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Research Article

Post Caesarean Section Outcomes for Obstetric Valvular Heart Disease Patients at CHARLOTTE .....CMJAH

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Abstract

Background: Valvular heart disease presents a unique set of conditions during pregnancy and delivery with the potential of adverse outcomes complicated by prior interventions and anticoagulation. The aim of this study was to describe the profile and outcomes of obstetric valvular heart disease patients who delivered via caesarean section at Charlotte Maxeke Johannesburg Academic Hospital.

Methods: A retrospective study was done using patient record files, anaesthetics forms and echocardiogram reports. The study period was a 5-year review from January 2016 to December 2020.

Results: Sixty-nine patients were included. The mean age ± SD of the patients in this study was 30.1 ± 5.6. A total of 83% had gravidity of 1-3 and 90% parity of 0-2. Majority of patients (57%) had elective caesarean section. General anaesthesia was the most common mode used and majority of patients had fixed interval analgesia (FIA) mode of analgesia postoperatively. Approximately half of the patients (40.5%) were on anticoagulants. A significantly higher percentage of those who needed anticoagulation (46%) had poorer outcomes when compared to those who did not (7%), (P<0.001). This was a univariable association between adverse maternal outcome and NYHA class and lack of use of anticoagulants [aOR 3.77, 95% CI 1.45 - 9.79, P=0.006 and aOR 0.11, 95% CI 0.018 - 0.67, P=0.017, respectively]. Low ejection fraction was univariably associated with adverse foetal outcome, uOR 0.94, 95% CI 0.90 - 0.99, P=0.032. One (1%) foetus demised.

Conclusion: Patients were younger and in relatively good functional status. They carried the pregnancies to term. Patients did experience adverse outcome related to bleeding and arrythmias predominantly, but none demised. One neonate was lost. A structured care plan for these patients, based on a multidisciplinary approach, to afford prehabilitation is necessary.

Keywords: Obstetric valvular heart disease; Caesarean section; Adverse outcomes

Introduction

The incidence of cardiac disease in pregnancy is estimated to be in the range of 1-1.5% [1,2]. Cardiac disease still represents a significant cause of poor maternal and foetal outcome in pregnancy [2,3]. Valvular heart disease related to rheumatic fever has declined in high-income countries but remains a significant health problem in low-income countries [2,4].

It impacts the heart and the body's ability to cope with the normal physiological changes of pregnancy [5,6]. It also often exacerbates the physiological changes of pregnancy, with most patients being diagnosed for the first time with valvular heart disease during the pregnancy [7-9].

Many complications have been associated with the disease in pregnancy such as thrombo-embolism, cardiac arrhythmias, pulmonary oedema and bleeding post caesarean section due to the use of anticoagulation [2,10,11]. Valvular heart disease has considerable effects on foetal outcomes and can result in preterm birth, respiratory distress, low birth weight even at term, increased resuscitation rates in severely preterm babies, and foetal demise [11,12].

The role of a multidisciplinary team in these often-challenging patients is not only to ensure that the patient can tolerate the challenges of pregnancy and delivery, but also to ensure survival in the postoperative period and beyond [4,15].

Data on perioperative outcomes of valvular heart disease in pregnancy in Sub-Saharan Africa is sparse. Knowledge is required on the perioperative course of valvular heart disease patients for management protocols to be developed to assist with the management in our resource limited settings. This study is aimed at evaluating the perioperative outcomes in obstetric valvular heart disease patients post caesarean section in the Department of Anaesthesia at Charlotte Maxeke Johannesburg Academic Hospital (CMJAH). The aim of the study was to describe the perioperative outcomes and factors associated with adverse outcome of obstetric valvular heart disease patients post caesarean section at CMJAH.

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Methods

This study was a descriptive retrospective study. The data in this study was collected from CMJAH (single centre). The study population consisted of obstetric patients with valvular heart disease who delivered by caesarean section over a period of 5 years from Jan 2016 - Dec 2020. The patient information utilized in this study was obtained from anaesthetic charts, patient record files and echocardiographic reports.

