = 28	DCM n = 38	Other n = 6	p
Gestational age (weeks)	36.76 ± 2.23	36.13 ± 2.42	35.92 ± 2.30	36.68 ± 2.81	0.893
Weight of newborns at birth (gr)	2711 ± 631	2697 ± 739	2724 ± 709	2688 ± 781	0.767
Maternal hospital stay (day)	5 (4-6)*	7 (5-10)	5 (4-7)	4 (4-5)	0.509
Neonatal hospital stay (day)	6 (5-8)	9 (7-12)	8 (7-10)	7 (6-8)	0.487
Maternal mortality (%)	4 (3.13%)	3 (10.71%)	1 (2.63%)	0 (0%)	0.022
Neonatal mortality** (%)	10/ 140 (7.14%)	6/30 (20.00%)	5/40 (12.50%)	1/6 (16.67%)	0.031

VHD: Valvular Heart Disease, CHD: Congenital Heart Disease. DCM: Dilated Cardiomyopathy.

*Median (Q1-Q3). **Considering 8% Twin delivery rate, the total number of neonates was 216.

Table-4: Peripartum outcomes of women and neonates considering pulmonary artery pressure (PAP).

	PAP <40 mmHg n=128	PAP ≥40 mmHg n=72	P
Maternal hospital stay (day)	5 (4-6)*	9 (6-13)	0.012
Neonatal hospital stay (day)	7 (6-8)	11 (8-14)	0.046
Maternal mortality (%)	2/128 (1.56%)	6/72 (8.33%)	0.027
Neonatal mortality** (%)	9/139 (6.47%)	13/77 (16.88%)	0.038

*Median (Quartile1-Quartile 3). **Considering 8% Twin delivery rate, the total number of neonates was 216.

Table-5: Peripartum outcomes of women and neonates regarding maternal left ventricular ejection fraction (LVEF).

	LVEF>25 n=145	LVEF≤25% n=55	P
Maternal hospital stay (day)	5 (4-7)*	10 (7-15)	0.007
Neonatal hospital stay (day)	7 (6-9)	13(9-17)	0.003
Maternal mortality (%)	3/145 (2.9%)	5/55 (9.1%)	0.046
Neonatal mortality** (%)	7/155 (4.5%)	15/61 (24.6%)	0.0004

*Median (Quartile1-Quartile 3). **Considering 8% Twin delivery rate, the total number of neonates was 216.

based on maternal LVEF status were separately assessed (Table-5).

Discussion

Normal changes occurring to the heart and blood vessels during pregnancy increase the workload of the heart, adding to the stress on a women's body and turning pregnancy into a stressful procedure. Moreover, risk of complications during pregnancy may increase due to some heart conditions and some women may have unidentified or inadequately-treated congenital cardiovascular abnormalities. Therefore, to avoid further undesirable complications during pregnancy, delivery or caesarean section, women with cardiac diseases do require special evaluations before and throughout pregnancy. The current study evaluated 200 pregnant women with cardiovascular diseases and a mean age of 29.4±4.28 years.

Manso et al.¹³ reported the rate of 4/69 (5.8%) twins, while in our study the incidence of twin neonates was 16/200 (8%). These findings are in line with several studies conducted globally that have reviewed pregnant women with heart conditions. A study in India, evaluated maternal complications and foetal outcomes in pregnant women in which the incidence of rheumatic heart disease was 88%, mitral stenosis 34% and CHD 24%. Later, it concluded that not only did pregnant mothers with NYHA class I-II (84.54%) tend to have less maternal

complications, but also their neonates had a higher birth weight ratio than those with NYHA class III-IV.¹⁴ A study in Thailand reported rheumatic heart disease, CHD, arrhythmia and cardiomyopathy in 133 (68.9%), 26 (13.5%), 32 (16.6%) and 2 (1%) cases, respectively.¹⁵ In this study maternal mortality rate was 2.1%. In another study conducted in Pakistan, a series of 42 pregnant women with heart diseases were evaluated. CHD was present in 7 (16.7%) and 28 (65.3%) cases had rheumatic heart disease, while mitral valve disease was the most common.¹⁶ Thanajiraprapa et al. reported 7.1% maternal mortality and 4.8% perinatal deaths in a study on pregnancy complications in women with heart disease in 2010.¹⁵ In addition, in another survey in Pakistan, which was carried out on 160 pregnant women with heart diseases, acquired VHD was found in 132 (82%) patients, while mitral stenosis was the most common (55%) and the remainders were congenital. Ten (6.3%) neonates expired, while maternal mortality was 6/160 (3.8%).¹⁷ In a report from north India, the maternal mortality was 3.1% in pregnant women with CHD.¹⁸ In a controlled study, it was concluded that maternal and perinatal morbidity and mortality rates, 25% and 0.5% respectively, were significantly related to maternal cardiac complications.¹⁹ In another study in Canada, 40% of the studied pregnant women had a primary valve disorder and maternal cardiac complications occurred in 13% of the patients. Moreover, this study focussed on the fact that cardiac complications were more frequent among women with ejection fraction <40%, aortic stenosis, mitral stenosis, and, in cases with previous cardiovascular events, such as heart failure, transient ischaemic attack, or stroke. Maternal mortality rate was about 0.5% involving patients with two or more risk factors.⁴ Drenthen et al., in a comprehensive literature review, showed cardiovascular events (myocardial infarction, cerebrovascular accidents, and mortality) occurring in 1 of every 50 pregnancies, while mortality was particularly higher in patients with Eisenmenger syndrome. In this study, neonatal mortality was high (4% vs. <1% in the general population) occurring particularly in CHD cohorts with high rates of premature delivery and/or recurrence of CHD.²⁰

In general, our study was in line with previous similar studies. However, maternal and neonatal mortality rates (4.0% and 10% respectively) were higher in our study. For instance, in a study on women with both congenital and acquired heart diseases, maternal mortality rate was 2.7%.²¹ Furthermore, in two different studies, puerperal mortality rates have been reported to be 0.12-0.6% of the pregnancies with CHD.^{22,23} Manso et al. divided their pregnant patients with CHD into low, moderate and high-risk groups and reported maternal mortality rates to be

0%, 7.6%, and 25% respectively.¹³

In a pregnant patient with pulmonary artery hypertension (PAH), the recently occurred physiological change i.e. pregnancy would deteriorate an already strained right ventricle, resulting in catastrophic consequences such as right ventricular failure (RVF) and death. Yet in these patients, mortality remains unacceptably high (25%-30%). Lane,²⁴ Madden²⁵ and Kiely²⁶ in separate studies reported maternal mortality rates of 30%-56%. However, this would not necessarily guarantee an uneventful process of pregnancy or labour as Bonnin reported a maternal mortality rate of 36% in pregnant women with severe pulmonary hypertension in spite of benefiting from the most modern medical supports.²⁷ In line with the above-mentioned studies, our study also had higher maternal mortality (8.33%) and neonatal mortality (16.88%) in women with PAH.

Conclusion

The study confirmed the results of the previous studies carried out in this field, especially those that were conducted in Pakistan, India and Thailand, showing that pregnant women with cardiac diseases in developing countries faced similar medical problems during pregnancy and labour. Also, women with CHD or PAP>40 mmHg are prone to higher maternal and neonatal mortality rates in northwest Iran. Thus, they do require a multi-disciplinary approach and intensive cardiac care to improve maternal and perinatal outcomes.

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