Pregnancy Outcome for Pregnant Women with Common Cardiac Problems at Mansaura University Hospital

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Abstract

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Background : Pregnancy in the presence of heart disease (HD) poses a high risk of maternal mortality and morbidities including heart failure (HF), stroke and arrhythmias. The physiologic circulatory alterations related to pregnancy worsen the haemodynamic changes that are already present in these females. The fetus is also not spared as intrauterine growth restriction (IUGR) and prematurity also significantly increased.

Aim : To assess maternal & fetal outcomes for pregnant women with common cardiac problem at Mansaura University hospital.

Methods: This cross-sectional study included 90 pregnant females aged between 18 to 40 years with congenital heart disease (CHD), with rheumatic heart disease (RHD) who underwent elective abortion. The cases were followed up till delivery to determine the primary and secondary outcomes. The primary outcome was the rate of maternal complication as heart failure. The secondary outcome included changes in NYHA functional class, cardiovascular complications, post-partum complications, delivery mode and perinatal outcomes.

Results: Rheumatic heart diseases were the most common in 81.1% while the non-rheumatic heart diseases were detected in 18. 9%. The history of previous abortion, the degree of mitral valve affection, the amount of intraoperative blood loss, the incidence of ICU admission and the incidence of puerperal pyrexia were statistically significantly higher in the non-rheumatic heart diseases (47.1%) as compared to the rheumatic heart diseases (30.1%). The mean ejection fraction, the 1- and 5- minutes APGAR scores, and the birth weight of the neonates were statistically significantly lower in the non-rheumatic heart diseases.

Conclusion: We concluded that heart diseases in mothers are not absolute contraindications for pregnancy, but there were associated with serious outcomes on both the mothers and offsprings. The non-rheumatic heart diseases (mainly CHD) are associated with worse outcomes compared with the mothers with RHD.

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Keywords: Heart diseases, Pregnancy, Arrhythmia, Rheumatic Heart Diseases, Congenital Heart Diseases, New York Heart Association.

INTRODUCTION

HD is the major cause of maternal death with a rate of 2.27/100,000 maternities. However, the incidence of HD during gestation has remained constant at 0.9% over many years, indicating that its severity and/or the risk it poses during gestation is increasing [1]. The major reason for that seems to be the high incidence in a pre-existing undiagnosed ischaemic heart disease. This is because of lifestyle changes, the presence of risk factors e.g. obesity, diabetes and smoking, and also pregnancies in older females. Furthermore, females who have complex pre-existing HD survive into adulthood and considering pregnancy [2].

Pregnancies in females with HD pose a risk of maternal mortality and serious morbidities including HF, stroke and cardiac arrhythmias. There may be also neonatal morbidity and mortality as IUGR and prematurity significantly increased [3]. The causes of maternal HD are diverse and its treatment is complex. The incidence of HD during pregnancy ranges between 0.9 and 3.1 % [4]. In developing countries, RHD accounts for 50–88 % of all HD in pregnancy [5]. CHD is less common however most CHD cases get pregnant with undiagnosed or untreated lesion [6].

The physiologic circulatory alterations during gestation worsen the haemodynamic changes which are already present. Pregnancy is a hypercoagulable state, this it enhances the risk of thromboembolic events particularly in those with artificial valves [7]. Cardiac intervention might be necessary for worsening cardiac condition in the pregnant woman. Such interventions together with cardiac drugs might pose a risk to the fetus [8, 9]. So, this study assessed maternal and fetal outcomes for pregnant females with common cardiac problem at Mansoura University hospital.

PATIENTS AND METHODS

This cross-sectional study was conducted at Obstetrics & gynecology Department, Mansoura University Hospitals, Mansoura, Egypt in the period between May 2021 and May 2023. The study included 90 pregnant females between 18 to 40 years old with heart diseases who underwent elective termination of pregnancy. We included females with CHD, with RHD, with Surgically Corrected Congenital Heart Disease, with complicated cardiac disease and with Cardiac arrhythmias. But we excluded pregnant females with cardiac problem who underwent emergent termination of pregnancy. A written informed consents were taken from all participants prior to participation after explaining the aim of the research, and the procedures that were commenced.

