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Review Article

Diagnosis and Management of Heart Valvular Diseases and Heart Failure in Pregnancy

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Abstract

Introduction: Heart disease is one of the most prevalent medical conditions during pregnancy. Significant hemodynamic changes brought on by pregnancy raise the risk of thrombo-embolic events and may worsen valvular heart disease. A significant contributor to maternal mortality and accounting for about a quarter of the cardiac conditions complicating pregnancy, valvular heart disease presents various therapeutic issues. About 1% of pregnancies are affected with valvular heart disease (VHD), and 13% encounter heart failure (HF), considerably raising the risk for both the mother and the fetus. The type and severity of the underlying VHD affect the risk of complications. Moreover, pregnancy is a hypercoagulable condition linked to a higher risk of thromboembolism.

Aim of the Study: The aim of this review is to understand the diagnosis and management of pregnant women with valvular heart diseases and heart failure.

Methodology: The review is the comprehensive research of PUBMED from 1990 to 2021.

Conclusion: In developing nations, rheumatic diseases and deadly pregnancy complications are frequently encountered. The combined skills of cardiologists, obstetricians, and anaesthesiologists during pregnancy are beneficial to pregnant women experiencing the aftereffects of rheumatic fever as well as other valvular diseases. Pregnancy can also result in the discovery of a previously undiagnosed disease, and giving birth offers the chance to ensure continuity of postnatal care with an emphasis on preventative therapy and contraception.

Keywords: *Pregnancy; Valvular Heart Diseases; Heart Failure Mitral Stenosis; Aortic Stenosis; Anticoagulation*

Introduction

Hyperdynamic circulation is a side effect of pregnancy. To boost uterine and placental perfusion and the perfusion of maternal organs, which is crucial for maintaining homeostasis during pregnancy, notably for the kidneys and skin, increased circulating blood volume and higher cardiac output are necessary adaptations. Increased heart rate and stroke volume during the first trimester cause an increase in cardiac output. In the second trimester, peripheral vasodilatation dominates the pregnancy adaptation, and volume expansion continues, causing blood pressure to drop. Vascular resistance increases, and the volume growth peaks early in the third trimester. A procoagulant hematological profile brought on by pregnancy has accelerated fibrinolysis and thrombus formation rates [1].

In developing nations, 80% of individuals with heart illness during pregnancy have valvular heart disease, with rheumatic fever being the most frequent cause of this condition. During pregnancy, it can make its first appearance. Heart failure (HF) accounts for up to 9% of in-hospital deaths in pregnancy-related hospitalizations. Most pregnant women with HF are associated with cardiomyopathy, where the risk of severe cardiovascular events is close to 50% [2,3].

Some of the valvular diseases frequently encountered are [4]:

Aortic Lesions	Mitral Stenosis - develop orthopnea, paroxysmal nocturnal dyspnea, and exertional dyspnea, as well as postural symptoms. Aortic Stenosis - associated with congenital bicuspid aortic valve
Regurgitant Lesions	Atrial fibrillation, Aortic regurgitation
Mixed Lesions	The dominant abnormality determines whether mixed valvular lesions occur.
Prosthetic Valves	

