



Maternal and fetal effects of cardiac illness during pregnancy in Beni-Suef localities/Egypt: A multi-centric cross sectional study

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Abstract

Objectives: To assess effects of cardiac illness during pregnancy in Beni-Suef localities/Egypt.

Methods: A multi-centric prospective observational study included 364 cardiac pregnant women. It was conducted between January 2015 and December 2016. A Performa was predesigned to complete essential information regarding heart condition during the present pregnancy from each participant.

Results: Two hundred thirty three patients had rheumatic valves with no surgical correction. Mitral stenosis was the commonest valve lesion either solitary in 65 cases or associated with other valve lesion in 168 patients. Congenital cardiac conditions represented 4.6%. Atrial septal defect was the commonest. According to modified WHO approach for risk stratification, there were 244 patients classified as class I and II. 120 patients were classified as III and IV.

Conclusion: Rheumatic heart disease is still the commonest cardiac condition with pregnancy in developing countries. However, other cardiac lesions became more obvious. Early booking and good cooperation with cardiology department are mostly important to decrease maternal cardiac morbidities.

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Keywords: Cardiac disease; MS; Rhematic heartl; fetal outcome

Synopsis: This is a multi-centric cross sectional study to assess maternal and perinatal outcomes of cardiac diseases with pregnancy in Beni-Suef localities/Egypt.

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Introduction

Cardiac disease affects approximately 0.2% to 4% of pregnant women [1]. It is responsible for 10% to 15% of maternal mortality. Incidence of cardiac illness during pregnancy has increased as more women with congenital or acquired heart condition reach childbearing age due to improved medical and surgical care [2].

Onset of pregnancy in patients with significant congenital or acquired valvular heart disease (VHD) presents challenges to their management [3]. Pregnancy is associated with progressive hemodynamic changes starting early. They reach their peak at the end of second trimester and remain relatively constant until childbirth. Major cardiovascular alterations in pregnancy include 30% to 50% increase in both cardiac output and blood volume, in addition to decreased blood pressure [4].

Many patients with significant VHD are not aware of their diagnosis prior to pregnancy. The diagnosis is made when hemodynamic changes of pregnancy aggravate the clinical symptoms of cardiac illness [3]. Although its prevalence is considered relatively low in pregnant women, heart disease is the most common cause of maternal mortality [4,5].

Heart disease also increases the risk of adverse perinatal events significantly [2]. Maternal-fetal risk is correlated with the maternal hemodynamic status [6] and nature of the preexisting cardiac lesion. The main aim of the present study was to assess heart disease as a causal factor for maternal morbidity and mortality among pregnant women in Beni-Suef localities in Egypt. Secondary outcomes were to evaluate the role of health care providers in decreasing adverse outcome of cardiac illness during pregnancy.

Material and methods

This was a multi-centric cross-sectional study in which all the maternal and fetal complications of cardiac diseases with the present pregnancy were registered. The study population included all pregnant ladies with cardiac illness over a period of 2 years from January 2015 to December 2016.

It was conducted in Beni-Suef localities as multidisciplinary cooperation between Obstetrics and Cardiology departments of Beni-Suef University Hospital. Women were distributed into groups according to the onset of occurrence of cardiac disease before or after present pregnancy and nature of cardiac lesion. Frequencies of maternal morbidity, fetal adverse outcome and maternal mortality were documented.

Four hundred patients were enrolled in our study. Only 364 cases were followed up till 6 weeks after delivery or abortion. Thirty six women missed follow up. A Performa was predesigned to complete essential information regarding heart condition in present pregnancy. Keeping in mind the limitation of resources, the Performa was made simple and brief.

Baseline data recorded at first prenatal visit included age, parity, gestational age, New York Heart Association (NYHA) functional class, co morbid conditions, prior cardiac events (for those who underwent cardiac intervention; only events after intervention were considered), cardiac lesions, prior surgery/interventions, cyanosis (oxygen saturation < 90 %), medications, use of tobacco, educational status, thorough clinical examination including chest auscultation, 12-lead ECG, and echocardiography.