Ethical approval

The study obtained its approval from the institutional review Board, Faculty of Medicine, Mansoura University. Confidentiality and privacy were maintained throughout the study. Patients were free to withdraw at any time with no consequences. Patients' data were not and will not be utilized for any other purpose.

Methods

The cases were subjected to thorough history taking included personal history (age, residence, occupation and smoking habit), Obstetrical history (gravidity, parity, mode of prior deliveries and Previous obstetric complications), present history of underlying cardiac lesion with analysis of type, onset, course and duration, and past history (previous surgeries, medical diseases, cardiac interventions before gestation, drugs, anticoagulant agents). Patients

were classified based on New York Heart Association (NYHA) functional class.

NYHA Classification of HF Stages [10] included class I that shows no symptoms and no limitations of regular activities, e.g. dyspnea on walking or climbing stairs, Class II shows mild symptoms (mild dyspnea and/or angina) and mild limitations in regular activities, class III shows significant limitations of ordinary activities because of symptoms, even with less-than-ordinary activities, e.g. walking a short distance (20—100 meters) and comfortable only at rest, and Class IV shows severe limitation and symptoms at rest, mostly bed-bound cases.

The examination included general examination (heart rate, blood pressure, temperature, respiratory rate, congested neck vein, hepatosplenomegaly, edema lower limb), laboratory investigations included complete blood count (CBC), electrocardiography and echocardiography were done to assess ejection fraction, LV and RV functions, thickness of LV and RV walls, value function (stenosis/regurgitation), and cardiac devices (mechanical valve, PPM, closure device), and obstetric ultrasound to assess fetal well-being, and fetal echo to assess fetus heart.

We collected patients' data about gestational age at termination, type of cardiac disease (CHD, RHD, surgically corrected congenital Heart Disease, Cardiac arrhythmias), maternal complication as antepartum hemorrhage, postpartum hemorrhage, heart failure and follow up for six weeks postpartum, mode of delivery, bleeding and blood transfusion during delivery. The fetus' data included fetal weight at delivery, APGAR score at one and five minutes, admission to neonatal intensive care unit (NICU) and postnatal echocardiography.

Outcomes

This was defined as something that follows as a result or consequence. Primary outcome included rate of maternal complication as ICU admission, while secondary outcome included changes in NYHA functional class, cardiac complications, maternal complication (antepartum hemorrhage, postpartum hemorrhage, heart failure) after follow up for six weeks, post-partum complications, delivery mode, and perinatal outcomes [IUGR, prematurity, stillbirths, low birth weight (LBW) and birth defects].

Statistical Analysis

Data were analysed using IBM SPSS Statistics for Windows, V 22.0. Armonk, NY: IBM Corp. Qualitative data were expressed as frequencies and percentages. Quantitative data were expressed as median (minimum and maximum, interquartile range) for non-normally distributed data and means ± SDs for normally distributed data following testing normality by Kolmogrov-Smirnov test. Student T-Test and Mann Whitney Tests were utilized to evaluate the significance of difference between 2 independent groups with parametric data and non-parametric data, respectively. Chi-Square test was used to compare ≥2 groups. Monte Carlo test as correction for Chi-Square test when > 25% of cells have count < 5 in tables (>2*2). Fischer's exact test as correction for Chi-Square test when >25% of cells have count <5 in tables (2*2).The significance was set at (0.05) level.

