ORIGINAL ARTICLE

Outcome of Obstetric Patients with Valvular Heart Diseases: Results of a Cohort Study from Tertiary Care Hospital, Multan, Pakistan

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ABSTRACT

Objective: To determine the outcomes of obstetric patients with valvular heart diseases in a tertiary care hospital.

Study Design: Cohort study.

Place and Duration of Study: This study was conducted at the Department of Gynaecology and Obstetrics, Combined Military Hospital (CMH), Multan, Pakistan, from 1st May 2023 to 30th April 2024.

Methods: A total of 110 pregnant women diagnosed with valvular heart disease, as confirmed by echocardiographic evaluation, were included in this study through consecutive sampling. The maternal, fetal, and neonatal outcomes, especially linked to cardiology and obstetrics, were recorded. Descriptive analysis of the study outcomes was done by applying frequency and percentages.

Results: The Mean± SD of age in this study was 27.83±5.25 years with an age range of 21-39 years. Mitral stenosis was the most frequent valvular heart disease observed in 66 (60%) and 58 (52.73%) patients, who belonged to NYHA class I. The maternal outcomes showed the mean gestational age of 37.58±1.75 weeks, with 34.55 % of the patients suffering from any type of maternal complications. Cesarean section (25.45 %), anemia (8.18%), atrial fibrillation (7.27%), cardiac arrhythmia (7.27%), and onset/worsening of heart failure (5.45%) were the most frequently recorded maternal complications. Data regarding fetal and neonatal outcomes showed that complications were present in 33.64% of cases. Preterm delivery (23.64%), low birth weight (20%), low APGAR (Appearance, Pulse, Grimace, Activity, Respiration) score at 5 minutes (7.27%), and stillbirth (6.36%) were the most common complications.

Conclusion: Adverse maternal, fetal, and neonatal outcomes are frequently reported in obstetric patients with valvular heart disease.

Keywords: *Fetal Development, Pregnancy Outcomes, Valvular Heart Disease*.

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Introduction

Cardiovascular (CV) disease is among the leading causes of death in women who are pregnant or have recently given birth. Even in developed countries like the USA, it is estimated to complicate 1% to 4% of pregnancies.[1,2] Valvular heart disease (VHD) is counted among the frequently reported causes of CV-related morbidity and mortality in women of fertile age.[3]

The mother's physiology changes significantly during pregnancy. The total volume of blood in the body goes up by 30 to 50% and thereby the amount of blood pumped by the heart also increases by 30 to 50%.[4] There is also an increase in heart rate by 10-20 beats per minute during pregnancy. Systemic vascular resistance decreases during this phase with increased stroke volume. Blood pressure drops in the

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first and second trimesters and then rebounds to pre-pregnancy levels in the third trimester as a result of placental development.[5-7]

Pregnancy thereby represents a period of increased vulnerability and risk for women with VHD. Young pregnant women are more likely to experience endocarditis and have babies with congenital anomalies. When the uterus contracts during labor, heart rate and systolic blood pressure temporarily go up, which may worsen cardiac disease.[8,9] Pregnancy's hypercoagulable state raises the thromboembolic events both during pregnancy and in the first 6 to 12 weeks after giving birth, making the management of anticoagulation for women with mechanical valves even more challenging.

In the scenarios described above, there are increased risk factors for both the mother and the child. The severity and nature of the mother's valvular disease, along with the consequent abnormalities in left ventricular function, pulmonary pressure, and functional ability, suggest a poor outcome.[9,10] Women who have VHD may not have enough cardiac reserve to handle these hemodynamic shifts, particularly if they have left-sided obstructive lesions. The changes in flow can lead to an increase in mitral and aortic transvalvular gradients and an overestimation of lesion severity. Particularly for patients who were recently diagnosed during pregnancy, direct valve planimetry may more precisely depict the degree of valve stenosis in patients with aortic stenosis (AS) or mitral stenosis (MS). A sudden increase in preload can cause clinical decompensation, so cases having high-risk lesions should be thoroughly monitored during the first few days following delivery and in the days that follow.[9,11] Mitchelson JB et al., in a case report of pregnant women with a history of regurgitant valve, mentioned the intense cardiac strain soon after delivery in patients with MS with raised intravascular volume resulting in pulmonary edema and suggested avoiding pregnancy in such cases.[12]

Therefore, close serial surveillance is required to check for clinical decompensation during pregnancy. A joint Pregnancy Heart Team, comprising a cardiologist with experience in the management of pregnancy with heart disease and a specialist in maternal fetal medicine (MFM), should provide counseling to women of fertile age group with VHD prior to conception.[13]

The data on these outcomes is an essential part of the management of obstetric patients; however, limited work is reported on this topic in Pakistan. This study aimed to determine the outcomes of obstetric patients with valvular heart diseases (VHD) in a tertiary care hospital in Pakistan. The results of this study may help clinicians manage such cases because of the related findings available in our population.