A total of 69 patients were included. No patients were excluded from this study for the study period. Permission to perform the study was obtained from CMJAH and the Human Research Ethics Committee (HREC) of the University of the Witwatersrand, research number M200751. Data were collected by the primary investigator. Patient information was de-identified and confidentiality maintained.

Statistical analysis

Data were collected on a Microsoft excel spreadsheet. Frequency and percentages were used to describe demographic data. Clinical and outcome data were reported as mean (SD) if normally distributed and median (IQR) if not normally distributed. Associations between patient characteristics and outcomes were determined using Fisher's Exact test, and the Wilcoxon-Ranksum test depending on the data distribution. A regression analysis was conducted to determine univariable associations with maternal and foetal outcomes. Those factors with P <0.1 were included into a multivariable regression analysis model. P values of <0.05 were accepted as significant.

Results

The total number of records analyzed was 69. The valve lesions ranged from isolated mitral, tricuspid, pulmonary and aortic valves, to mixed valve lesions (Figure 1). Patients had a caesarean section under regional anaesthesia (spinal/epidural), general anaesthesia or a combined technique. The mean age ± SD of the patients was 30.1 ± 5.6 with a range of 18-41 years (Table 1). Ninety percent (n=62) of patients were of the Black race. A total of 83% had gravidity of 1-3 and 90% parity of 0-2. Most neonates were born at term (75%) with a median (IQR) gestation of 37 (36-38) weeks. Majority of patients (57%) had elective caesarean section whilst 43% had emergency caesarean section. General anaesthesia was the most used mode and majority of patients had fixed interval analgesia (FIA) postoperatively. Approximately half of the patients (40.5%) were on anticoagulants.

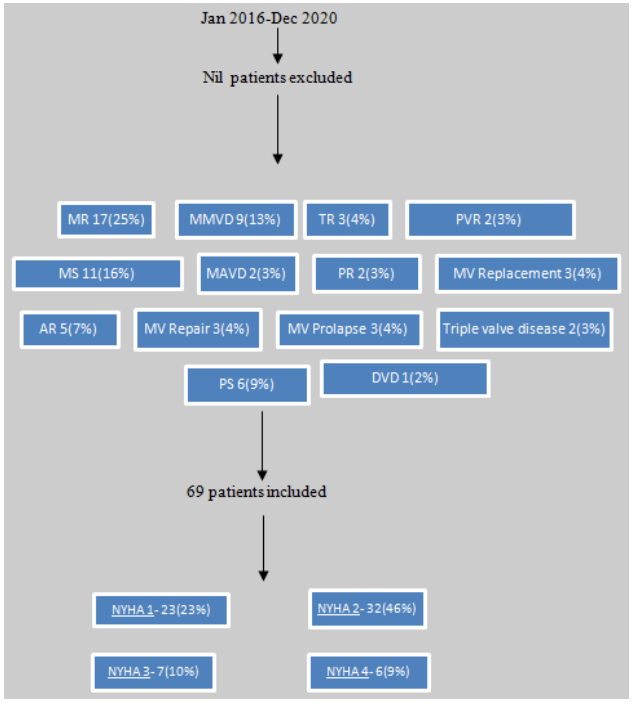

Figure 1: Flow diagram of the study data.

Table 1: Patients characteristics.

Parameters		N (%)
Age	16 - 25	18 (26)
	26 - 35	36 (52)
	36 - 45	15 (22)
Ethnicity	Black	62 (90)
	Coloured	2 (3)
	Caucasian	3 (4)
	Asian	2 (3)
Gravidity	1 - 3	57 (83)
	4 - 6	9 (13)
	7 - 9	3 (4)
Parity	0 - 2	62 (90)
	3 - 5	6 (9)
	6 - 8	1 (1)
Gestational age	28 - 32 weeks	5 (7)
	33 - 36 weeks	12 (17)
	37 - 42 weeks	52 (75)
Elective/Emergency	Elective	39 (57)
	Emergency	30 (43)
Mode of anaesthesia	Spinal	23 (33)
	Epidural	8 (12)
	General Anaesthesia	34 (49)
	Unknown	1 (1)
	Spinal + GA	2 (3)
	Epidural + GA	1 (1)
Post-op analgesia	Epidural	4 (6)
	Spinal	2 (3)
	FIA	36 (52)
	Unknown	1 (1)
	Spinal + Fixed	22 (32)
	Epidural + Fixed	4 (6)
Surgeon level of experience	MO	3 (4)
	Registrar	33 (48)
	Consultant	29 (42)
	Unknown	4 (6)
Anti-coagulant		28 (41)

FIA: Fixed Interval Analgesia; MO: Medical Officer; GA: General Anaesthesia.