RESULTS

As shown in table (1), the mean age of included females was 29.83 ± 5.44 years while the median age was 29 years (range=18-40 years). The mean number of Gravidities was 3.32 ± 1.34 while the median number was 3 (range= 1-7). The mean number of parities was 1.82 ± 1.13 while the median number was 2 with range between 0 and 6. Previous abortion was reported in 30 cases (33.3%) while previous still birth was shown in 1 case only (1.1%). Among the cases, 77.8%

had previous CS and 20% had previous vaginal delivery. Regarding the type of heart diseases, RHD was the most common in 81.1% while the non-rheumatic heart diseases were detected in 18. 9%. The types of non-rheumatic heart diseases included pulmonary hypertension in 2 cases, cardiomyopathy/ chronic hypertension in one patient, chronic hypertension in one patient, CHD in 9 cases, dilated cardiomyopathy in 1 case, ischemic heart disease in 2 cases and arrhythmogenic heart disease in 1 cases.

Table (1): Demographic data, obstetric history and Cardiac history in the study cases

Variables	Study cases (N = 90)	
Age (years)		
Mean ± SD	29.83 ± 5.44	
Median (range)	29 (18 - 40)	
Gravidities		
Mean ± SD	3.32 ± 1.34	
Median (range)	3 (1 - 7)	
Parities		
Mean ± SD	1.82 ± 1.13	
Median (range)	2 (0 - 6)	
Previous obstetric complications		
Previous abortion	30	33.3
Previous still birth	1	1.1
CS		
0	20	22.2
1	30	33.3
2	23	25.6
3	17	18.9
Vaginal delivery		
0	72	80.0
1	4	4.4
2	8	8.9
3	4	4.4
4	1	1.1
5	1	1.1
Type of heart disease		
Rheumatic heart diseases	73	81.1
non-rheumatic heart diseases	17	18.9
Types of non-rheumatic heart diseases		
Pulmonary hypertension	2	2.2
Cardiomyopathy/chronic hypertension	1	1.1
Chronic hypertension	1	1.1
Congenital heart disease	9	10
Dilated cardiomyopathy	1	1.1

Ischemic heart disease	2	2.2
Arrythmogenic heart disease (SVT)	1	1.1

Continuous data expressed as mean±SD and median (range)

Categorical data expressed as Number (%)

Table (2) demonstrates a non-significant difference among RHD cases and cases with non-rheumatic heart diseases in terms of age, gravidity, parity, CS, vaginal delivery and previous stillbirth, however, the history of previous abortion was statistically significantly higher in the non-rheumatic heart diseases (47.1%) as compared to the rheumatic heart diseases (30.1%). The mean ejection fraction was significantly lower in the non-rheumatic heart diseases (p= 0.002). Also, there was higher degree of heart affection the non-rheumatic heart diseases (p=0.005), there were 23.5% and 11.8% with NYHA class 3 and 4 in the non-rheumatic heart diseases while there were no cases with class 3 or class 4 in the rheumatic heart diseases.

Table (2): Comparison of the demographic data, obstetric history, and cardiac disease severity in the cases according to the nature of cardiac diseases

	Groups		**Test of significance**	**P value**
	Rheumatic heart disease (n= 73)	**Non-rheumatic heart diseases (n= 17)**		
Age (Years)	30.13 ± 5.28	28.59 ± 6.06	t= 1.049	0.297
Gravidity	3 (1 – 7)	3 (1 – 7)	z = - 0.480	0.631
Parity	2 (0 – 5)	2 (0 – 6)	z = - 0.220	0.826
CS	1 (0 – 3)	2 (0 – 3)	z = - 0.947	0.344
Vaginal delivery	0 (0 – 5)	0 (0 – 3)	z = - 0.871	0.384
Previous abortion	22 (30.1%)	8 (47.1%)	$\chi 2$= 4.253	**0.005***
Previous stillbirth	1 (1.4%)	0 (0%)	FET = 0.235	0.627
Ejection fraction (%)	64.15 ± 6.17	58.11 ± 7.02	t = 4.218	**0.002***
NYHA classification				
Class 1	24 (32.9%)	1 (5.9%)	MC = 6.459	**0.005***
Class 2	49 (67.1%)	10 (58.8%)		
Class 3	0 (0%)	4 (23.5%)		
Class 4	0 (0%)	2 (11.8%)		

