

Pregnancy and valvular heart disease

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ABSTRACT

Objective: To review all cases of valvular heart disease during pregnancy in a regional Saudi-Arabian population between 1993-1997, determine its incidence, contributing factors and its effect on the outcome of pregnancy.

Methods: A retrospective study of 33,200 cases between 1993-1997 performed over a period of 5 years in the Department of Obstetrics and Gynecology in King Khalid University Hospital, Riyadh, Kingdom of Saudi Arabia. Most patients were Saudi nationals (83.4%). Evidence of heart disease was detected in 166 pregnant women, an incidence of 0.5%. Valvular heart disease was present, either as a single valve involvement or in combination, in 76% of the patients. The remaining 24% were a miscellaneous group including patients with cardiomyopathies, or pulmonale and septal defects. The data collected was analyzed using Gold Stat Software Package.

Results: As a single valve disease, mitral valve involvement was predominant (94.5%), compared to aortic valve (5.5%). The most common condition involving mitral valve was the valve prolapse (39.2%), followed by mitral regurgitation (19.9%) and mitral stenosis (16.9%). Twenty-four percent of

the pregnant women with valve disease had multiple valve involvement. Forceps were applied in 8.4% of the patients and ventouse deliveries in 1.2%. Cesarean section was performed in 3.6% of the cases, out of which 2.4% were emergency lower segment cesarean section and 1.2% were elective. No maternal or infant mortality occurred. All infants were normal and healthy with mean infant weight of 3.24 ± 0.52 kg. Prophylactic antibiotics were administered in 83% of the patients. None of the patients, whether treated with antibiotics or not, developed infective endocarditis.

Conclusion: Presence of valvular heart disease in our study did not appear to affect the outcome of pregnancy, but its accurate diagnosis and management demand a greater understanding of cardiovascular physiology and its pathophysiology in pregnancy, labor and the puerperium. The successful management of the woman with valvular heart disease in pregnancy required complete cooperation between the patient herself, the obstetrician, cardiologist, anesthetist and other supporting medical staff, to optimize the outcome for both the mother and her baby.

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Presence of valvular heart disease in pregnant women is a risk to the fetal well being. Pregnant women with valvular heart disease and good cardiac status during pregnancy have been shown to develop less intrauterine growth retardation, less premature births and less maternal mortality and morbidity. In the presence of valvular heart disease, careful cardiac and obstetric management in a tertiary referral center is recommended for optimal maternal and fetal outcome. During pregnancy, valvular heart disease is commonly complicated by congestive cardiac failure. Hemodynamic changes during pregnancy are stressful to the cardiovascular system. A woman with previously

asymptomatic cardiovascular disease may develop life-threatening cardiac failure due to the increase in blood volume during pregnancy. Early diagnosis, close control and treatment during pregnancy, delivery and the postpartum period are therefore, essential for a better outcome. Saudi society is among the most affluent societies of the world, and has in the recent past, experienced a rapid urbanization. In the present investigation, we have for the first time assessed the incidence of valvular heart disease in pregnant women and its impact on the fetus in the Kingdom of Saudi Arabia (KSA).

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Methods. Medical records of women referred to the cardiology clinic for evaluation and obstetric care between 1993-1997 were assessed. Out of the 33,320 pregnant women, 166 were identified to have cardiac disease and an incidence of 0.5%. Information was collected in specially designed protocol forms. Emphasis was given to maternal age, parity, duration and nature of heart disease, maternal complications during pregnancy, labor and puerperium, mode of delivery, analgesia, contraception, prophylactic antibiotics, weight of babies, Apgar score in one and 5 minutes. Cardiac status was diagnosed by angiography, echocardiography or operation. The patients were managed by obstetric staff in collaboration with the division of cardiology. Fetal well-being was assessed by regular ultrasonography performed by obstetricians and cardiologist at the combined antenatal clinic. Frequency of patient's visits to the clinic varied from weekly to monthly depending on the severity of the cardiac ailment and gestational age. The patients were advised on the importance of proper afternoon rest, taking supplemental iron and folic acid and related safety precautions against urinary and pulmonary infection. In case of infection, vigorous treatment was given. Patients were encouraged to report to the hospital without waiting for their next clinical appointment if any deterioration in their condition occurred. Labor was induced only for the most stringent obstetric indications and only where there were clear obstetric indications. While excellent epidural service is available at this hospital, most of the patients preferred pethidine or entonox during labor.

