# Cardiac and pulmonary diseases in pregnancy

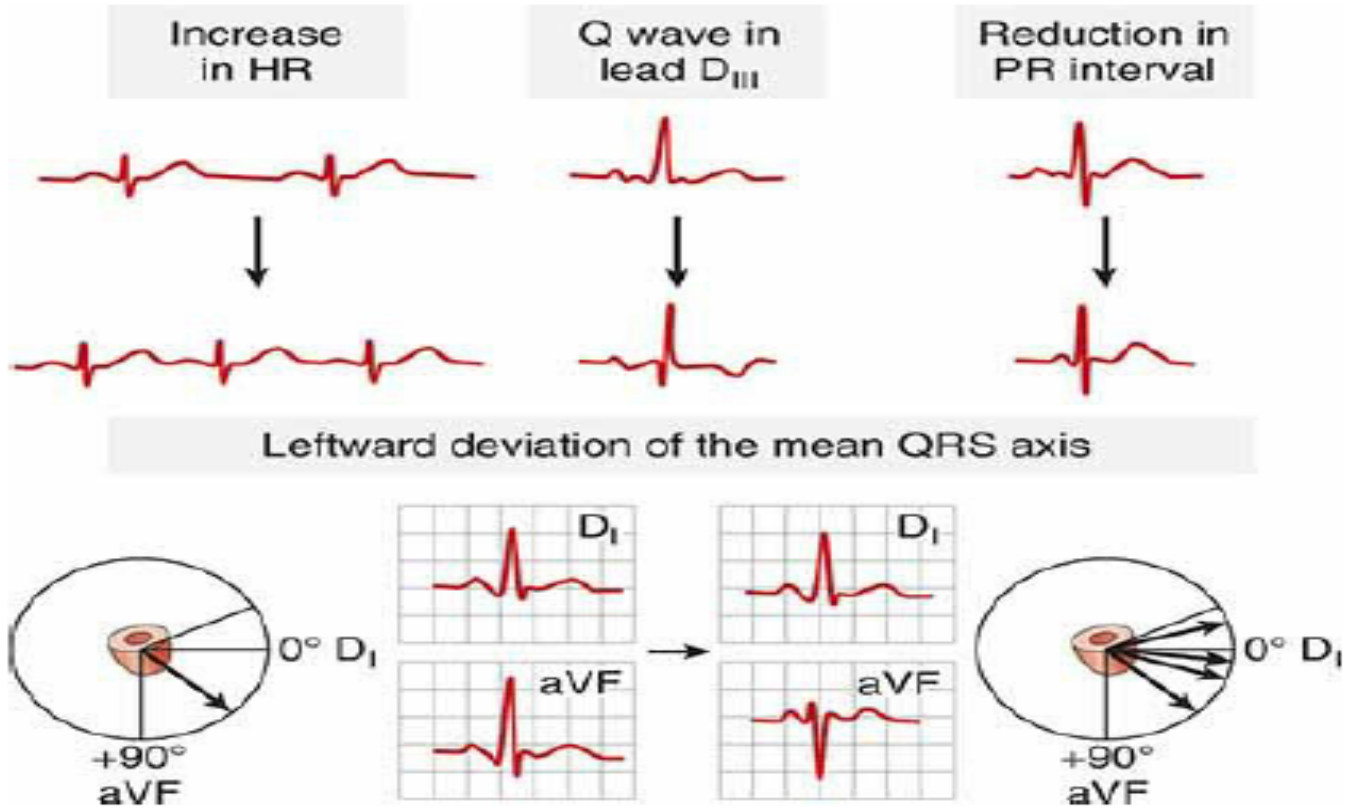
# Hemodynamic changes in normal pregnancy

| Parameter | Change (%) |
|---|---|
| Cardiac output | +43 |
| Heart rate | +17 |
| Left ventricular stroke work index | +17 |
| Vascular resistance | |
| Systemic | −21 |
| Pulmonary | −34 |
| Mean arterial pressure | +4 |
| Colloid osmotic pressure | −14 |

Data from Clark, 1989.

