Heart Disease in Pregnancy  
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**Incidence**  
1% of pregnancies.

**Causes**  
Rheumatic heart (75%): mitral valve affection is the commonest followed by aortic valve then both or others.  
Congenital heart diseases (10%):  
- Acyanotic (left to right shunt): more common, includes septal defects and patent ductus arteriosus.  
- Cyanotic (right to left shunt): e.g. Fallot’s tetralogy and Eisenmenger’s syndrome which is more dangerous carries a maternal mortality rate exceeding 25%.  
Others (5%): e.g. ischaemic heart disease, arrhythmias and cardiomyopathy

**Diagnosis**  
History of:  
- rheumatic fever,  
- heart lesion,  
- dyspnoea,  
- paroxysmal nocturnal dyspnoea,  
- orthopnoea,  
- haemoptysis,  
- prophylaxis with long acting penicillin.

**Examination** may reveal:  
- murmur,  
- accentuated heart sound,  
- arrhythmia,  
- central cyanosis,  
- displaced apex beat,  
- manifestations of left side heart failure e.g. gallop rhythm, crepitations over lung bases and pleural effusion.  
- manifestations of right side heart failure e.g. congested neck veins, enlarged tender liver, ascitis and oedema lower limbs.

**Investigations:**  
- Chest X-ray: may show cardiac enlargement, pulmonary congestion or pleural effusion.  
- Electrocardiography (ECG).  
- Echo cardiography: shows cardiac structure and function.
**Physiological Consideration** with Heart Disease In Pregnancy

The most important changes in cardiac function occurs in the first 8 weeks of pregnancy with maximum changes at 28 weeks

\[
\begin{align*}
\downarrow & \text{Vascular resistance} \\
\downarrow & \text{Blood pressure} \\
\uparrow & \text{Heart rate} \\
\uparrow & \text{Blood volume} \\
\uparrow & \text{Stroke volume} \\
\uparrow & \text{COP} \quad 30\%-50\%
\end{align*}
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Maternal weight and basal metabolic rate also affect COP

Normal physiological changes of pregnancy that mimic symptoms and signs of cardiac disease

**Symptoms**

- Tiredness
- Dyspnoea
- Orthopnoea
- Syncope

**Electrocardiogram**

- Left axis deviation
- ST segment and T wave changes
- Small Q, inverted P or T wave in lead III
- Increased R wave amplitude in lead V2
- Atrial or ventricular ectopics

**Chest X-ray**

- Straightened left upper cardiac border
- Horizontal heart position
- Increased lung markings

**Echocardiogram**

- Increased left/right ventricular dimensions
- Mild increase in left/right atrial size
- Slightly improved left ventricular systolic function
- Functional tricuspid/pulmonary insufficiency
- Small pericardial effusion

**Functional classification**

According to New York Heart Association (1964);

- **Class I**: No discomfort (i.e. dyspnoea, palpitation or anginal pain) on ordinary activity.
- **Class II**: Discomfort on ordinary activity.
- **Class III**: Discomfort on less than ordinary activity.
- **Class IV**: Dyspnoea at rest. Patient is decompensated.
Mortality associated with specific cardiac lesions;

1. Low risk of maternal mortality (less than 1%).
   (a) Septal defects.
   (b) New York Heart Association classes I and II.
   (c) Patent ductus arteriosus.
   (d) Pulmonary / tricuspid lesions.

2. Moderate risk of maternal mortality (5-15%).
   (a) NYHA classes III and IV mitral stenosis.
   (b) Aortic stenosis.
   (c) Marfan's syndrome with normal aorta.
   (d) Uncomplicated coarctation of aorta.
   (e) Past history of myocardial infarction.

3. High risk of maternal mortality (25-50%).
   (a) Eisenmenger’s syndrome.
   (b) Pulmonary hypertension.
   (c) Marfan’s syndrome with abnormal aortic root.
   (d) Peripartum cardiomyopathy.

**Effect of Pregnancy on Heart Disease**

Heart failure:
During pregnancy, heart failure can occur at any time but the maximum incidence is between 32 and 34 weeks when the blood volume and cardiac output are in their peaks. After that they have a plateau level up to full term.

During the 2nd stage, heart failure may occur due to stress on the heart.

After delivery, failure may occur due to loading of the circulation by the blood from the placental sinuses after retraction of the uterus.

