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Research Article

Pregnancy Outcomes of Maternal Heart Disease: A Cosmopolitan Experience

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Abstract

Objectives: To study neonatal outcomes of mothers with established congenital and acquired heart diseases.

Methods: A retrospective review of data from the PEARL maternal and neonatal registry was conducted. The PEARL database includes and enumerates mothers with diagnosed heart disease and their babies.

Results: Out of a total population of 41,000 mothers, 195 mothers with established congenital and acquired heart disease gave birth to 200 babies, accounting for 5 occasions of twins, but no occasions of three or more births. There was no significant difference in terms of disease outcomes; 65.6% of women in the sample size suffered from acquired heart disease, whereas 34.4% carried a diagnosis of a congenital cardiac disorder at the time of delivery. The local Qatari population made up 41% of the mothers while 59% were expatriates, comprising mainly Indian subcontinent and Arab population. Results across both groups were comparable, with no difference in terms of maternal or neonatal outcomes. The vast majority of babies were delivered in good condition, with an average birth weight of 3.1kg. Length of hospital stay was 3.5 days± 1.5 and Apgar score was 9 ±1 at five minutes of age. However, one baby died in the NICU due to congenital anomalies. Rate of stillborn was 2.5%.

Conclusion: Contrary to what is reported in the literature, our data indicate that maternal heart disease confers similar risk of adverse neonatal outcomes of NICU admissions, length of hospital stay, and pre-term delivery, whether congenital or acquired. The outcome was favorable in both types of heart diseases. There was no difference between local and expatriate populations in terms of disease severity or pathology. The neonatal outcomes were also similar, indicating that the level of care rendered at a tertiary care center was comparable across both groups.

Keywords: Heart; Maternal; Neonatal; Outcome

Abbreviations

ASD: Atrial Septal Defect; ARTT: Arrhythmia; CAD: Coronary Artery Disease; CARD: Cardiomyopathy; ACHD: Adult Congenital HD; CS: Caesarean Section; HD: Heart Disease; RHD: Rheumatic Heart Disease; PH: Pulmonary Hypertension; VHD: Valvular HD; VSD: Ventricular Septal Defect.

Introduction

Heart disease [HD] is a leading cause of maternal deaths in the developed world [1-3]. With the advent of modern neonatal and pediatric practice that has enabled greater survival of babies with complex cardiac disease, a higher proportion of affected women are stepping into motherhood. We are also aware of several entities such as atrial septal defects and cardiomyopathy, which may become hemodynamically dramatic as adolescence is reached. More-over, in modern societies there is a significant geographical mix between congenital and acquired heart diseases. For instance, acquired heart diseases like rheumatic heart is more common in crowded populations than in low inhabitant population.

HD in pregnancy represents a spectrum of etiologies, inclusive of cardiomyopathies, valvular HD [VHD], pulmonary hypertension [PH], adult congenital HD [ACHD], and rheumatic heart disease [RHD]. Recent epidemiological data suggest that the prevalence of maternal HD during pregnancy is rising [4-6], not only for those with ACHD but for those with acquired HD such as cardiomyopathy and PH [7]. Both acquired and ACHD predispose pregnant women and their offspring to a heightened risk of adverse events, particularly during labor and delivery [8]. However, an overwhelming majority of the data in the area of fetal or neonatal outcomes in women with HD are centered on the outcomes of women with ACHD [9-11] and not on those with acquired HD such as cardiomyopathy, VHD,

or PH, although these forms of HD are collectively more common. Comparative research in these areas is also lacking.

In this study, we sought to evaluate the maternal and neonatal outcomes of pregnant women with and without multiple forms of HD [cardiomyopathy, VHD, PH, ACHD] in a contemporary cohort of women admitted for delivery in the State of Qatar. Women's Wellness and Research Center [WWRC] is a state-of-the-art tertiary referral women's hospital where 40 to 50 deliveries occur daily. The WWRC accommodates 214 maternity beds and 110 NICU cots distributed across two floors. It is the referral hospital of choice for patients with high-risk pregnancies from any of the four newly established government hospitals and several health centers in the country.