Risk assessment

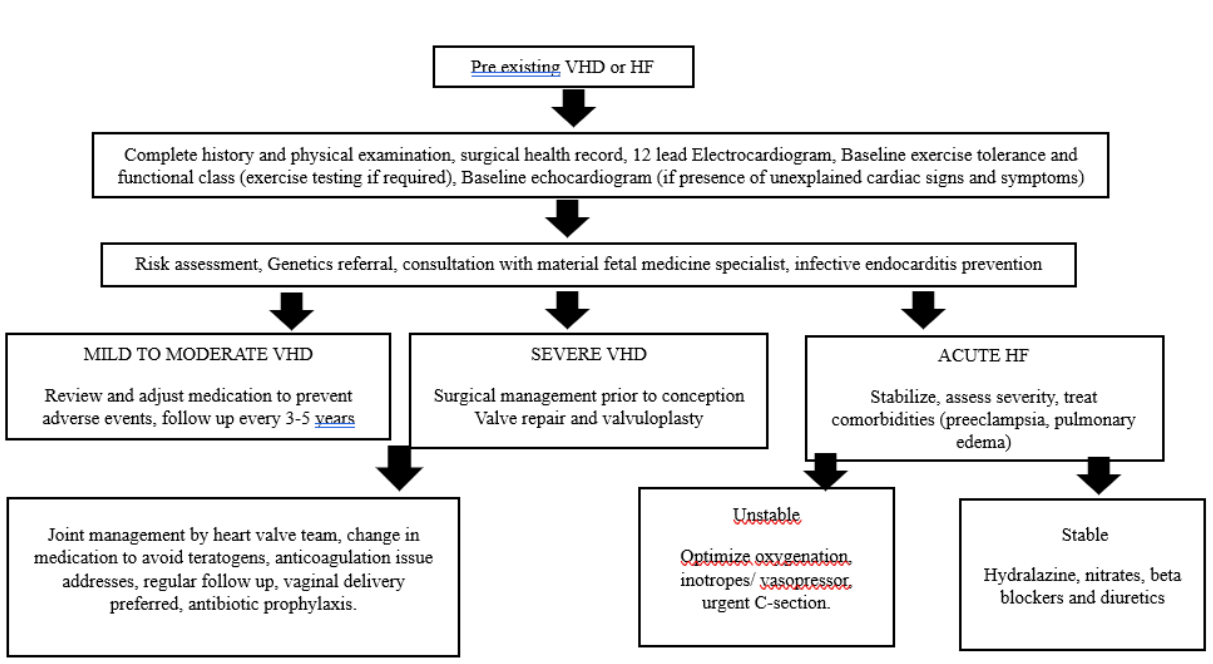
Heart failure, arrhythmias, and thromboembolic complications are the most frequent maternal side effects of valvular heart disease during pregnancy. For women using anticoagulants, postpartum bleeding can be a common consequence. Many women can manage their cardiac symptoms by drinking more water, receiving medical treatment, and engaging in less physical activity. Valve intervention during pregnancy may be required if symptoms are resistant to conservative therapy. Percutaneous balloon valvuloplasty carried out by skilled operators is preferable for stenotic lesions. To reduce radiation exposure during organogenesis, it is ideal for these treatments to be carried out after the fourth month of the second trimester [5,6].

Risk Class	Risk of pregnancy by the medical condition
Class I	No or just a slight increase in morbidity and no discernible increase in the risk of maternal mortality.
Class II	Mild increase in morbidity or a slight increase in the probability of maternal death.
Class III	Greater likelihood of severe morbidity or maternal death. Professional counselling is necessary. If pregnancy is chosen, there will be a need for continuous, specialised cardiac and obstetric monitoring throughout the whole pregnancy, delivery, and puerperium.
Class IV	Pregnancy is not recommended due to the extremely high risk of maternal mortality or severe morbidity. Once pregnancy develops, the issue of abortion should be raised. If the pregnancy continues, treat her as a class III patient.

Table 1: *World Health Organisation (WHO) risk classification [6].*

Symptoms and signs

Common signs of cardiac diseases include cyanosis, clubbing, resting tachycardia, any arrhythmia, hypertension or hypotension, hypoxia, tachypnea, elevated jugular venous pressure, diastolic murmur, murmur radiating beyond the left sternal edge, murmur associated with a thrill, marked peripheral edema, or evidence of pulmonary edema, as well as symptoms like orthopnea, call for further investigation. Dyspnea, coughing, bilateral pitting pedal edema, increased jugular venous pressure, the third heart sound, and painful hepatomegaly were all common in pregnant women with HF.