Subacute bacterial endocarditis: may develop in the puerperium.

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**Effect of Heart Disease on Pregnancy**

- Abortion.
- Intrauterine growth retardation.
- Still birth.
- Premature labour.
- These complications are encountered especially in cyanotic heart diseases.
Management
Pre-conceptional counselling
• This is an important aspect of management or the cardiac patient planning a pregnancy.
• Ideally, the obstetrician and cardiologist should work together to help the patient make an informed decision.
• Prevent an unwanted pregnancy and avoid the risks associated with pregnancy continuation or termination.

Toronto risk markers for maternal cardiac events
1-prior episode of heart failure, arrhythmia or stroke
2-NYHA class > II or cyanotic
3-left heart obstruction (mitral valve area < 2.0 cm², aortic valve area < 1.5 cm², or peak left ventricular outflow tract gradient > 30 mm Hg)
4-reduced left ventricular function (EF < 40%)

General management:
• More frequent antenatal visits. More rest.
• Diet is directed to restrict weight gain and prevent anaemia as it increases cardiac strain.
• Infection should be avoided and properly treated.
• Hospitalisation: if signs of decompensation occur, the earliest evidence is tachycardia exceeding 100 beats/minute and crepitations at the lung bases. Rest in a hospital is desirable in special conditions.

Specific management:
Medical treatment:
Digoxin: is indicated in atrial fibrillation to slow the ventricular response and in acute heart failure to increase myocardial contractility.
Diuretics are used in acute and chronic heart failure with potassium supplements in prolonged therapy.
Beta-adrenergic blockers: as propranolol may be indicated for arrhythmia associated with ischaemic heart disease.
Aminophylline: relieves bronchospasm.
Heparin: is indicated in patients with artificial valves or atrial fibrillation.

N.B. Acute pulmonary oedema is urgently treated by:
• Morphine 15 mg IV, to allay anxiety and reduce venous return.
• Oxygen.
• Digoxin 1 mg IV, except in severe mitral stenosis as the increase in right heart output cannot be handled by the mitral valve.
• Aminophylline 250 mg IV.
• Venesection, removing 500 ml blood rapidly may be indicated in severe cases.
Surgical treatment:
The indications for Termination of pregnancy.
Because of high maternal risks, MTP is indicated in:
1. Eisenmenger’s syndrome.
2. Marfan’s syndrome with aortic involvement
3. Pulmonary hypertension.
4. Coarctation of aorta with valvular involvement.
Termination should be done before 12 weeks of pregnancy.

Cardiac surgery: It may be an alternative to therapeutic abortion. The principal indication is recurrent pulmonary oedema with mitral stenosis and heart failure not responding to medical treatment. There is no increased risk to the mother or the foetus in closed cardiac surgery e.g. mitral valvotomy but there is higher incidence of foetal loss with open surgery

Management of labour
- There is no indication to induce labour because of cardiac disease.
- If induction of labour is indicated for an obstetric cause e.g. antepartum haemorrhage a low amniotomy + oxytocin in a concentrated glucose solution is the best method. This minimises the incidence of infection and pulmonary oedema.
- Induction of labour never to be undertaken in patient with acute heart failure.
- Vaginal delivery is preferable to caesarean section but should be an easy and not a prolonged one.
- There is no place for "trial of labour" in cardiac patients.
- Bed rest in semi-sitting position.
- Oxygen mask or ventilation if heart failure or cyanosis develop.
- Adequate analgesia pethidine or morphine can be used. Epidural anaesthesia is preferable as it abolishes the bearing down desire so decreases the effort load.
- Shorten the second stage by forceps or ventouse.
- Ergometrine is better avoided as it causes sudden load of the circulation with blood from the uterus leading to acute heart failure. Oxytocin can be used instead.
- Prophylactic antibiotic is essential to guard against subacute bacterial endocarditis.
- Postpartum observation for 48 hours is essential as the risk of heart failure is high in this period. Although bed rest is essential, early ambulation is desirable to avoid thromboembolism.
- Breast feeding is allowed unless there is heart failure. Oestrogens should not be used to suppress lactation and bromocriptine or lisuride can be used.
- Sterilisation may be advised if decompensation occurred in this pregnancy.