Follow-up data was obtained from clinical visits during the second trimester, third trimester, peripartum period (onset of labor until hospital discharge), and at 6 weeks postpartum. Women were advised on the importance of rest, folic acid supplementation, avoidance of infection, and early visit to the clinic if there is any deterioration of health condition. Women with NYHA classes I and II were admitted to the hospital at 36 weeks. Vaginal delivery was the aim.

Cesarean section was done only with clear obstetric indications. Intramuscular syntocinon was given following second stage except in patients with heart failure. Hundred patients delivered at Beni-Suef University hospital and the rest delivered in nearby governmental and private hospitals.

From our hospital records, 2162, 2059 ladies delivered during 2015 and 2016 respectively. For patients who did not give birth at University hospital, follow-up data were obtained by reviewing discharge summaries from the obstetric centers and by contacting the responsible physicians.

Newborns of mothers with congenital heart disease had cardiologic examination done for them. Pediatric echocardiography was performed in all infants with abnormal cardiac examinations.

Results

The present study included 364 cases that were observed until 6 weeks postpartum. Percentage of cardiac patients delivered at Beni-Suef University hospital was 2.3% of total deliveries. Average live birth rate in Beni-Suef governorate is 200000/year, so roughly speaking cardiac diseases incidence rate is about 0.2%. Actual rate may be higher. One hundred and thirty patients (35.7%) were first diagnosed during present pregnancy. Only 15% of cases were primigravida. The majority were among the age group of 20 to 25 years (56.5%).

Among surgically not corrected rheumatic valvular diseases group, 90% (n=210) of patients were at the age of 20 to 29 year old, 76% (n=179) live in rural areas, 41.7% (n=152) of them first diagnosed during present pregnancy while 58.3% (n=212) were diagnosed after 20 weeks of gestation. According to the nature of cardiac lesion, valvular heart disease constitutes the majority of cases (91.7%, N=334).

One hundred of patients with valve heart disease were corrected before pregnancy (91 valve prosthesis: 45 with Mitral Valve (MV) prosthesis, 22 had Aortic Valve (AV) prosthesis, 24 MV and AV prostheses, 7 with balloon valvoplasty and 3 had MV repair done for them) table (1). Two hundred thirty three were not surgically corrected. Mitral stenosis (MS) was the commonest lesion either solitary in 65 cases or associated with other valvular lesions in 168 cases.

Out of 15 patients with severe MS and secondary pulmonary artery hypertension, 8 patients had undergone mitral balloon valvoplasty during pregnancy and the other 7 had the same after termination of pregnancy. All patients with rheumatic lesions were on IM injection of Long Acting Penicillin /21 day. Seventeen patients had cyanotic congenital heart disease (4.6%), 11/17 were surgically corrected for Atrial Septal Defect (ASD), 3 cases with corrected pulmonary stenosis, 1 corrected Ventricular Septal Defect (VSD), 1 MV prolapsed and 1 case had compensated transposition of great vessels. There were 3 patients with cardiomyopathy, 3 patients with Aortic Dissection, 7 patients with prepregnancy arrhythmias (5 with supraventricular

tachycardia and 2 with Wolff-Parkinson-White syndrome).

Twenty seven patients had secondary pulmonary hypertension, 20 of them with MS while the other 7 were residuals after valve prosthesis or balloon valvoplasty table (3). According to modified WHO approach for risk stratification [7], there were 244 patients classified as class I, II and 120 patients as III, IV.

One of patients with moderate Mitral Regurge (MR) had presented with severe preeclampsia, heart failure and died 1 day after C.S. in the intensive care unit. Interestingly two patients with severe Aortic Stenosis (AS) completed pregnancy with good maternal and fetal outcomes except for wound infection in one of them. Twenty patients developed secondary pulmonary artery hypertension.