Graph 1: *Schematic presentation of the management of VHD in pregnancy [3,7].*

Delivery consideration

For most women with valvular heart disease, vaginal delivery is preferred unless it is indicated for obstetric reasons. Less blood loss, a faster rate of recovery, and a lower risk of thrombogenic and infectious complications are all associated with vaginal birth. At 39 weeks of gestation, women with stable heart illnesses can give birth to a healthy baby. After a vaginal delivery, effective pain management with a regional anesthetic can reduce the release of catecholamines linked to unexpected spikes in heart rate and stroke volume. Women with severe heart failure (New York Heart Association [NYHA] class III-IV), high-risk aortic disease, or severe pulmonary hypertension should consider having a cesarean delivery. Cesarean delivery should be considered to reduce the risk of a fetal cerebral hemorrhage in women who need to give birth when fully anticoagulated on warfarin.

Specific management

It is mandatory to understand the cardiovascular physiological changes during pregnancy to achieve the optimum care monitoring of her pregnancy and prepare for the anticipated time and mode of delivery. Therefore, Maternal management of cardiovascular disease requires a multidisciplinary team, including a maternal-fetal medicine specialist, cardiologist, cardiovascular surgeon, and neonatologist, to avoid severe cardiovascular risks and complications [8].

Heart failure

HF is the most common complication among women with cardiovascular disease regardless of the cause (e.g. valvular or congenital heart disease, pulmonary hypertension, or cardiomyopathy) due to hemodynamic demands accompanying the pregnancy progression on

the maternal cardiovascular system, increasing the risk for complications in women with limited cardiovascular reserve [9]. According to the classified as New York Heart Association Class 1 or 2, they are well tolerated in pregnancy, table 2 [10].

Class I	No symptoms of heart failure.
Class II	Symptoms of heart failure with moderate exertion, such as ambulating two blocks or two flights of stairs.
Class III	Symptoms of heart failure with minimal exertion, such as ambulating one block or one flight of stairs, but no symptoms at rest.
Class IV	Symptoms of heart failure at rest.

Table 2: *Functional classifications of New York Heart Association (NYHA) [8].*

The first objectives should be to stabilize the patient, confirm the diagnosis, determine the severity of the HF, determine the fetal state and viability, and get in touch with the members of an interdisciplinary cardio-obstetrics care team when a pregnant or postpartum woman arrives with acute HF. Any reversible conditions, including anemia, thyroid dysfunction, pulmonary embolism, preeclampsia/eclampsia, or infection that may have contributed to the patient's appearance should be treated. Evaluating fetal viability and stability is the first stage's final step. If there is worry about immature fetal lung development, steroids may be recommended. Women who experience heart failure symptoms or left ventricular dysfunction can be treated with diuretics and vasodilators such as hydralazine or nitrates. Angiotensin-converting enzyme inhibitors or angiotensin receptor blockers are contraindicated [3,11].

Valvular disease

Medical management for stenotic lesions includes beta blockers (Metoprolol), and diuretics are used to treat pregnant women with symptoms and functional limitations. Beta-blockers reduce left atrial pressure, prolong diastolic filling time, and slow the heart rate. To prevent interfering with beta-2-mediated uterine relaxation, beta-1 selective drugs are preferable. In addition, women with severe MS who also have other stroke risk factors, such as a big left atrium (60 mL/m^2) or congestive heart failure, should think about taking anticoagulation [12].

Pregnant women who experience significant symptoms despite receiving sufficient medical care and being restricted in their activities might require mitral valve intervention. It is safe to do percutaneous mitral balloon valvotomy (PMBV). It should be avoided during first trimester due to ionizing radiation. Pregnancy-safe percutaneous transcatheter aortic valve replacement for bicuspid severe aortic stenosis may be preferable over valvuloplasty if there is considerable aortic regurgitation [13].

Women with artificial heart valves are likelier to experience valve thrombosis during pregnancy since pregnancy is prothrombotic. Pregnant women with mechanical heart valves must be carefully managed using anticoagulants to avoid significant maternal morbidity. When exposed between 6- and 12 weeks during pregnancy, warfarin penetrates the placenta and is linked to an embryopathy that includes nasal hypoplasia, stippled epiphyses, and choanal atresia. Intracranial bleeding and central nervous system disorders are linked to later exposure. Miscarriage is the most frequent fetal adverse event, occurring at any stage of gestation [14,15]. Because low molecular weight heparin (LMWH) cannot enter the placenta, it is not linked to congenital defects. Weight-based dosing is given twice a day, and the kidneys eliminate it. Because of variations in renal clearance and volume of distribution throughout pregnancy, dose modification in response to peak anti-Xa levels is required. Compared to dose-adjusted regimens, fixed-dose LMWH is associated with noticeably increased thromboembolic consequences among expectant women with peak anti-Xa concentrations in the 0.8 to 1.2 U/mL range [16,17].