Table 2: Presenting Cardiac Pathology.

Parameters		N (%)
Lesion Severity	Mild	29 (42)
	Moderate	14 (20)
	Severe	18 (26)
	Severity unknown	8 (12)
Congenital/Acquired	Congenital	17 (25)
	Acquired	52 (75)
NYHA Class	1	23 (33)
	2	32 (46)
	3	7 (10)
	4	6 (9)
	Unknown	1 (2)
Prosthetic/Native valve	Tissue	3 (4)
	Mechanical	4 (6)
	Valvuloplasty	2 (3)
	Native valve	58 (84)
	Unknown cardiac intervention	2 (3)

NYHA: New York Heart Association.

Table 3: Predominant cardiac lesions and echocardiography parameters.

Parameter	N (%)
Cardiac Lesion	
Mitral regurgitation	20 (29)
Mitral stenosis	11 (16)
Mixed mitral valve disease	9 (13)
Mitral valve replacement previous	3 (4)
Mitral valve repair previous	3 (4)
Pulmonary stenosis	6 (9)
Pulmonary valve replacement	2 (3)
Pulmonary regurgitation	2 (3)
Aortic regurgitation	5 (7)
Mixed aortic valve disease	3 (4)
Tricuspid regurgitation	3 (4)
Triple valve disease	2 (3)
Echocardiography	
Ejection fraction	
<50	7 (10)
50 - 55	7 (10)
56 - 65	31 (46)
66 - 75	18 (27)
76 - 85	5 (7)
MVA (cm^2)	
0.5 - 1.5	10 (42)
1.6 - 2.5	10 (42)
2.6 - 4	4 (16)
Pulmonary arterial pressure	
25 - 30	4 (20)
31 - 40	5 (25)
41 - 50	7 (35)
51 - 60	4 (20)

MVA: Mitral Valve Area.

Table 4: Maternal and foetal outcomes.

Parameters	N (%)
Maternal	
Bleeding	6 (9)
Thrombo-embolism	0 (0)
Cardiac-arrythmias	6 (9)
Cardiac failure	5 (7)
Pulmonary oedema	1 (1)
In-hospital mortality	0 (0)
Post-operative stay	
ICU	19 (27)
High care	35 (51)
Ward	15 (22)
Neonatal	
Birth weight	
< 1500g	2 (3)
1500g - 2499g	19 (28)
≥ 2500g	47 (68)
Unknown	1 (1)
Maturity at delivery	
28 - 32 weeks	5 (7)
33 - 36 weeks	12 (17)
≥ 37 weeks	52 (75)
Respiratory distress	14 (20)
Foetal demise	1 (1)

ICU: Intensive Care Unit.

A predominantly larger proportion of patients had mild to moderate valvular disease 62%, whereas 26% presented with severe disease (Table 2). The cause of the valvular heart disease was predominantly rheumatic in nature as opposed to congenital pathology, 75% *vs.* 25% respectively.

The NYHA classes 1 and 2 represented 79% of patients. Data showed that 84% of patients had not had any surgical intervention for their cardiac pathology prior to the caesarean section with only 16% having had a surgical intervention.

Table 3 details the different predominant valvular lesions reported. Mitral valve disease accounted for most of the predominant lesions and tricuspid valve disease was the least reported. A total of 42% of patients with MS presented with a mitral valve area (MVA) of less than 1.5cm^2 (Table 3).

Cardiac arrhythmias and bleeding were the leading complications at rates of 9% each (Table 4). Nineteen patients (27%) were cared for in ICU postoperatively, 35 (51%) were in high care, and 15 (22%)

Table 5: Factors associated with maternal and foetal outcomes.