Methods

This cohort study was conducted at the Department of Gynaecology and Obstetrics in collaboration with Department of Cardiology, Combined Military Hospital (CMH), Multan, Pakistan from 1st of May 2023 to 30th of April 2024 over a period of 1 year after taking approval from the institute vide letter no: 138/2023 held on dated: 10th April 2023. Sample size was calculated as per the following assumptions: Precision=5.00%, Prevalence of still birth in pregnant women with VHD=7.4 %.[14] Population size = infinite, with 95% confidence interval and specified limits [2.4%--12.4%] n (Estimated sample size) = 106. Inclusion criteria were pregnant women diagnosed with VHD (moderate or severe) as confirmed by echocardiographic evaluation.

A total of 110 pregnant women diagnosed with VHD (moderate or severe) were included in this study through consecutive sampling. The European Society of Cardiology (ESC) guidelines were used while grading valve lesions.[15]

Exclusion criteria were set as all pregnancies that ended in spontaneous abortion before the 8th week of gestation and cases where pregnancy termination was induced through medical intervention. The pregnant women with any other conditions that might affect the course of their pregnancy, like hypertension, diabetes, or renal impairment, were also excluded.

All the demographic data and medical history were recorded at the time of inclusion, and follow-up was continued until 8 weeks after delivery. The maternal, fetal, and neonatal outcomes were recorded for each case.

Major maternal outcomes included gestational age, mode of delivery, atrial fibrillation, cardiac

arrhythmia, worsening or development of congestive heart failure (CHF), anemia, eclampsia, pulmonary edema, postpartum hemorrhage, and death.

For fetal and neonatal outcomes, preterm delivery, low birth weight, low APGAR score at 5 minutes, stillbirth, early neonatal mortality, admission to the neonatal intensive care unit, and congenital malformations were recorded.

The study purpose was explained to the patients, and consent was obtained on written forms.

Data analysis was performed using SPSS version 25. Quantitative variables were expressed in the form of Mean±SD, while qualitative variables were expressed in the form of frequency and percentage. Descriptive analysis of the study outcomes was done by applying frequency and percentages.

Results

The mean±SD of patients' ages in this study was 27.83±5.25 years, with an age range of 21-39 years. The details of demographics and medical history as taken at the time of the first visit are shown in Table 1.

Table 1: Demographics and medical history (N=110)

Age (Mean± Standard deviation) years	27.83±5.25	
Gravida (Mean± Standard deviation)	1.78±0.81	
Para (Mean± Standard deviation)	1±0.87	
Time of first report at hospital N (%)	First trimester	27 (24.55)
	Second trimester	62 (56.36)
	Third trimester	21 (19.09)
Type of lesion N (%)	Mitral Stenosis	66 (60)
	Mitral regurgitation	34 (30.91)
	Aortic regurgitation	5 (4.55)
	Pulmonary valve disease	3 (2.73)
	Tricuspid valve disease	2 (1.82)
New York Heart Association class N (%)	I	58 (52.73)
	II	34 (30.91)
	III	16 (14.55)
	IV	2 (1.82)

Table 2: Maternal outcomes (N=110)

Gestational age (Mean± Standard deviation) weeks		37.58±1.75
		N (%)
Patients with any type of maternal complication		38 (34.55)
Mode of delivery	Vaginal	82 (74.55)
	Cesarean Section	28 (25.45)
Anemia		9 (8.18)
Atrial fibrillation		8 (7.27)
Cardiac arrhythmia		8 (7.27)
Development or worsening of heart failure		6 (5.45)
Pulmonary hypertension		3 (2.73)
Termination of pregnancy		3 (2.73)
Eclampsia		2 (1.82)
Post-partum Hemorrhage		2 (1.82)
Maternal death		2 (1.82)

Table 3: Fetal and neonatal outcomes (N=-110)	
Outcome Variables	N (%)
Cases with any fetal complication	37 (33.64)
Pre-term delivery	26 (23.64)
Low birth weight	22 (20)
Low Appearance, Pulse, Grimace, Activity, and Respiration score	8 (7.27)
Still birth	7 (6.36)
Neonatal Intensive Care Unit Admission	6 (5.45)
Congenital malformations	2 (1.82)
Early neonatal mortality	2 (1.82)

The details of maternal outcomes in these obstetric patients with VHT showed the mean gestational age as 37.58±1.75 weeks. Moreover, as high as 34.55 % of the patients suffered from any type of maternal complications, as shown in Table 2.

Similarly, the details of fetal outcomes showed that the cases with any type of fetal complication were 33.64% where low birth weight was the most common among these complications, as shown in Table 3.

Discussion

The Mean± SD of age in our study was 27.83±5.25 years with an age range of 21-39 years. MS was the most frequent valvular heart disease (60%), and most patients belonged to the NYHA class I. The maternal outcomes showed the mean gestational age of 37.58±1.75 weeks and 34.55 % of the patients suffered from any type of maternal complications. Cesarean section (25.45 %), anemia (8.18%), atrial fibrillation (7.27%), cardiac arrhythmia (7.27%), and onset/worsening of heart failure (5.45%) were the most frequently recorded maternal complications. The incidence of maternal death was recorded in 2 (1.82%) of cases. Data regarding fetal and neonatal outcomes showed that complications were present in 33.64% of cases. Preterm delivery (23.64%), low birth weight (20%), low APGAR score at 5 minutes (7.27%) and still birth (6.36%) were the most common complications. Early neonatal death was recorded in 1.82% of cases.