During the 2nd and 3rd trimesters, women with bioprosthetic and mechanical valves should take a baby aspirin. Warfarin taken continuously during pregnancy by females with mechanical valves gives the lowest risk of maternal thromboembolic problems but, as previously

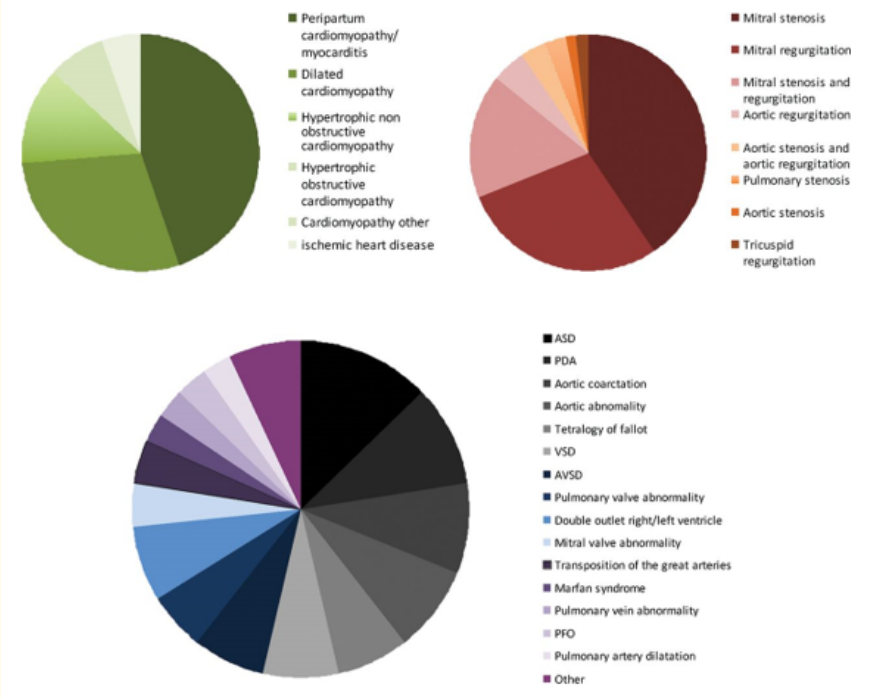
mentioned, carries a higher risk of miscarriage and embryopathy. The 2018 ESC Pregnancy and Heart Disease Guidelines and the 2014 ACC/AHA Valvular Heart Disease Guidelines both advise avoiding dose increases of warfarin during the first trimester and switching to dose-adjusted LMWH or intravenous (IV) UFH when the daily dose is greater than 5 mg/d [6,11,18].

Other specifications

Those with pulmonary edema or persistent symptoms should take furosemide despite using beta blockers. Women who develop atrial fibrillation should be given anticoagulant medication, typically low molecular weight heparin, unfractionated heparin, or warfarin, depending on the trimester and clinical situation [12].

Outcome

Pregnant women with cardiovascular disease are associated with significant cardiac and neonatal complications the despite the obstetric and cardiac state. Nevertheless, using the risk index can predict maternal cardiac risk, reducing this complication [10]. Systematic review-metanalysis study conducted in 2013 among the registry on pregnancy and cardiac disease between 2007 and June 201, out-of the 1321 enrolled patients, 173 (13.1%) developed HF during pregnancy or after delivery (Graph 2). The diagnosis of HF was positively associated with maternal mortality ($p < 0.001$). Moreover, Obstetric complications, such as intrauterine growth restriction, pregnancy-induced hypertension, (pre-) eclampsia, and bleeding during pregnancy, were more common in these patients. Fetal and neonatal death, premature birth < 37 weeks, birth weight < 2500g and APGAR score < 7 (%) were also documented as fetal complications [9].