# The ECG changes in normal pregnancy

1. Atrial and ventricular extrasystoles
2. A ‘left shift’ in the QRS axis
3. Small Q wave and inverted T wave in lead III
4. ST segment depression
5. T wave inversion in the inferior and lateral leads.



# Pregnancy changes mimic cardiac disease

***Symptoms*** – breathlessness, weakness, oedema, syncope and tachycardia

***Signs*** **:**

- Splitting of 1st heart sound
- Murmur – systolic , breast bruit
- Displacement of apex beat – upwards to left

# Clinical Indicators of Heart Disease During Pregnancy

## Symptoms

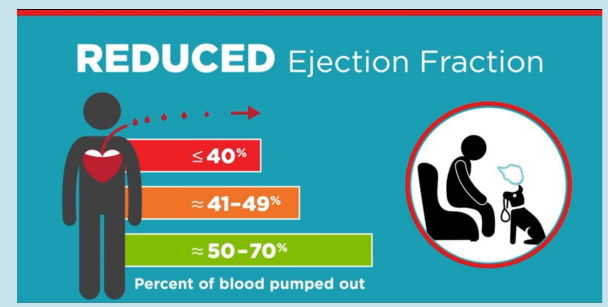
- Progressive dyspnea or orthopnea
- Nocturnal cough
- Hemoptysis
- Syncope
- Chest pain

## Clinical Findings

- Cyanosis
- Clubbing of fingers
- Persistent neck vein distention
- Systolic murmur grade 3/6 or greater
- Diastolic murmur
- Cardiomegaly
- Persistent tachycardia and/or arrhythmia
- Persistent split second sound
- Fourth heart sound
- Criteria for pulmonary hypertension

# High-risk cardiac conditions

- Systemic ventricular dysfunction (ejection fraction <30%, NYHA Class III-IV).
- Pulmonary hypertension.
- Cyanotic congenital heart disease.
- Aortic pathology (dilated aortic root >4 cm, Marfan syndrome).
- Ischaemic heart disease.
- Left heart obstructive lesions (aortic, mitral stenosis).
- Prosthetic heart valves (metal).
- Previous peripartum cardiomyopathy.



# Fetal risks of maternal cardiac disease

- Recurrence (congenital heart disease).
- Maternal cyanosis (fetal hypoxia).
- Iatrogenic prematurity.
- FGR.
- Effects of maternal drugs (teratogenesis, growth restriction, fetal loss).

# Risk factors for the development of heart failure in pregnancy

1. Respiratory or urinary infections.
2. Anaemia.
3. Obesity.
4. Corticosteroids.
5. Tocolytics.
6. Multiple gestation.
7. Hypertension.
8. Arrhythmias.
9. Pain-related stress.
10. Fluid overload

Treatment of HF in pregency such that in non-pregency pt
With diuretic and oxygen and inotropic agent and vasodilator
With spesific treatment for any arrhthymia

# Investigations

- **ECG** – cardiac arrhythmias, hypertrophy
- **Echocardiography** – cardiac status and structural anomalies , an echocardiogram at the booking visit and at around 28  GA is usual
- **X-ray chest** –AP and lateral view CXR
  - lead apron shield
  -cardiomegaly , vascular prominence
- **Cardiovascular MR imaging**
- **Cardiac catheterization -** It is safe to perform cardiac catheterization with limited fluoroscopy time to minimize radiation exposure

# Preconception counseling:

It is important in the care for women with cardiac disease and it should be performed before conception or, as early as possible during pregnancy

- It should be **multidisciplinary with both cardiac and obstetric input**, to enables women and their partners to make a well-informed choice whether to continue pregnancy or not.
- Counseling regarding the risk of pregnancy for the mother and fetal.
- Optimizing the woman's clinical condition by changes in medications or surgical procedures before conception

# Issues in prepregnancy counselling of women with heart disease

1. Risk of maternal death.
2. Possible reduction of maternal life expectancy.
3. Effects of pregnancy on cardiac disease.
4. Mortality associated with high-risk conditions.
5. Risk of fetus developing congenital heart disease.
6. Risk of preterm labour and FGR.
7. Need for frequent hospital attendance and possible admission.
8. Intensive maternal and fetal monitoring during labour.
9. Other options – contraception, adoption, surrogacy.
10. Timing of pregnancy.