Results. Valvular heart disease, either as single valve involvement, or in combination, was found in 76% of patients. The remaining 24% were miscellaneous group including cases of cor pulmonale and septal defects, and were not studied further. Mitral valve disease was more common (94.5%) than aortic valve disease (5.5). **Table 1** shows that mitral valve prolapse was seen more frequently (39.2%) than mitral regurgitation (19.9%), mitral stenosis (16.9%), or combined valve involvement (24%). **Table 2** shows that majority (86.8%) of these women were ≤ 35 years of age. Most of the patients (91.3%) kept their appointments at the antenatal clinic. Patients were encouraged to attend clinic regularly. Regarding booking status, 93.4% of the patients in this study were booked patients, 38.4% booked in the first trimester, 53% were booked in the 2nd trimester and only 8.6% booked in the third trimester. Fifty percent of the cases received treatment during pregnancy. Approximately 86% patients had spontaneous vaginal delivery (**Table 3**). Cesarean sections (CS) were performed in 3.6%, out of which 1.2% were elective CS and 2.4% were emergency. All CS were carried out on obstetrical indication and not due to heart disease. Forceps and ventouse deliveries were only in 8.4% and 1.2%. Eighty-three percent of the patients received prophylactic antibiotics. Infective endocarditis did not

occur in any patient whether treated or not. All patients delivered normal healthy infants with the mean birth weight of 3.24 ± 0.59 kg (**Table 4**). Mean apgar scores in one and 5 minutes were 7.6 ± 1.1 and 8.84 ± 0.78 (**Table 4**). No infant mortality occurred and no congenital cardiac abnormalities were detected in babies delivered by these mothers.

Discussion. The incidence of heart disease in pregnancy in Saudi patients is similar to that presented elsewhere.¹⁻³ In pregnant women valvular heart disease was seen more often than other types of cardiac involvement. This finding is in contrast to the changing pattern of valvular heart disease in many developed countries. Valvular heart disease was once commoner than the congenital heart disease in the developed countries. The ratio has now been reversed to one to 1.5 in favor of congenital heart disease.¹ This reversal has been attributed to advances in medical and surgical care. In KSA, advanced medical and surgical facilities are available and it is therefore possible that the prevalence of valvular heart disease could be brought down with the passage of time. The most significant finding in the present study is that there was no maternal mortality due to cardiac status. Mortality up to 9.5% and morbidity up to 50-100% have been reported.⁴ The higher maternal mortality rates may be due to instability of the cardiac status due to advanced cardiac involvement in the disease process. However, good patients' compliance and the high quality antenatal care provided may have contributed to the lack of maternal mortality in the present study. Mitral valve disease was seen more commonly compared to aortic valve disease in pregnant women in this study, as well as in other reports.⁵ Mitral valve prolapse was the most common condition seen in others⁶ and in our study. This cardiac condition is known to cause sudden death in pregnant women, mainly attributed to electrical instability leading to cardiac arrhythmias.⁷ Regurgitant valve disease is well tolerated during pregnancy due to the systemic vasodilatation favors forward flow and the left ventricular filling is rapid and unimpeded. The regurgitant flow tends to decrease with the increased cardiac output and fall in the systemic vascular resistance. Should symptoms develop, such as a patient with mitral valve disease developing atrial fibrillation and rapid ventricular rate, aggressive medical therapy is indicated. Direct current cardioversion can be carried out following transesophageal electrocardiography, to exclude any thrombus in the left atrium.⁶ Mitral valve prolapse causing mitral regurgitation tends to diminish during pregnancy due to the increased left ventricular volume and most patients do well.⁸ In severe mitral stenosis the physiological rise in cardiac output and a rise in pulse rate, in combination with increased blood volume, leads to further increments in an already raised left atrial pressure. The diastolic filling time is decreased, leading to an increase in pulmonary venous

Table 1 - Nature of cardiac disease in the patients.

Type of heart disease	n	(%)
Mitral valve prolapse	65	(39.2)
Mitral sterosis	28	(16.9)
Mitral regurgitation	33	(19.9)
Combined valve involvement	40	(24)
Total	166	(100)

Table 2 - Characteristics of pregnant women with cardiac disease.

Characteristics	n	(%)
Age (years)		
< 25	39	(23.5)
25 -35	105	(63.3)
> 35	22	(13.2)
Booking status		
Booked	155	(93.4)
Unbooked	11	(6.6)
Received medical treatment	83	(50)
Analgesia		
None	76	(45.8)
Epidural	2	(1.2)
Pethidine	82	(49.4)
General	6	(3.6)

Table 3 - Mode of delivery in women with cardiac disease.