Parameter		UOR (95% CI)	p-value	AOR (95% CI)	p-value
Maternal outcomes					
Age in years		1.09 (0.97 - 1.21)	0.14		
Gravidity		1.01 (0.70 - 1.49)	0.93		
Parity		0.98 (0.60 - 1.60)	0.95		
Acquired or congenital	Rheumatic	1 (reference)		1 (reference)	
	Congenital	0.17 (0.02 - 1.40)	0.1	0.26 (0.019 - 0.35)	0.31
NYHA class		3.22 (1.56 - 6.66)	0.002	3.77 (1.45 - 9.79)	0.006
EF %		0.98 (0.93 - 1.04)	0.55		
Anticoagulant	Yes	1 (reference)		1 (reference)	
	No	0.075 (0.026 - 0.42)	0.002	0.11 (0.018 - 0.67)	0.017
Elective/Emergency	Elective	1 (reference)			
	Emergency	0.39 (0.11 - 1.38)	0.15		
Neonatal outcomes					
Age in years		1.02 (0.94 - 1.11)	0.64		
Gravidity		1.09 (0.79 - 1.50)	0.6		
Parity		0.89 (0.59 - 1.34)	0.58		
Acquired or congenital	Rheumatic	1 (reference)			
	Congenital	0.82 (0.26 - 2.48)	0.72		
NYHA class		1.15 (0.67 - 1.96)	0.62		
EF %		0.94 (0.90 - 0.99)	0.032	0.96 (0.90 - 1.01)	0.12
Anticoagulant	Yes	1 (reference)		1 (reference)	
	No	0.43 (0.16 - 1.16)	0.094	0.55 (0.17 - 1.77)	0.32
Elective/Emergency	Elective	1 (reference)			
	Emergency	1.13 (0.44 - 2.95)	0.82		

NYHA: New York Heart Association.

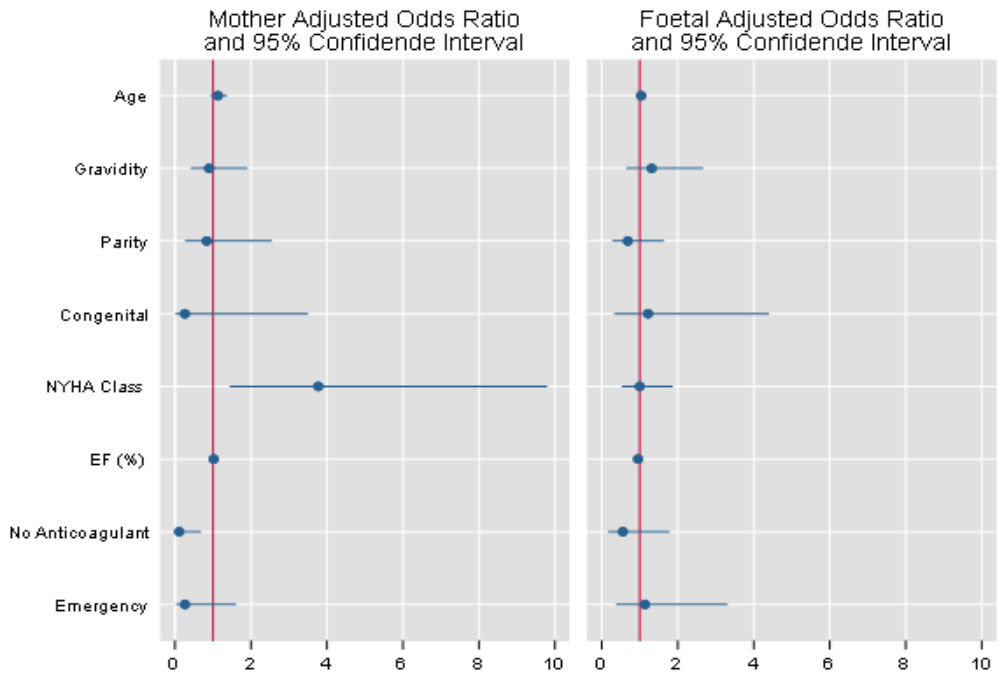

Figure 2: Forest plot of factors predictive of adverse foeto-maternal outcome.

at the general ward. None of the patients died in hospital. Majority of the neonates were born at term (75%), at normal birth weight of ≥2500 grams (68%) (Table 4). Respiratory distress at birth occurred in 14 (20%) neonates and 1 (1%) foetus demised.