Graph 2: *In green shades, n = 36 cardiomyopathy; in red shades, n = 64 valvular heart disease; in other shades, n = 71 congenital heart disease [9].*

Conclusion

Management of valvular heart disease in pregnant women overlaps and occasionally clashes with obstetric care during pregnancy. Pregnant women who were previously asymptomatic may suddenly develop signs of heart illness due to the physiological changes of pregnancy. The necessity for high-quality medical care is combined with the additional factor of perinatal outcome.

Bibliography

1. Brenner B. "Haemostatic changes in pregnancy". *Thrombosis Research* 114.5-6 (2004): 409-414.
2. Watkins DA., *et al*. "The burden of antenatal heart disease in South Africa: a systematic review". *BMC Cardiovascular Disorders* 12 (2012): 23.
3. Bright RA., *et al*. "Maternal Heart Failure". *Journal of the American Heart Association* 10.14 (2021): e021019.
4. Anthony J., *et al*. "Valvular heart disease in pregnancy". *The Cardiovascular Journal of Africa* 27.2 (2016): 111-118.
5. De Souza JA., *et al*. "Percutaneous balloon mitral valvuloplasty in comparison with open mitral valve commissurotomy for mitral stenosis during pregnancy". *Journal of the American College of Cardiology* 37.3 (2001): 900-903.
6. Regitz-Zagrosek V., *et al*. "2018 ESC Guidelines for the management of cardiovascular diseases during pregnancy". *European Heart Journal* 39.34 (2018): 3165-3241.
7. Nanna M and K Stergiopoulos. "Pregnancy complicated by valvular heart disease: an update". *Journal of the American Heart Association* 3.3 (2014): e000712.
8. Adam K. "Pregnancy in Women with Cardiovascular Diseases". *Methodist DeBakey Cardiovascular Journal* 13.4 (2017): 209-215.
9. Ruys TPE., *et al*. "Heart failure in pregnant women with cardiac disease: data from the ROPAC". *Heart* 100.3 (2014): 231-238.
10. Siu SC., *et al*. "Prospective Multicenter Study of Pregnancy Outcomes in Women with Heart Disease". *Circulation* 104.5 (2001): 515-521.
11. Nishimura RA., *et al*. "2014 AHA/ACC Guideline for the Management of Patients with Valvular Heart Disease: executive summary: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines". *Circulation* 129.23 (2014): 2440-2492.
12. Al Kasab SM., *et al*. "Beta-adrenergic receptor blockade in the management of pregnant women with mitral stenosis". *American Journal of Obstetrics and Gynecology* 163.1-1 (1990): 37-40.
13. Hodson R., *et al*. "Transcatheter Aortic Valve Replacement During Pregnancy". *Circulation: Cardiovascular Interventions* 9.10 (2016).
14. Alshawabkeh L., *et al*. "Anticoagulation During Pregnancy: Evolving Strategies with a Focus on Mechanical Valves". *Journal of the American College of Cardiology* 68.16 (2016): 1804-1813.
15. Van Hagen IM., *et al*. "Pregnancy in Women with a Mechanical Heart Valve: Data of the European Society of Cardiology Registry of Pregnancy and Cardiac Disease (ROPAC)". *Circulation* 132.2 (2015): 132-142.
16. Oran B., *et al*. "Low molecular weight heparin for the prophylaxis of thromboembolism in women with prosthetic mechanical heart valves during pregnancy". *Thrombosis and Haemostasis* 92.4 (2004): 747-751.

17. Quinn J., *et al*. "Use of high intensity adjusted dose low molecular weight heparin in women with mechanical heart valves during pregnancy: a single-center experience". *Haematologica* 94.11 (2009): 1608-1612.

18. Lewey J., *et al*. "Valvular Heart Disease in Pregnancy". *Cardiology Clinics* 39.1 (2021): 151-161.

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