MS was diagnosed in 14 patients, 8 underwent mitral balloon valvoplasty during present pregnancy, and one patient experienced spontaneous preterm vaginal delivery in the same day of balloon valvoplasty at 33 weeks of gestation. Another woman developed infective endocarditis and died 1 week after C.S due to heart failure despite administration of broad spectrum antibiotics. The patient was un booked and it was the first time to show up.

Seven women had post abortive balloon valvoplasty during first trimester. Obstetric complications included post abortive bleeding, post partum haemorrhage and vaginal haematoma (p value <0.001) while preterm delivery showed (p value <0.05) in table (4).

Cardiac complications as valve thrombosis, atrial fibrillation (AF) and maternal mortality show highly significant statistical difference (P value = 0.001) between both groups in table (5). Abortion, preterm, low birth weight (LBW) and intrauterine fetal death (IUFD) showed highly significant statistical difference (P value < 0.001) table (6).

Table 7 shows highly significant statistical difference in fetal adverse outcomes between women who received heparin and those who were on warfarin.

Discussion

Cardiovascular disease is the 2nd most common cause of maternal mortality in Egypt [8]. In the present study, rheumatic valve lesions either native or prosthetic were predominant including 91.7% while congenital cardiac lesions represented only 4.6%.

Cardiomyopathy and aortic dissection despite being rare diseases represented 1.6%.

Among rheumatic valve lesions, MS was a predominant lesion. Similar findings were reported in India by Tushar S. et al [9], Konar H. And Chaudhuri S. [10], Indira et al [11]. Also a Sudanese study reported the same previous findings [12]. Moreover, a study in Egypt agreed with our results [13]. Interestingly during our research, two patients with severe AS had a safe pregnancy. They delivered by C.S without any maternal or fetal complications; one of both patients had MV prosthesis in addition. This supports importance of multidisciplinary prenatal counselling involving cardiology and obstetrics departments. Similar findings were documented by Baumgartner H et al in 2010 [14] and Silversides CK, et al in 2003 [15].

In Upper Egypt, a study observed 150 cases with different structural cardiac lesions, 15 patients with valve prosthesis, 115

with valvular lesions, 11 with congenital diseases, 16 with cardiomyopathy and 3 ischemic heart diseases. Follow up for 121 cases was completed. Our findings were similar regarding lesions the predominant cardiac lesions but not prosthetic valves and cardiomyopathy cases.

Authors in that research didn't include arrhythmias which may be an explanation for the difference in type and rate of complications [13]. Regarding valvular prosthesis, our results were similar to those of a study by Ashour Z. et al who observed 43 patients with mitral valve prosthesis, 12 patients with aortic valve prosthesis and 12 patients with double valvular prosthesis [16]. Our research agrees with Mazibuko M. et al [17] and Ashour Z. et al [16] because of similarity in culture and socio-economic level. The most common valve replaced in those studies is mitral valve due to spread of rheumatic fever and rheumatic heart disease.

Those results were also similar to those of Tounsi et al [18] and Samiei et al [19]. Our results regarding valve prosthesis were different from a study in Denmark where aortic valve prosthesis was more common. In developed countries, congenital heart diseases are more common than rheumatic heart diseases and endocarditis [20].

Heart failure is a major complication in pregnancy and is often associated with maternal mortality (Table 5). In this study, we emphasize on monitoring cardiac patients for early detection and treatment of this condition throughout pregnancy, labor and puerperium. The majority of pregnancies with cardiac illness in our research had good course with satisfactory outcome.

Causative cardiac lesions of maternal mortality are shown in table 3. This stresses on the importance of every early preventive measure for pregnant cardiac women at high risk. We used to give all patients prophylactic antibiotics against bacterial endocarditis. However, the working party of the British Society for Antimicrobial Chemotherapy recommends prophylaxis only in very high risk women, such as those with prosthetic heart valves or previous endocarditis [21].