Methodology

Data for this study was derived from the Qatar Pearl-Peristat Registry, which was developed in 2011 and reactivated in 2017 as Qatar Neonatal and Maternal Registry. The registry is funded by Qatar National Research Fund [QNRF] while it is supervised and supported by the medical research center of Hamad Medical Corporation. This retrospective study was conducted in state-run hospitals in Qatar with a focus on maternal and newborn registries with data covering the perinatal to postpartum periods. By utilizing patient care records, the study aims to examine the short and long-term maternal and newborn outcomes within the healthcare system. In addition, the registry aims to investigate the development of specified sub-cohorts, with the intent to improve reproductive health outcomes of the population in Qatar. The QNRF registry houses delivery cohorts from 2011 to 2012 as the first phase and currently 2017 to 2019 as a second phase. This current phase is targeting around 35000 deliveries within the whole country. Data in the interim period from 2012 to 2016 was lacking in details due to several confounders such as relocation of the hospital facility and lack of funding during this period which contributed to the inferior data quality. Therefore, data for this period, 2012-2016, was excluded to ensure consistency and validity.

This population-based retrospective study was designed to assess maternal and neonatal outcomes of mothers referred to and/or delivered with heart diseases among the residents of Qatar in government hospitals over a 2-year period. We retrieved the data from the medical records of each mother and infant. The registry obtained a general waiver of consent approved by Institutional Review Board [IRB].

Collected patient data was inserted in a specially designed program [Dendrite©]. SPSS 22 and Microsoft excel© were used for Data analysis.

Results

Forty-one thousand maternal cases of HD were investigated. Data from 195 pregnant women diagnosed with cardiac disease was analyzed in this study. Of this number, 43% of the women [79 cases] were Qatari citizens while 57% [116 cases] were expatriates. Acquired heart diseases were reported in 125 cases while congenital heart diseases were reported in 70 cases. Majority of women in this report were younger than 35 years of age [72% for AHD and 81% for ACHD], multiparous and non-hypertensive (Table 1). The rate of acquired versus congenital heart disorders was same throughout year 2011 to 2017 (Figure 1). Mitral valve disorders were the main acquired heart diseases, followed by rheumatic heart disease then Arrhythmias. VSD and ASD were the commonest congenital heart diseases (Figure 2 and 3). Women from North African and Indian subcontinent scored the highest among the expatriate residents in the state of Qatar.

	Acquired HD [125]		Congenital HD [70]		P-value
	N	%	N	%	
Age ≥35 years	36	28.1	13	19.4	0.182
Parity >1	104	81.3	47	70.1	0.078
Twin pregnancy	2	1.6	3	4.5	0.223
BMI 30-39.9	59/125	38	25/70	35.7	0.32
BMI > 40	17/125	13	5/70	7	0.15
Born at WWRC	95	76%	54	77	0.26
Caesarean birth	50	38.5%	27	38.6%	0.988
Hypertension in Pregnancy	8	6.3	5	7.5	0.747
DM in pregnancy	27	21.1	12	17.9	0.598
Maternal Mortality	0	0	0	0	NA

Table 1: Maternal characteristics.

Premature delivery was 19% in AHD versus 15.7% in ACHD. No significant difference between acquired and congenital defects were noted with respect to birth weight, cord blood gases, Apgar score, NICU admission or hospital stay. Only one hospital death was reported in the acquired group. The commonest cause of neonatal admission to NICU was transient tachypnea of newborn and prematurity (Table 2).

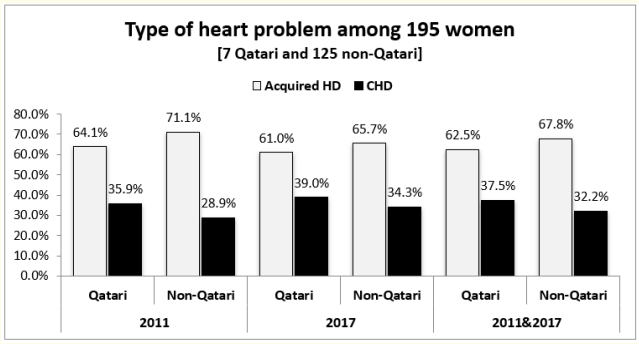

Figure 1: Types of heart disease according to nationalities among 195 pregnant women. [79 Qatari and 116 Expatriates] demonstrating rate of cases diagnosed or managed].