Data regarding the outcomes in obstetric patients with VHD is important for taking measures to avoid them. While international literature reports varying results, evidence specific to our local population remains limited and under-documented.

Beriye M et al. studied the feto-maternal outcomes in obstetric women with VHD in Ethiopia. The study mentioned the prevalence of VHD in pregnant women as 0.6%.[16] Out of the total study patients, 75.9% had pathology related to the mitral valve, and 55.2% had severe MS. The most common complication in these women was either onset or worsening of existing CHF reported in 74.9% of cases. Regarding fetal complications, preterm birth was the most frequent complication found in 39.3% of cases. The incidence of postpartum mortality was reported in 6.9% while early neonatal mortality was 14.3%.[16] These results are similar to our findings and mention predominance of mitral valve pathology, though HF incidence was notably higher in this study compared to our results. Preterm delivery rate in our study was higher while maternal mortality was substantially lower study indicating better management of these patients in our set ups.

In a retrospective cohort study by Hammami R et al., risk factors for maternal cardiac and obstetric complications and newborns in pregnant women with severe VHT were evaluated.[17] Findings of this study are also closely aligned with our results, where cardiac complications appeared in 61% of the cases. These complications included severe MS and raised pulmonary systolic pressure. Complications related to obstetrics were recorded in 31.8% and neonatal complications were recorded in 39.3% of cases.[17]

Ferreira VV worked on the CV outcomes in mothers, fetus and neonates in cases of obstetric women with VHD. The majority of these women belonged to NYHA class I or II, and 59% had a minimum of one heart valve replacement. Hemorrhagic complications were reported in 8.6% of the cases where anticoagulation drugs were in use and

miscarriage happened in 23.5%. A maternal mortality rate similar to our study was reported (1.82%), however, the heart failure rate was significantly lower in our findings versus this study (42%). A higher congenital malformation rate was also a notable outcome (14.8%).[14] An important recent observation on the topic was published in a study by Sajjadieh Khajouei A et al., sharing their 10 years' experience of feto-maternal outcomes in mothers with MS, finding that complications may occur despite optimal treatment. Maternal complications included decompensated heart failure (2.5%), arrhythmia (2.5%), and one death (1.2%) while the adverse fetal outcomes included stillbirth (1.2%), abortions (34.6%), congenital anomalies (7.4%), prematurity (3.7%), and IUGR (4.9%).[18]

Altaf A et al. determined the effect of VHD on maternal and fetal outcomes in young obstetric Pakistani women. The results of this study shared a substantial correlation between the two, with significantly higher incidences of CHF, surgical interventions, and mortality in these patients compared to the control group. For fetal outcome results, there was a higher rate of preterm births, low birth weight, and infants with lower APGAR scores in patients with VHD compared to controls.[8] A recently published study in Pakistan by Ullah H et al. evaluated the outcomes of pregnancy in patients with VHD reporting at a tertiary care health setup.[18] Out of these, 53.97% had MS, followed by mitral regurgitation in 18.42% of patients. The results of the study shared the incidence of still birth in 6.57%, cardiac arrhythmia in 7.23% while maternal death in 0.65% of the cases. The study thereby concluded that the patients with VHD are at high risk of maternal and fetal complications.[19] Both of these Pakistani studies demonstrate remarkable consistency with our findings, particularly regarding adverse fetal outcomes and maternal complications observed in obstetric patients. These similar patterns across different tertiary care centers underscore the reproducibility of these outcomes within our local healthcare settings.

Lewey J et al., in their review on VHD in pregnancy, also shared that in cases of mild to moderate VHD, pregnancy is generally well tolerated.[20] However, in severe MS or AS, patients are at elevated risk of severe maternal morbidity and mortality unless valve repair is carried out.[19] This is very important clinical observation consistent with our results, where the majority of our patients with NYHA class I status (52.73%) had relatively favorable outcomes, supporting the principle that functional status is a key predictor of pregnancy outcomes in VHD patients.

Review of evidence found in our study and the studies discussed above underscores that close serial surveillance and multidisciplinary care are necessary for VHD obstetric patients. Involvement of cardiology and maternal-fetal medicine specialists, and individualized risk stratification will help in optimizing this management.

The limitations of our study include its small sample size. Moreover, this is the result of a single tertiary care hospital. Studies with larger sample sizes, based on data collected from different institutions, will provide more useful insights into this subject.

Conclusion

Adverse outcomes are frequently reported in obstetric patients with VHD, including the event of mortality. When managing such cases in pregnant women, hospitals need to be cautious and implement evidence-based measures to avoid these events.

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ZH: Conception and design of the work, manuscript writing for methodology design and investigation
INS: Writing the original draft, proofreading, and approval for final submission
SB: Revising, editing, and supervising for intellectual content
RA: Validation of data, interpretation, and write-up of results
HW: Data acquisition, curation, and statistical analysis
B: Manuscript writing for methodology design and investigation