However, in our University hospital antibacterial endocarditis prophylaxis should be routinely given to all women with heart disease in pregnancy. Pre-term birth and low birth weight babies are known as the major neonatal complications in cardiac patients. Perinatal outcome depended more on severity of symptoms during pregnancy rather than the duration and type of heart disease [22].

As shown in (Table 6), there was a significant difference between classes I, II and III, IV. These neonates may also face the risk of inheriting congenital heart disease. Overall, the risk of such inheritance is quoted to be 3–5 % compared to 1 % risk in general population [23]. In our study, we have only observed two neonatal cases of inherited heart disease through the 17 cases with congenital heart disease.

Warfarin embryopathy occurs in 5–10 % of fetuses in mothers who received warfarin in the first trimester [21]. In the present study 35 patients with mechanical prosthetic valves used warfarin and conceived inadvertently. By the time they were first seen in the clinic, all were in their second trimester. None of their neonates had congenital malformations.

We may conclude that low dose of warfarin (3–4 mg a day) may not have a very high fetal risk as the earlier studies had

shown [24]. The fetal risk from warfarin is dose dependent. A dose more than 5 mg is associated with the increased risk of teratogenesis, miscarriage, and stillbirth [24].

Unfortunately, conception cannot be precisely planned all the time and the price paid by the patient for not using any form of anticoagulant is valve thrombosis and embolism.

The risk of warfarin embryopathy certainly seems to be uncommon even when it was used in the first trimester [24]. However, further controlled studies are needed to document the safety of the use of low dose warfarin throughout pregnancy.

Arrhythmias in 7 patients, aortic dissection in 3 women and cardiomyopathy in 3 patients (2 of them died) were seen during present pregnancy. It may be due to increased association of medical disorders like obesity, diabetes, hypertension, and stress during pregnancy. Increased maternal age is also a known risk factor. Rheumatic heart disease is still the predominant cardiac illness in our country [13].

Maternal mortality in this study is comparable to another study in Egypt [13]. In the present study, the incidence of pregnancy complicated by heart disease was 0.2 %. Rheumatic heart

disease was the commonest etiological factor, followed by congenital heart disease.

Mitral stenosis was the most common lesion among the rheumatic heart disease group and atrial septal defect among the congenital heart disease group. WHO classes I and II had better prognosis than class III and IV. Maternal mortality was 2.2%. We concluded that pregnancy outcome is good in booked cases with regular checkup by obstetrician and cardiologist even with severe MS as decision of termination or balloon is taken early. Poor maternal outcome was associated with aortic dissection and cardiomyopathy.

Any clinical diagnosis or suspicion of cardiac disease should be confirmed by a cardiologist. Hence, joint management by obstetrician, cardiologist, anesthetist and neonatologist ensures good prognosis.

Our research was an observational study of local population so the results of which may not be generalized. However, the advantage of our study in our opinion is providing systematized results for comparison with other findings especially in countries having populations sharing similar characteristics.

Tables

Table 1: is showing number of cases with obstetric & fetal complications in surgically corrected and noncorrected rheumatic heart valvular lesions.

Obstetric & fetal complications	Surgically noncorrected rheumatic heart valvular lesions	Surgically corrected rheumatic valvular lesions
Abortion	12/233	8/101
Post abortive bleeding	6/233	0/101
Postpartum hemorrhage	9/233	1/101
Vaginal haematoma	2/233	0/101
Rupture uterus	1/233	0/101
Internal haemorrhage	1/233	0/101
preeclampsia	1/233	0/101
IUGR	15/233	12/101
IUFD	8/233	2/101
Preterm delivery	19/233	17/101
Neonatal death	3/233	0/101
Congenital anomalies	2/233	0/101
Low birth weight	55/233	33/101
C.S	128/233	63/101

Table 2: is showing cardiac complications in surgically noncorrected and corrected rheumatic valvular lesions