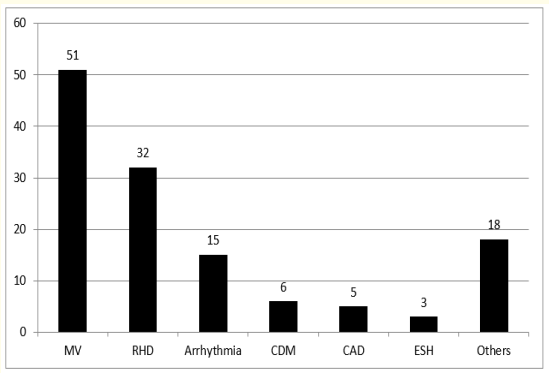

Figure 2: Number and types of acquired heart diseases recorded: RHD: Rheumatic Heart Daises; CDM: Cardiomyopathy; CAD: Coronary Heart Disease; ESH: Essential Hypertension.

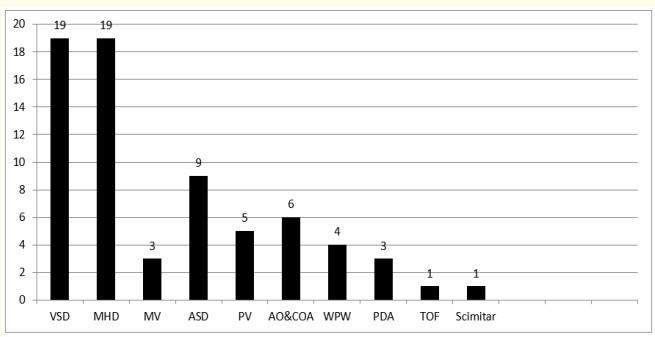

Figure 3: Number and types of congenital heart diseases recorded among 70 maternal cases. VSD: Ventricular Septal Defect; MHD: Multiple Heart Defect; MV: Mitral Valve; ASD: Atrial Septal Defect; PV: Pulmonary Valve; TOF: Tetralogy of Fallot; WPW: Wolff-Parkinson-White Syndrome.

	Acquired mean [SD]	Congenital mean [SD]	P-Value
Birth weight	3115 grams [±689]	3060 [±601.4]	0.578
GA at birth	38 wk [±3.1]	38 [±2.3]	0.192
Arterial cord pH	7 [±0.1]	7 [±0.1]	0.224
Venous cord pH	7 [±0.1]	7 [±0.1]	0.334
Arterial cord BE	-2 [±4.6]	-2 [±3.9]	0.629
Apgar score at 1st minute	8 [±1]	8[±1]	0.76
Apgar score at 5th minute	8 [±1]	9 [±1]	0.81
Apgar <7 at 5mins	0	0.0%	0
Venous cord base deficit	-3 [±4.6]	-2 [±3.7]	0.575

Table 2: Neonatal characteristics.

Discussion

The data of the study was retrieved from Pearl-Peristat Maternal and Neonatal registry which represents four government hospitals; all of which are state-of-the-art and well-equipped with neonatal intensive care facilities. The Women's Wellness and Research Center [WWRC] is a tertiary hospital, the largest of all in Qatar, and delivers forty to fifty births every day, with an estimated 17000 deliveries per year. State of Qatar is described as one of the wealthiest nations with the highest GDP per capita. This study aimed at assessing the maternal and neonatal complications associated with cardiac disease in pregnancy. The total population considered in this study was about 41950 deliveries over a 2-year period. Various studies estimated that 0.3% to 3.5% of all pregnancies are complicated by heart disease [12]. In the present study, the overall prevalence was found to be 5 cases per 1000 deliveries [0.005%] which is significantly lower than the numbers reported in some studies from developing countries [20]. In the current study, majority of the patients were less than 35 years [73.8%] and most of them were either multigravida or multipara [75%]. This is comparable to Vidyadhar., *et al*. where 70% were either primigravida or multipara [13] (Table 1).

In the current study, combined mitral valve disease and rheumatic heart disease accounted for 64% of all maternal heart diseases. These results were in consensus with the literature [13,14]. However, incidence of RHD has been greatly reduced in developed countries through widespread use of antibiotics effective against the streptococcal infections. The majority of rheumatic heart disease cases occurred among North African expatriates, Indian subcontinent expatriates and Qatar locals. Among locals, RHD cases

accounted for 10 out of 79 cases of acquired heart disease while the figure was 34 out of 116 cases of heart disease [29%] among non-Qatari (Figure 4). Thirty patients [15%] had multiple cardiac lesions. In this study, 61.5% of all women had spontaneous vaginal delivery compared to other studies where values ranged between 21 to 68% [12-16]. No death was recorded among the 195 pregnant women with heart diseases, which reflects the level of maternal health care provided to them. Thus, the current study indirectly indicates inadequate treatment of streptococcal infections in childhood and adolescence, particularly among the expatriates, and proposes that more efforts should be geared towards early diagnosis and treatment of RHD among those populations. Echocardiography was done routinely in our patients. Regular follow-up by cardiologists and obstetric services echocardiography was helpful for early and accurate evaluation of cardiac lesions. Cardiomyopathy was noted only in mothers with acquired conditions.