Mode of delivery	n	(%)
Spontaneous vaginal delivery	144	(86.8)
Forceps	14	(8.4)
Ventouse	2	(1.2)
Cesarean section	6	(3.6)
Total	166	(100)

Table 4 - Maternal and neonatal factors in pregnancies complicated by cardiac disease.

Variable	Minimum	Maximum	Mean \pm SD
Maternal age (yrs)	16	44	28.8 \pm 5.74
Parity	0	9	3.38 \pm 2.36
Gestational age at delivery (weeks)	33	42	39.45 \pm 1.6
Baby weight (kg)	1.6	4.94	3.24 \pm 0.52
Apgar one minute	1	9	7.6 \pm 1.1
Apgar 5 minute	2	10	8.84 \pm 0.78

pressures and pulmonary congestion. Further increases in cardiac output during labor will add to the patients risk of pulmonary edema. The increased left atrial pressure and volume predisposes the patient to atrial arrhythmias and thrombus formation in the atrial appendages. In patients with significant mitral stenosis (mitral valve area <1.0 cm²) and more than New York Heart Association (NYHA) functional class II, despite aggressive medical therapy, consideration should be given to urgent surgical intervention. Percutaneous balloon mitral valvoplasty and closed valvotomy has also been successfully and safely performed in pregnancy.^{9,10} Although surgery can be performed safely in pregnancy, most authors would generally recommend early intervention before pregnancy. No such complications occurred in the current study. Aortic stenosis is uncommon in pregnancy and complications arise mainly in women with severe stenosis, as a result of a restricted capacity to raise cardiac output. It is associated with a maternal mortality of 17%.¹¹ In our review there is no maternal mortality in patients who have aortic stenosis. Small decrease in preload from hemorrhage or epidural anesthesia may result in hypotension and reduced cardiac output. In contrast, increases in intravascular volume produces a significant rise in filling pressure resulting in pulmonary edema. It is therefore, crucial to maintain venous return, since any reduction may also cause myocardial, cerebral and even uteroplacental insufficiency. The pregnant woman with aortic stenosis should therefore, be followed up closely. In pregnancy, serial echocardiogram studies should demonstrate increased Doppler velocimetry of the left outflow tract. Any lack of rise or fall in the Doppler flow indicates a fall in the stroke volume and incipient trouble. The development of angina and heart failure denotes clinical deterioration. If conventional medical therapy fails, aortic valve surgery or balloon valvotomy should be considered.⁶ Maternal rheumatic heart disease is a serious risk factor to the fetus. The degree of cardiac involvement is related to the outcome of the pregnancy. The average birth weight of the neonates born to mothers with advanced rheumatic heart disease has been shown to be lower than the average in an uncomplicated pregnancy.¹² The infants born to mothers with valvular heart disease in the present study had a normal mean birth weight. This demonstrates that valvular heart disease in the Saudi women has little or no effect on the birth weight of the infants. All patients with multiple valve involvement delivered at or near term with no serious complications. It is however, recommended to deliver patients with multiple valve involvement much earlier than the expected time of delivery to avoid complications.¹³ We observed no complications in the current study, which could be due to sufficient adaptability of the myocardium to the pregnancy-related volume overload. The human heart has been shown to resist the long term effects of multiple pregnancies due to its property of adaptation.¹⁴

Infective endocarditis is a complication of pre-existing cardiac lesions. In the presence of valvular heart disease, women during gestation, labor and delivery are exposed to bacteremia and are at a greater risk of developing infective endocarditis.¹⁵ Justification for using antibiotics is based on the occurrence of transient asymptomatic bacteremia in zero to 5% of mothers,^{16,17} at delivery and on reports of endocarditis in the puerperium.¹⁸ However, there is no evidence that the long established antibiotic regimens have an effect on the frequency, which endocarditis occurs following high risk procedures. In 2 series, a total of 3,915 women with rheumatic heart disease^{19,20} in whom routine peripartum antibiotics were not used, there were only 2 cases (0.05%) of infective endocarditis. The prophylactic antibiotic protocol used in the current study provided a good protection against infective endocarditis. A critical reappraisal of antibiotic prophylaxis in cardiac patients around the time of delivery may be required. No fetal or maternal mortality or morbidity occurred in this study. Fetal outcome was within normal limits. No adverse effects were noted in premature delivery, weight or Apgar score. Congenital heart disease was not seen in any infant delivered by these mothers.

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