Prognosis depending on the functional status
- In general, women in NYHA classes I and II lesions usually do well during pregnancy and have a favorable prognosis with a mortality rate of <1%.
- Patients in NYHA classes III and IV may have a mortality rate of 5% to 15%. These patients should be advised against becoming pregnant.
FETAL: Little increased risk if mother kept healthy. Watch for fetal risks from anticoagulation if relevant

Contraception
- Barrier methods – unreliable.
- COC contraindicated.
- Progesterone only pill have better side effect profile & long acting slow releasing as Mirena intrauterine system have improved efficacy.
- Sterilization where family completed. (Laparoscopic clip sterilization carries risk).

Mitral Stenosis
- The majority of patients with moderate-severe MS worsen during gestation
- The pressure gradient across the narrow valve increases secondary to the increased heart rate and blood volume
- Left atrial pressure increases and may lead to atrial arrhythmias
- There is marked increase in the following issues regarding the fetus
  - Rate of prematurity
  - Fetal growth retardation
  - Low neonatal birth weight
- Therapeutic approach is to reduce the heart rate and decrease left atrial pressure
  - Restrict physical activity
  - Restrict salt intake
  - diuretics
  - Beta blockers
  - Digoxin (if patient is in a. fib)
- Repair or replacement of the valve may be necessary if medical therapy is ineffective
  - Balloon valvuloplasty
- Surgery (repair/replacement)
- Vaginal delivery can be permitted in most patients
- Hemodynamic monitoring is recommended (Swan) and should be continued several hours following delivery

Aortic Stenosis
- Mild AS is usually tolerated
- Moderate to severe AS is likely to be associated with symptomatic deterioration during pregnancy
- Women with valve area <1.0 should consider valve replacement prior to pregnancy
- Symptoms often develop in the 2nd and 3rd trimester
  - Exertional dyspnea
  - Chest pain
  - Syncope
- Patients may require balloon valvuloplasty or surgical intervention
• Fetal effects included
  – Intrauterine growth retardation
  – Premature delivery
  – Reduced birth weight
  – Increase in cardiac defects

**Eisenmenger Syndrome**
• High risk of maternal morbidity and mortality
• Death usually occurs between the first few days and weeks after delivery, but the cause is unclear
• Patients should be advised against pregnancy
• Patients should be monitored closely for any signs of deterioration
• Early elective hospitalization is recommended
• Hemodynamic monitoring is required

**Marfan's Syndrome**
Pregnancy in patients with Marfan's poses 2 problems
• Cardiovascular complications of the mother
• Risk of having a child who inherits Marfan's syndrome
• Cardiovascular problems
  – Dilation of the ascending aorta, may lead to development of aortic regurg. and heart failure
  – Proximal and distal dissections of the aorta.
• Patients with only mild dilation (<40mm) of the ascending aorta usually do well
• Obstetrical complications
  – Cervical incompetence
  – Abnormal placental location
  – Postpartum hemorrhage
• Patients with more than mild dilation of the aorta, or history of aortic dissection should be advised against pregnancy
• Progressive dilation of the aorta during gestation may occur even with a normal-sized aorta
  – Preconception echo evaluation allows for evaluation of the aortic root. Periodic echocardiographic follow-up is recommended

Management
• Vigorous physical activity should be avoided
• Beta blockers (reduces the rate of aortic dilation)
• If substantial dilation/dissection should occur, depending on the stage of pregnancy, therapeutic abortion, early delivery or surgical intervention should be considered
Prosthetic Heart Valves

- Increased thromboembolic events have been reported during pregnancy in women with prosthetic valves, incidence as high as 10-15%
- 2/3rds of these patients presented with valve thrombosis which led to death in 40%
- Oral anticoagulants can cross the placenta and be harmful to the fetus
- Exposure during the first 8-12 weeks can be associated with a teratogenic effect leading to warfarin embryopathy (nasal deformity) as well as other complications
  - intracranial bleeding
  - Congenital anomalies
  - Fetal wastage
  - Spontaneous abortion/fetal loss
- anticoagulation in pregnant patients with prosthetic heart valves
  - Unfractionated heparin (UFH) SQ q12 hours throughout pregnancy following PTT levels
  - LMWH (Lovenox) throughout pregnancy following anti-Xa levels
  - LMWH or UFH until week 13, then warfarin until middle of third trimester, then restart UFH/LMWH until delivery