There was a significant univariable association between NYHA and those not on anticoagulation with adverse maternal outcome [UOR 3.22, 95% CI 1.56 - 6.66, P=0.002 and UOR 0.075, 95% CI 0.026 - 0.42, P=0.002], respectively. Both factors remained significant in an adjusted model (Table 5). EF was the only factor univariably associated with adverse foetal outcome [UOR 0.94, 95% CI 0.90 - 0.99, P=0.032] (Figure 2).

The most used method of post-operative analgesia was fixed interval analgesia (FIA) 52%. Significantly more patients operated on by consultants had poor outcomes (38%) compared to those operated on by registrars (9%), (P=0.035). Majority of patients 49% had a general anaesthetic, however, there was an insignificant relationship between the mode of anaesthesia with poor maternal outcomes (>0.1).

Discussion

The patients in our study were young. Majority were Black with low gravidity and parity. They seemed to carry the pregnancy to term successfully as a large proportion of patients were in NYHA 1-2, with mild to moderate disease. Symptoms of valvular heart disease are often unmasked during the pregnancy due to exacerbation of the physiological changes of pregnancy [7-9].

Higher classes of NYHA were associated with adverse maternal outcome, whereas low EF adversely affected foetal outcome. However, majority of our patients (90%) had normal EF, making the extrapolation difficult. Similar to our outcomes, it has been shown that severity of maternal disease affects foetal outcome [1]. The presence of heart disease, more especially in those with a high NYHA class, has been shown to be associated with the highest risk of maternal and foetal morbidity and mortality [13,14].

Of concern was that most were not on anticoagulants and this factor had a significant univariable association with adverse outcome. Despite this, the leading complication was haemorrhage postoperatively. Patients were predominantly cared for in ICU or HCU. The nature of the cardiac lesions was predominantly acquired compared to congenital. This reflects an ongoing rheumatic heart disease state in our communities.

Majority of patients in this study had no cardiac surgical intervention prior to this pregnancy, possibly because many of them were only diagnosed with cardiac pathology during the pregnancy. This may be due to limitations in access to health care services in our country similar to that reported in low-income countries [1,12]. The predominant lesion in our study was mitral valve disease, which is patho-pneumonic of rheumatic heart disease as it known to predominantly affect the mitral valve [4]. Of those with MS, 7 (64%) had critical stenosis. Within those with pulmonary hypertension, 2 (10%) had severe PHT.

In this currently study, complications such as postpartum haemorrhage and cardiac arrhythmias, which have been reported in previous studies, were present [10,12]. The type of anaesthetic, timing of surgery, level of qualification of surgeon, urgency of the procedure, parity or gravidity seemed to have no bearing on outcomes. The choice of regional or general anaesthetic, is often determined by the patient's haemodynamic stability and goals associated with each valve lesion [10,16]. Perhaps the reason why most had general anaesthesia.

Conclusion

However, it is evident that patients were younger and in relatively good functional status considering their valve lesions, affording them progress to term labour. Patients did experience adverse outcome related to bleeding and arrythmias predominantly, but none demised. One neonate was lost. A structured care plan for these patients, based on a multidisciplinary approach, is necessary. Our cohort over 5 years was small. Data therefore cannot be extrapolated to the whole population.

Declarations

Ethics approval and consent to participate: Ethics approval was obtained from the ethics committee at the University of Witwatersrand and the Human Research Ethics Committee (medical). Consent to participate was not obtained from the patients as this was a retrospective study and was approved as such by the medical ethics committee. All methods used to collect and analyze data were carried out in accordance with relevant guidelines and regulations as stipulated by the University of the Witwatersrand medical ethics committee.

Availability of data and materials: Data on an excel spreadsheet and data analyzed in data tables for this study is also available from the corresponding author on reasonable request.

Authors contributions: Ntombizabanguni Mfeka: Wrote the main manuscript and text; Palesa Motshabi Chakane: Corrected main manuscript and tables and figures; Amanda Nkuna: Reviewed main manuscript and corrected it; Haroun Rhemtula: Involved in provided the patient records for the manuscript.

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