P: probability. Quantitative data expressed as mean ± SD/ median (Range), Categorical data expressed as Number (%). MC: Monte-Carlo test, t: Independent samples t-test, FET: Fisher's exact test, z: Mann-whitney U-test

Table (3) demonstrates a non-significant difference between the cases with rheumatic heart disease and the cases with non-rheumatic heart diseases regarding the affection of aortic valve, pulmonary valve or the tricuspid valve. However, the degree of mitral valve affection was significantly higher in cases with RHD ($p < 0.001$). No significant difference existed between RHD cases and cases with non-rheumatic heart diseases regarding the delivery mode (p= 0.098) and GA at delivery (p = 0.921). The amount of intraoperative blood loss was significantly higher in cases with non-rheumatic heart diseases compared with cases with rheumatic heart diseases (p= 0.030). Also, there was statistically significant higher requirement of blood transfusion in the non-rheumatic heart diseases (p=0.005).

Table (3): Comparison of the valve affection and operative data in the cases according to the nature of cardiac diseases

	Groups		Test of significance	P value
	Rheumatic heart disease (n= 73)	Non-rheumatic heart diseases (n= 17)		
Mitral valve				
Normal	8 (11%)	10 (58.8%)	MC = 20.298	**< 0.001***
Affected	44 (60.3%)	6 (35.3%)		
Replacement	21 (28.8%)	1 (5.9%)		
Grade of affection	**(N= 44)**	**(N = 6)**		
Mild	3 (6.8%)	0 (0%)	MC = 0.511	0.775
Moderate	25 (56.8%)	4 (66.7%)		
Severe	16 (36.4%)	2 (33.3%)		
Aortic valve				
Normal	47 (64.4%)	15 (88.2%)	MC = 3.705	0.157
Affected	16 (21.9%)	1 (5.9%)		
Replacement	10 (13.7%)	1 (5.9%)		
Grade of affection	**(N= 16)**	**(N = 1)**		
Mild	6 (37.5%)	1 (100%)	FET = 1.512	0.218
Moderate	10 (62.5%)	0 (0%)		
Tricuspid valve				
Normal	38 (52.1%)	11 (64.7%)	$\chi 2$= 0.890	0.346
Affected	35 (47.9%)	6 (35.3%)		
Grade of affection	**(N= 16)**	**(N = 1)**		
Mild	6 (17.6%)	1 (16.7%)	MC = 3.585	0.167
Moderate	19 (55.9%)	5 (83.3%)		
Severe	9 (26.5%)	0 (0%)		
Pulmonary valve				
Normal	63 (86.3%)	14 (82.4%)	FET = 0.216	0.786
Hypertension	10 (13.7%)	3 (17.6%)		
Mode of delivery				
CS	67 (91.7%)	17 (100%)	FET = 2.859	0.098
Vaginal delivery	6 (8.3%)	0 (0%)		
Amount of intraoperative blood loss (cc)	389 (215-1100)	842 (430-2500)	z = - 2.542	**0.030***
Gestational age at delivery (Weeks)	37.16 ± 1.80	37.12 ± 1.45	t= 0.100	0.921
Intraoperative blood transfusion	0 (0%)	2 (23.5%)	FET = 4.625	**0.005***

P: probability, Quantitative data expressed as mean ± SD, Categorical data expressed as Number (%)

MC: Monte-Carlo test, FET: Fisher's exact test/ t: Independent samples t-test z: Mann-whitney U-test

Regarding the maternal outcomes in the two study groups, table (4) shows a non-significant difference between RHD cases and cases with non-rheumatic heart diseases regarding the Postpartum haemorrhage (p= 0.516) and the wound healing or infection at follow up (p = 0.244). The incidence of ICU admission (p= 0.042) and the incidence of puerperal pyrexia (p= 0.028) were statistically significantly higher among cases with non-rheumatic heart diseases compared to the cases with rheumatic heart diseases, no significant difference existed between cases with rheumatic heart disease and the cases with non-rheumatic heart diseases as regards the number of fetii (p= 0.494), abortion (p = 0.228), IUGR (p= 0.0727) and neonatal mortality (p= 0.924). The 1- and 5-minutes APAR scores were statistically significantly lower in the cases with non-RHD (p= 0.002 and 0.001 respectively). The birth weight of the neonates was significantly lower in non-RHD cases (p= 0.040). Moreover, NICU admission (p= 0.004) and presence of congenital anomalies (p= 0.018) in the neonates was statistically significantly higher in this group.