# General considerations in pregnant women with heart disease:

The outcome and safety of pregnancy are related to:

- presence and severity of pulmonary hypertension;
- presence of cyanosis;
- haemodynamic significance of the lesion;
- functional NYHA (New York Heart Association) class as determined by the level of activity that leads to dyspnoea .

Most women with pre- existing cardiac disease ***tolerate pregnancy well if they are asymptomatic or only mildly symptomatic*** (NYHA class II or less) before the pregnancy, EXECPT:

pulmonary hypertension, Marfan's syndrome with a dilated aortic root, and some women with mitral or aortic stenosis.

- Women with cyanosis (oxygen saturation below 80–85%) have an increased risk of fetal growth restriction, fetal loss, and thromboembolism secondary to the reactive polycythaemia.

# Antenatal management

It is important to distinguish between ‘normal’ symptoms of pregnancy and an impending cardiac failure, so ***ask*** the pregnant woman if :

- She has noted any breathlessness, specially at night.
- Any change in her HR or rhythm
- Any tiredness or a reduction in exercise tolerance.

***Routine physical examination*** should include:

PR, BP, jugular venous pressure, heart sounds, ankle and sacral oedema and presence of basal crepitations.

# Antenatal management

1. Counseling regarding the risk of pregnancy.
2. Correct any maternal complication (hypertension, anemia arrhythmia).
3. Monitor signs of heart failure(clinically and with echo).
4. Monitor fetal growth (risk of IUGR)
5. Women should advice to reducing their normal physical activities.
6. Prophylactic antibiotics should be given to any women with a structural heart defect to reduce the risk of bacterial endocardites.
7. Anticoagulant is essential in patients with CHD who have pul. HT or artificial valve replacement , and patients at risk of atrial fibrillation

Anticoagulation with heparin is less hazardous for the fetus, however, the risk of maternal thromboembolic complications is much higher.

Warfarin is teratogenic and causes miscarriage, stillbirths, and fetal malformations.

AHA estimate that the risk of embryopathy is dose dependent:

if the dose of warfarin is ≤5 mg/d the risk—< 3%

If the dosage is >5 mg/d, the risk > 8%

warfarin is teratogenic if used in the first trimester, and is linked with fetal intracranial haemorrhage in the third trimester.

## Four regimens is recommended.

1. Adjusted-dose LMWH is given twice daily, with a peak anti-Xa level drawn 4 hours after dosing.
2. Adjusted UFH is dosed every 12 hours to keep the mid interval aPTT twice control or anti Xa level between 0.35–0.70 U/mL.
3. LMWH or UFH is given as just described until 13 weeks, and then warfarin is substituted until near delivery, at which time it is replaced by LMWH or UFH.

Warfarin can give in 2nd T only

4. Last, in women judged to carry a high risk of thrombosis and for whom the efficacy and safety of heparins are concerns, warfarin is suggested throughout pregnancy. Heparin is then substituted close to delivery. In addition, aspirin, 75 to 100 mg, is given daily.

Heparin is discontinued just before delivery , warfarin or heparin may be restarted 6 hours following vaginal delivery and 6-12 h after c/s

# Management of labour and delivery

1. Avoid induction of labour if possible.

*C/S* should only be performed in situations where the maternal condition is considered too unstable to tolerat the physiological demands of labour ex.:

(1) dilated aortic root >4 cm or aortic aneurysm

(2) acute severe congestive heart failure

(3) recent myocardial infarction

(4) severe symptomatic aortic stenosis

2. Epidural anaesthesia is often recommended

3. Prophylactic antibiotics should be given to any woman with a structural heart defect
4. O2 saturation and continuous arterial blood pressure monitoring.
5. Keep the second stage short. This reduces maternal effort and the requirement for increased cardiac output
6. Ensure fluid balance.
7. Avoid the supine position.
8. active management of the third stage is usually with Syntocinon. (vasodilator and therefore should be given slowly to patients with significant heart disease, with low-dose infusions preferable. )

# PULMONARY HYPERTENSION

The current clinical classification system, **five** groups of disorders that cause pulmonary hypertension. In pregnant women, group 2 disorders are the most common. These are secondary to pulmonary *venous hypertension caused by left-sided atrial,* ventricular, or valvular disorders. A typical example is mitral stenosis . In contrast, groups 3 through 5 are seen infrequently in young healthy women.