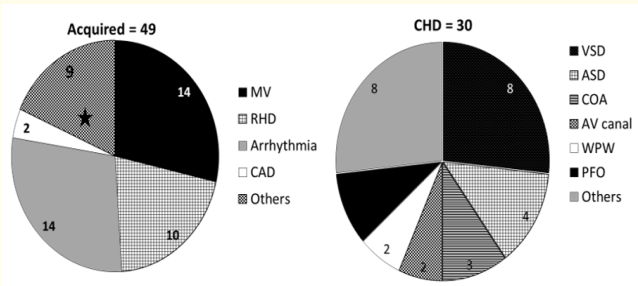

Figure 4: Maternal heart disease in local citizens. 2 cases suffered from rheumatic heart disease with mitral valve stenosis.

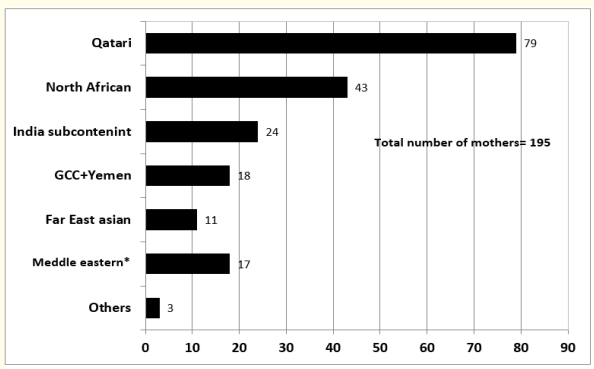

Figure 5: Number of cases distributed according to Nationalities.

- North African included : Egypt, Tunisia, Morocco
- Middle Eastern included: Jordan, Iraq, Syria, Iran, and Lebanon.
- Others: Ukraine, Romania, Brazil

Neonatal outcome

This study reports favorable neonatal outcome in the study group. In Table 3, it is clear that the neonatal outcome was satisfactory with normal birth weight, gestation age, Apgar scoring at fifth minute and hospital stay. The majority of the babies were admitted to NICU for a brief time with a mild form of transient tachypnea of newborn. The still born rate was 5/195 [2.5%].

	Infants born to mothers withAcquired HD [125 babies]		Infants born to mothers with CHD [70]		
	N	%	N	%	P-value
Preterm [≤ 36wks]	25	19.2%	11	15.7%	0.537
Term LBW [<2500g]	1/105	1.0%	3/59	5.1%	0.133
NICU admission	20/124	16.1%	7/70	10.0%	0.236
Stillborn	5	3.8%	0	0.0%	NA
Died in hospital	1/125	0.77%	0/70	0.0%	NA
Cardiac Defects	0/125	0%	0/70	0%	NA
Hospital Stay	3.4 d [±4.3]	NA	3.8 [±5.8]	NA	0.549

Table 3: Neonatal outcomes.

Only one baby died in the NICU because of congenital anomaly. All deaths were among mothers with acquired disorders; there were no recorded cases of death among mothers with congenital heart defects. Owen's., *et al.* demonstrated higher rate of maternal and neonatal morbidities and mortality, in cases where cardiomyopathy and arrhythmia were leading causes of complications. [17/30] In this report, the opposite was observed as there were fewer reported cases of mortality among newborn infants. Rate of stillborn birth was reported as 2.5% in Owen's., *et al*. studies while it was 0.7% in the present study. The conclusion by K Ramage., *et al.* was similar to our findings where women with different subtypes of acquired heart diseases are not uniformly at risk for adverse maternal and neonatal outcomes [17].

Conclusion

Cardiac failure is a serious complication and often leads to maternal death. Rheumatic heart disease, arrhythmia, and mitral valve problems are leading causes of acquired maternal heart diseases while isolated VSD, ASD, and COA are the most common CHD. This study concluded that pre-pregnancy diagnosis, counseling, appropriate referral, routine antenatal supervision and delivery at an equipped health center improve the heart-disease-complicated

pregnancy outcomes for both mother and baby. In our report, no newborns reported to have heart problems.

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