Table (4): Comparison of the maternal outcomes and foetal outcomes in the cases according to the nature of cardiac diseases

	Groups		**Test of significance**	**P value**
	Rheumatic heart disease (n= 73)	**Non-rheumatic heart diseases (n= 17)**		
ICU admission	0 (0%)	3 (17.6%)	FET = 2.975	**0.042***
Postpartum haemorrhage	0 (0%)	1 (5.9%)	FET = 0.423	0.516
Puerperal pyrexia	1 (1.4%)	4 (23.6%)	FET = 3.216	**0.028***
Wound at follow up				
Healed non-complicated	73 (100%)	15 (88.2%)	FET = 1.278	0.244
Wound sepsis	0 (0%)	2 (11.8%)		
Number of fetii				
Single foetus	68 (95.8%)	16 (100%)	FET = 0.468	**0.494**
Two fetii	3 (4.2%)	0 (0%)		
1 minute APGAR score	8 (5 - 8)	7 (5 - 8)	z = - 3.143	**0.002***
1 minute APGAR score	10 (6 - 10)	6 (6 - 10)	z = - 3.318	0.001*
Birth weight (gm)	2520 ± 421.73	2253.13 ± 613.04	t= 2.086	0.040*
Abortion	6 (8.5%)	0 (0%)	FET = 1.452	0.228
IUGR	3 (4.2%)	1 (6.3%)	FET = 0.122	0.727
NICU admission	9 (12.7%)	7 (43.8%)	FET = 8.401	0.004*
Mortality	4 (5.6%)	1 (6.3%)	FET = 0.009	0.924
Congenital anomalies	1 (1.4%)	4 (25%)	FET = 4.015	0.018*

P: probability. Categorical data expressed as Number (%)

FET: Fisher's exact test/ t: Independent samples t-test z: Mann-whitney U-test

Table (5) shows that the highest percentage of the cases were classified as NYHA class II (64.4%) followed by NYHA class I in 28.9%, NYHA 3 in 4.4% and NYHA 4 in 2.2%. LMWH / Beta blockers were used in 93.3% of the cases. The mean ejection fraction among the included cases was 61.29 ± 8.51 % with range between 35 and 75%. The mitral valve was the most affected vale in 80% of cases, tricuspid vale in 43.3%, aortic valve in 34.4% and then pulmonary vale in 14.4%.

Table (5): Dyspnea severity, treatment and Echocardiographic in the cases of the study

Variables	Study cases N = 90	
NYHA classification		
Class 1	26	28.9
Class 2	58	64.4
Class 3	4	4.4
Class 4	2	2.2
Medications		
Beta blocker	3	3.3
LMWH / Beta blocker	84	93.3
LMWH / Beta blocker/long-acting penicillin	1	1.1
Methyl- dopa	2	2.2
Ejection fraction (%)		
Mean ± SD	61.29 ± 8.51	
Median (range)	60 (35 - 75)	
Mitral valve		
normal	18	20
Mitral valve Stenosis	10	11.1
Mitral valve replacement	25	27.8
Mitral valve prolapse	1	1.1
Mitral valve Regurgitation	36	40
Aortic valve		
Normal	59	65.6
Stenosis	1	1.1
Replacement	11	12.2
Aortic valve Regurgitation	19	21.1
Pulmonary valve		
normal	77	85.6
pulmonary hypertension	12	13.3
pulmonary Regurgitation	1	1.1
Tricuspid valve		
Normal	51	56.7
Tricuspid Regurgitation	39	43.3
Synthetic valve		
No	60	66.7
Well-functioning	28	31.1
Good functioning valve prothesis	2	2.2

Continuous data expressed as mean±SD and median (range)
Categorical data expressed as Number (%).