***Idiopathic*** pulmonary arterial hypertension

***Secondary*** to left - to - right shunt such as a VSD (***Eisenmenger's syndrome)*** or to chronic pul .thromboembolic disease , connective tissue disease and secondary to mitral stenosis .

Pul. HT cause maternal mortality in 25-40%

In women with PH, pregnancy is associated with a high risk of maternal death.

The danger of pul. HT relates to fixed pulmonary vascular resistance that cannot fall in response to pregnancy, and a consequent inability to increase pulmonary blood flow with refractory hypoxaemia.

***Management***: Specific treatments shown to improve symptoms and survival include endothelin blockers, Ex. bosentan, and phosphodiesterase inhibitors such as sildenafil.

In women who choose to continue their pregnancy, targeted pulmonary vascular therapy is an option, with timely admission to hospital and delivery according to the progress of the woman and fetal condition.

# Contraception:

| | |
|---|---|
| Surgical: vasectomy | -Best, low failure rate (LFR) |
| BTL | -Laparoscopic/minilap |
| Barrier method: condom, spermicides | Compliance issues, High failure rate (HFR). |
| COCP: | Avoid in IHD, valvular heart disease and Pulmonary hypertension |
| POP: /Implanon NXT | Very useful |
| IUCD/LNG-IUS (Mirena) | LFR, contraindicated in prosthatic valve, endocarditis. |

**CAUSION:**

Bosentan can reduce the effectiveness of most hormonal contraception , including Cerazette and Nexplanon, so additional contraception should be used if you need to take bosentan

Mirena IUS can be used in all Cardiac patients unless:

High risk of endocarditis

Pulmonary hypertension

condition where vagal reaction would be poorly tolerated

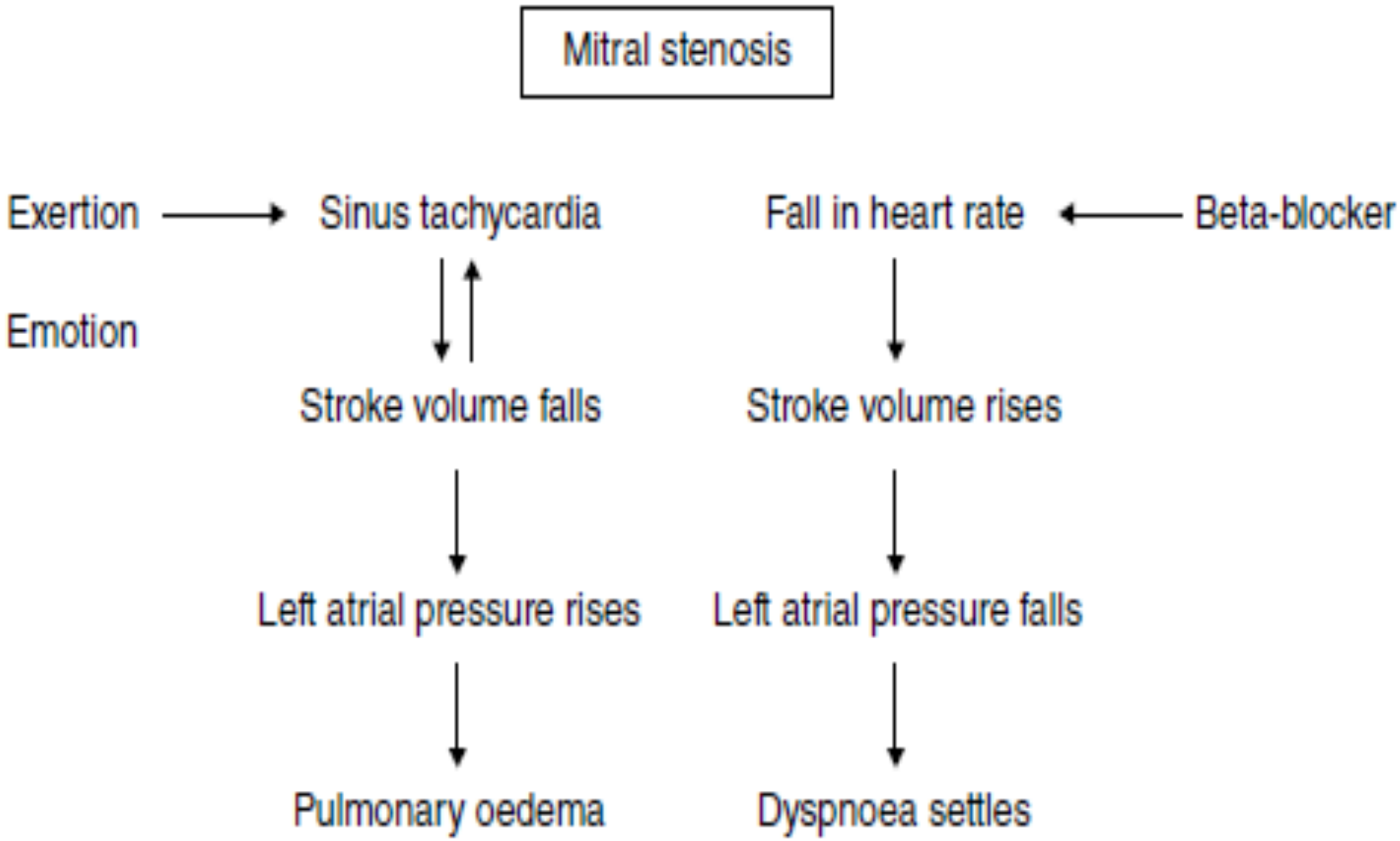
Its contraceptive efficacy is superior to that of sterilisation. It usually causes advantageous oligoamenorrhoea, in contrast to the menorrhagia and dysmenorrhoea associated with traditional copper coils.

Although antibiotic prophylaxis is recommended at the time of insertion, the risk of endocarditis is lower with the IUS than with the copper coil

# *Mitral stenosis*

- It is a well-recognized risk factor for maternal morbidity and mortality, as it result in an inability to increase cardiac output to meet the demands of pregnancy , MS usually is rheumatic in origin. The normal mitral valve surface area is 4.0 cm2, and when stenosis narrows this to <2.5 cm2 symptoms usually develop.

Women may deteriorate secondary to tachycardia, arrhythmias or the increased cardiac output such as in 3rd stage of labour . The commonest complication is pulmonary oedema, This risk is increased with severe mitral stenosis, moderate or severe symptoms prior to pregnancy


Mitral stenosis
Exertion
Emotion
Sinus tachycardia
Fall in heart rate
Beta-blocker
Stroke volume falls
Stroke volume rises
Left atrial pressure rises
Left atrial pressure falls
Pulmonary oedema
Dyspnoea settles

# *Management*

-bed rest, oxygen, beta-blockade and diuretic therapy.
-balloon mitral valvotomy or mitral valve replacement.

- Women with severe mitral stenosis should be advised to delay pregnancy until after balloon mitral ***valvotomy*** or mitral valve replacement.
- ***Beta-blockers*** decrease heart rate and the risk of pulmonary oedema but if medical therapy fails or for those with severe mitral stenosis, balloon mitral valvotomy may be safely and successfully used in pregnancy
- Avoid supine and lithotomy positions as much as possible for labour and delivery.
- Avoid Fluid overload
- Pulmonary oedema should be treated in the usual way with oxygen and diuretics.