	Surgically Noncorrected rheumatic valvular lesions	Surgically corrected rheumatic valvular lesions
Valve thrombosis	0/233	0/101
Valvular AF	7/233	5/101
thromboembolism	2/233	0/101
NYHA 3,4	14/233	9/101
Heart failure	6/233	2/101
Infective endocarditis	1/233	0/101
Maternal death	2/233	1/101

Table 3: is showing number and timing of maternal deaths and their causative lesions

Causative lesion	Maternal deaths	Timing
MS with Balloon valvoplasty, infective endocarditis	1	Postpartum
MR with severe preeclampsia	1	Postpartum
Double valve prosthesis with stuck valve, rupture uterus	1	Postpartum
Aortic dissection	3	2 postpartum 1 Intrapartum
cardiomyopathy	2	1 postpartum 1 Intrapartum

Table 4: is showing obstetric complications difference between WHO classes I, II and WHO classes III, IV in modified approach for risk stratification.

Obstetric complications	WHO I,II	WHO III,IV, n=120	P Value
Post abortive bleeding	0 (0.0%)	6 (5%)	.00001**
Postpartum hemorrhage	1 (0.4%)	9 (7.5%)	.00001**
Vaginal haematoma	0 (0%)	2(1.7%)	0.043*
Rupture uterus	0(3.8%)	1 (0.8%)	0.761
Internal haemorrhage	0 (0.0%)	1 (0.8%)	0.338
preeclampsia	2 (7.7%)	0 (0.0%)	0.320
IUGR	7 (.2.9%)	20 (16.7%)	0.338
Preterm delivery	9 (3.7%)	32 (26.7%)	.00001**

P value < 0.001 highly significant difference** P value < 0.05 significant difference*

Table 5: is showing cardiac complications difference between WHO classes I, II and WHO classes III, IV in modified approach for risk stratification.

Cardiac complication	WHO 1,2	WHO 3,4, n=120	P Value
Valve thrombosis	0 (0.0%)	8(6.7%)	.00001**
Valvular AF	0 (0.0%)	12 (10%)	.00001**
thromboembolism	0 (0%)	2(1.7%)	0.043*
Heart failure	1(0.4%)	13(10.8%)	0.761
Infective endocarditis	0 (0.0%)	1 (0.8%)	.153
Maternal death	1 (0.4%)	7 (5.8%)	.001**

P value < 0.01 highly significant difference** P value < 0.05 significant difference*

Table 6: is showing fetal outcome difference between WHO classes I, II and WHO classes III, IV in modified approach for risk stratification.

Fetal outcome	WHO I,II	WHO III,IV, n=120	P Value
Abortion	2 (0.8%)	19 (15.8%)	.00001**
preterm	9 (3.7)	32 (26.7%)	.00001**
IUGR	7 (2.9%)	20(16.7%)	0.043*
IUFD	0(0.0%)	10 (8.3%)	.0001*
Neonatal death	1 (0.4%)	6 (5%)	.003*
Congenital anomalies	1 (0.4%)	1 (0.8%)	.607
Low birth weight	52 (21%)	52 (43.3%)	.0001**

P value < 0.01 highly significant difference** P value < 0.05 significant difference*

Table 7: is showing difference between patients on heparin and those on warfarin.

Variables	Patient on cal heparin or LMW Heparin	Patient on warfarin n=35	P Value
Abortion	2	13	.00001**
preterm	10	10	.073
IUGR	8	7	.225
IUFD	1	9	.0001**
PPH	1	8	.0001**
Neonatal death	2	0	.316
Congenital anomalies	1	0	.481
Low birth weight	24	13	.0001**
Valve thrombosis	8	0	.039*
thromboembolism	2	0	.316
Heart failure	1	5	.007*
Malfunctioning valve	8	0	.039*

P value < 0.01 highly significant difference** P value < 0.05 shows significant difference*

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