Table (6) shows that the general anathesia was used in 11.1% of the cases. Caesarean section was the most common ode of delivery in 93.3%. the amount of blood loss ranged from 215 and 2500 cc. four cases (4.4%) required intraoperative blood transfusion.

Table (6): Operative data in the cases of study

Variables	Study cases N = 90	
Anesthesia		
General	**10**	11.1
Spinal (epidural)	**80**	**88.9**
Mode of termination		
Caesarean section	**84**	**93.3**
Vaginal delivery	**6**	**6.7**
Blood loss intraoperative (cc)		
Mean ± SD	**459.57 ± 281.27**	
Median (range)	**389 (215 - 2500)**	
Intraoperative blood transfusion		
No	86	95.6
Yes	4	4.4
Number of blood units		
Mean ± SD	**2.34 ± 0.69**	
Median (range)	**2 (1 - 4)**	

Continuous data expressed as mean±SD and median (range), Categorical data expressed as Number (%)

Table (7) shows that the maternal outcomes included puerperal pyrexia in 5 cases (5.6%), ICU admission in 3 cases (3.3%), wound infection in 2 cases (2.2%) and postpartum haemorrhage in 1 case only (1.1%). The mean duration of hospital stay was 3.74 ± 1.78 days with range between 2 and 15 days. Regarding the adverse neonatal outcomes included IUGR in 4 cases (4.6%), NICU admission in 16 cases (18.4%), neonatal mortality in 5 cases (5.8%) and congenital anomaly in 5 cases (5.8%). The median APGAR score at 1 minute was 8 (range= 5-8) while the median APGAR score at 5 minutes was 10 (range= 6-10). The mean GA at delivery was 37.16 ± 1.73 weeks (range= 29-49) while the mean birthweight was 2470.85 ± 470.76 rams with range between 1000 and 3600 grams.

Table (7): Maternal outcomes in the cases of study

Maternal Complications	Study cases N = 90	
ICU admission	**3**	**3.3%**
Postpartum haemorrhage	**1**	**1.1%**
Puerperal pyrexia	**5**	**5.6%**
Wound at follow up		
Healed non-complicated	88	97.8%
Wound sepsis	2	**2.2%**
Duration of hospital stay (Days)		
Mean ± SD	3.74 ± 1.78	
Median (range)	3 (2 – 15)	

Fetal Outcomes		
Number of fetus	**N = 87**	
Single fetus	84	11.1%
Two feti	3	88.9%
GA at delivery (Weeks)		
Mean ± SD	37.16 ± 1.73	
Median (range)	38 (29 - 40)	
Neonatal outcomes		
IUGR	4	4.6%
NICU admission	16	18.4%
Mortality	5	5.8%
Congenital anomaly	5	5.8%
APGAR score		
1 minute	8 (5 - 8)	
5 minutes	10 (6 - 10)	
Birth weight (grams)		
Mean ± SD	2470.85 ± 470.76	
Median (range)	2600 (1000 – 3600)	

Continuous data expressed as mean±SD and median (range), Categorical data expressed as Number (%)

DISCUSSION

Pregnancy and the peripartum period cause prolonged physiologic stress on mother's heart. Although the majority of cardiac diseases are well-tolerated during gestation with good outcome, some diseases as linked to morbidities and death of the mother and the fetus [11].

HD that complicate pregnancy is a key non-obstetric and an 'indirect' cause of maternal death, since it is not related to any complication of the pregnancy itself [12]. Arrhythmias and HF the most common cardiac complications during gestation. Both conditions are associated with maternal death, prematurity, LBW, and neonatal death [5]. The prevalence antenatal heart diseases differs between developed and developing countries [13].