# PERIPARTUM CARDIOMYOPATHY

Occur within the last month of pregency and 6 month after it

This pregnancy-specific condition is defined as heart failure secondary to left ventricular (LV) systolic dysfunction towards the end of pregnancy or in the months following delivery, where no other cause of heart failure is found. It is a diagnosis of exclusion. The LV may not be dilated but the EF is always reduced < 45%

***Risk factors include*** multiple pregnancy, hypertension, multiparity, increased age and African–Caribbean race

**Diagnosis** should be suspected in puerperal women or those in late pregnancy with breathlessness and signs of heart failure. It is confirmed with

- **echocardiography** showing LV dysfunction EF <45%; and often dilatation of all four chambers of the heart , shortening fraction<30 % , left ventricular end- diastolic dimension >2.7cm/m2
- **CXR** shows an enlarged heart with pulmonary congestion or oedema and often bilateral pleural effusions

## The differential diagnosis:

- pre-existing dilated cardiomyopathy
- pulmonary thromboembolism
- amniotic fluid embolism
- myocardial infarction
- pulmonary oedema related to pre-eclampsia or β2-agonist therapy for preterm labour.

## Treatment

- As for other causes of heart failure, with oxygen, diuretics, vasodilators,
- Anticoagulation prophylaxis with unfractionated heparin should be started
- inotropes if required.

After delivery add diuretics to reduce cardiac work and switch to ACE inhibitors,

And LMWH to warfarin

# Prognosis and recurrence

- depend on the normalization of LV size and function within 6 months of delivery
- Approximately half of women suffering from peripartum cardiomyopathy recover baseline ventricular function within 6 months of delivery. But in those with persistent cardiac failure, the mortality rate approaches 85 % over 5 years
- one third of women with a history of peripartum cardiomyopathy will suffer relapse with worsening of symptoms and deterioration of left ventricular function during another pregnancy

# Pulmonary disorders

***Asthma*** is the most common pul. disorder which affects up to 4% of women. It is chronic disease that inflammed and narrows airways due to increase responsiveness of tracheobronchial tree to multiple stimuli . patient present with cough, shortness of breath, wheezing.

It is common in young women and therefore is seen frequently during pregnancy it has no effect on pregnancy , only poorly controlled asthma may be associated with low birth weight and preterm labour.

## Effect of pregnancy on asthma:

1/3 show no change.

1/3 improve.

1/3 deteriorate ( most episodes occur bet 24 and 36 wk)

# Management

1. Multidisplinary team.
2. Treatment should be continued during pregnancy.
3. Measure expiratory flow rate.
4. Follow up of blood  sugar because of increase risk of gestational DM in women on long term oral steroid.
5. Asthma attack may occur during labour . if women on long term oral steroid give her IV hydrocortisone during labour because of risk of collapse.
6. Avoid prostagladin f2 alpha.
7. Encourge breast feeding because it decrease risk of allergy later in life.

# Features of severe lifethreatening asthma

- Peak expiratory flow rate <35% of predicted.
- $pO_2$ <8 kPa.
- $pCO_2$ >4.6 kPa.
- Silent chest.
- Cyanosis.
- Bradycardia.
- Arrhythmia.
- Hypotension.
- Exhaustion.
- Confusion.

# *Pneumonia*

IT is an inflammatory condition of the lung affecting primarily the alveoli it can be caused by bacteria , viruses , fungi , or due to autoimmune disease, its incidence is about 1/1000.

Clinical featurese include: cough, SOB ,fever and fatigue.

***Diagnosis*** usually based on clinical findings, CXR may be needed.

***Treatment*** include physiotherapy ,adequate oxygenation, hydration and appropriate antibiotics (ampicillin, cephalosporin or erythromicin).

***Complications*** include PTL and LBW

# Pneumonia: warning signs

- Respiratory rate >30/minute.
- Hypoxaemia; $pO_2$ <7.9 kPa on room air.
- Acidosis; pH <7.3.
- Hypotension.
- Disseminated intravascular coagulation.
- Elevated blood urea.
- Evidence of multiple organ failure.