In developing countries, RHD accounts for 50–88 % of all cardiac diseases during gestation [5]. In Egypt, HD is the commonest indirect cause of death of the mother during pregnancy [14]. In pregnant females, mitral stenosis (MS) is the commonest rheumatic heart valve disease, which might be linked to pulmonary oedema, and arrhythmia during pregnancy or soon post-delivery [15].

This study assessed maternal and fetal complications of 90 pregnant females with common cardiac problem at Mansoura University hospital. In our study, rheumatic heart diseases were more common than non-rheumatic heart diseases representing (81.1% and 18.9%, respectively). CHD was the most common type of non-RHD and was found in 9 cases (10%) while in the RHD group, the mitral valve was the commonest type in 80% of these patients. Salam et al., included 90 pregnant females complicated by HD. The prevalence of HD was 4.3%. The main cardiac lesion was RHD (56.6%) whereas CHD was present in 13.3%. Among females with RHD, MS observed in 21 (23.3%) females was the commonest lesion while multiple heart lesions were observed in 21 (24.4%) females. Among those with CHD, mitral valve prolapse was the commonest lesion in 5 (5%) females [16]

In this study, the mean age was 29.83 ± 5.44 years and there was high prevalence of either primigravidae or primipara. Salam et al., included 90 pregnant females with congenital heart diseases and showed that most of cases (74.5%) aged 20-30 years old and the majority of them were either primigravidae or primipara (60%) [16].

Beriye et al. demonstrated that the prevalence of valvular heart disease (VHD) among pregnant females was 0.6%. Out of 29 pregnancies, 28 (96.6%) had RHD. MS (75.9%) was the commonest valvular lesion and 16 (55.2%) had severe MS [17]. Behera and Moharana showed that the principal lesion was RHD (68.1%) followed by CHD (22.7%) and cardiomyopathies (6.25%). The commonest valvular pathology in our study is MS (46.6%),which agrees with Manohar et al., (38.6%) [18]. This could be explained by the lack of preventive measures and inappropriate administration of secondary antibiotics as a prophylaxis against streptococcal infection with subsequent occurrence of valvular lesions.

Our results conflict with Lima et al., who examined 81,295 cases with heart disease and 39,894,032 without. CHD was the commonest lesion (33,982/ 81,295 cases; 41.8%), followed by VHD (25,138/ 81,295 cases; 30.9%), cardiomyopathies (16,926 / 81,295 cases; 20.8%), and pulmonary hypertension (5,250 of 81,295 cases; 6.5%) [19]. The difference could be explained as the latter study was conducted in the US and there is relatively higher prevalence of non-RHD in the developed world due to efficient screening programs and early treatment of infections.

In this work, the highest percentage of pregnant females was classified as NYHA class II (64.4%) followed by NYHA class I in 28.9%. Behera and Moharana who included 22 pregnant females with cardiac diseases and showed that most of cases were in NYHA class II (50%) followed by NYHA class I in 22.7% [18].

In females with HD, planned C-section did not improve maternal outcomes and was detrimental to fetal outcomes [20]. Thus, vaginal delivery is advised in almost all females, and C- section is reserved for selected cases with severe pathology (e.g. advanced HF or pulmonary hypertension, alarming aortic dilatation or spontaneous labor during oral administration of anticoagulants) [21].

In our study, 88.9% of the included cases delivered by CS and this could be explained due to the attitude of high CS rate in Egypt. In our study, the maternal outcomes included puerperal pyrexia in 5 cases (5.6%), ICU admission in 3 cases (3.3%), wound infection in 2 cases (2.2%) and postpartum hemorrhage in 1 case only (1.1%). Steiner et al., that analyzed the outcomes in 245 pregnancies with heart diseases, postpartum hemorrhage was reported in 24 cases (9.9%), preeclampsia in 23 cases (9.5%) and pregnancy composites in 80 cases (32.7%) [22].

Magun et al., included 306 pregnant females (median age 29 years) with CVD were seen. The reported maternal outcomes were gestational diabetes in 11.4%, gestational hypertension in 9.5%, and pre-eclampsia in 12.1% of females. In addition, 27 females (8.8%) required ICU admission. One mortality occurred within 12 months after delivery in a female with Eisenmenger syndrome [23]. Out of 90 pregnant females in their study, Salam et al., reported that 4 (4.4%) females died and 9 (9%) females had first trimester abortion [16].

In our study, the adverse neonatal outcomes included IUGR in 4 cases (4.6%), NICU admission in 16 cases (18.4%), neonatal mortality in 5 cases (5.8%) and congenital anomaly in 5 cases (5.8%). The mean GA at delivery was 37.16 ± 1.73 weeks (range= 29 -40 weeks) while the mean birthweight was 2470.85 ± 470.76 rams with range between 1000 and 3600 grams. Khanna et al., included 80 patients with heart diseases, abortion was reported in 7 cases (8.7%), intra-uterine fetal death in 1 case only (1.2%), IUGR in 4 cases

(5%), oligohydramnios in 11 cases (13.7%), preterm in 19 cases (23.7%), LBW (<2.5 kg) in 40 cases (50%) and very-low-birth-weight ((<1.5 kg) in 3 cases (3.7%) [24]. The adverse neonatal outcomes reported by Steiner ad his colleagues included intrauterine Growth Restriction in 19 cases (7.9%), small for Gestational Age in 7 cases (2.9%), neonatal Intensive Care Unit Stay in 60 cases (24.7%) and preterm Birth in 42 cases (17.14%) [22].

Beriye et al., showed that the mean birth weight of newborns was 2640 (±690) grams (range= 1200 - 3900 grams). Eleven (39.3%) newborns were admitted to NICU with diagnosis. Ten (35.7%) neonates were LBW. Seven (25%) neonates were SGA having mean weight of 1921(±565) grams. Nine (32.1%) neonates had low fifth minute APGAR score [17].

Salam et al., among all newborns born alive none had CHD. There were 77 (85.6%) live births observed in these females. In addition, 56 (72.8%) weighted > 2 Kgs [16]. Priya et al. demonstrated that half of neonates had a birth weight between 2.5 and 3.5 kg. However about 30% of newborns were of LBW (<2.5 kg). Authors suggested that heart disease itself could be a risk factor for LBW [25].

In this study, a significant relationship existed between non-rheumatic heart diseases and occurrence of adverse maternal outcomes. The incidence of ICU admission and puerperal pyrexia was statistically significantly higher among the cases of this group. Liu et al., showed that pregnancies with CHD were associated with longer hospital stay, more frequent hospitalizations, more cost, greater mortality rates, as well as higher likelihood of adverse outcomes compared to pregnancies without CHD [26].

In our study, the incidence of unwanted neonatal outcomes was statistically significantly greater in the cases with non-rheumatic heart diseases. The 1- and 5-minutes APAR scores were significantly lower in the cases with non- rheumatic heart diseases. The birth weight of the neonates was significantly lower in non- rheumatic heart diseases cases. Moreover, NICU admission and presence of congenital anomalies in the neonates was statistically significantly higher in this group. Liu et al., who showed that newborns born to mothers with CHD had more likelihood to be a pre-term or a LBW neonate. Furthermore, they have more likelihood to have a growth restriction because of the drugs administered by the mother [26]. This was in accordance with who showed that neonatal complications likely followed a pattern comparable to maternal and obstetrical outcomes. Complications were highest in the neonates born to mothers with cardiomyopathies and pulmonary hypertension and lower in RHD mothers [27].

This study has some limitations, mainly the small sample size included and being a single center study. Also, the lack of the control group limit the power of the obtained results as it didn't actually reflect the burden or the magnitude of the condition.

CONCLUSION

We concluded that heart diseases in mothers are not absolute contraindications for pregnancy, but there were associated with serious outcomes on both the mothers and offsprings. The non-rheumatic heart diseases (mainly the congenital heart diseases) are associated with worse outcomes as compared to the mothers with rheumatic heart diseases.

Conflict of interest: None.

Funding: This research didn't receive any specialized grant from funding agencies.

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