

# Obstetrics & Gynecology TEAM



## Cardiac Disease in Pregnancy

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◆ very important ◆ mentioned by doctor ◆ team notes ◆ not important

## Objectives:

- ❖ To understand the normal physiological changes of CVS in pregnancy.
- ❖ Symptoms and signs suggestive of CVS disease.
- ❖ When to investigate for cardiac disease.
- ❖ Types and grades of CVS disease.
- ❖ Effect of pregnancy on CVS disease and effect of cardiac disease on pregnancy.
- ❖ Pre-pregnancy counseling.
- ❖ Management of CVS disease in pregnancy, labor and puerperium.

## Hemodynamic changes during pregnancy:

- ❖ Starts around 5-8 weeks of pregnancy.
- ❖ Peak at late second trimester; 20-24 weeks.
- ❖ Symptoms and signs due to these changes include: fatigue, dyspnea, decreased exercise capacity, peripheral edema, physiologic systolic murmur and 3rd heart sound.

### 1) Blood volume

- ❖ Increase 40-50% up to 32 weeks.
- ❖ Plasma volume increases (50%) more than RBC mass (20%) resulting in physiologic anemia.

### 2) Cardiac output

- ❖ Rises 30-50% (max 20 weeks) by increased blood volume, reduced systemic vascular resistance and increase maternal heart rate by 10-15 beats per minute.
- ❖ Stroke volume increase in 1st and 2nd trimester and decrease in the 3rd trimester.

### 3) Slight decrease in BP

- ❖ Diastolic reduced more than systolic. (Reduced blood pressure is normal as long as the patient doesn't have any symptoms)

### 4) Labor and delivery

- ❖ Each uterine contraction result in displacement of 300-500 cc of blood to the general circulation → increase stroke volume and cardiac output by about 50%.
- ❖ Blood pressure & heart rate increase due to pain and anxiety.
- ❖ Blood loss during delivery may compromise the hemodynamic state.

### 5) Postpartum

- ❖ Relieve of vena cava compression by the gravid uterus → increase venous return → increase cardiac output 10-20 % → diuresis. (That's how women lose the excess blood volume they gained during pregnancy. You see patients in post-partum complaining of edema, it will gradually resolve with increase diuretics after delivery)

### 6) Changes due to epidural anesthesia

- ❖ Peripheral vasodilation → decrease cardiac output & blood pressure. Therefore patients need pre-hydration to prevent drop in blood pressure.

## Symptoms and signs of cardiac disease in pregnancy

There is overlap with the common normal/physiologic symptoms of pregnancy	Symptoms that merit a cardiac evaluation in pregnancy
<ul style="list-style-type: none"><li>❖ Fatigue</li><li>❖ Orthopnea</li><li>❖ Edema (lower limb in up to 50% of women)</li><li>❖ Systolic flow murmur</li><li>❖ 3<sup>rd</sup> heart sound</li></ul>	<ul style="list-style-type: none"><li>❖ Progressive limitation of physical activity</li><li>❖ Chest pain</li><li>❖ Syncope</li></ul>

## Evaluation

- ❖ History and physical exam.
- ❖ ECG.
- ❖ Chest radiogram.
- ❖ Echocardiogram.

## NYHA functional classification of cardiac diseases in pregnancy

NYHA Class	Symptoms
I	<b>Asymptomatic.</b> Cardiac disease, but no symptoms and no limitation in ordinary physical activity. E.g. shortness of breath when walking, climbing stairs etc.
II	<b>Mild symptoms</b> (mild shortness of breath and/or angina) and slight limitation during ordinary activity.
III	Marked limitation in activity due to symptoms, even during less-than-ordinary activity. E.g. walking short distances (20–100 m). <b>Comfortable only at rest.</b>
IV	Severe limitations. Experiences <b>symptoms even while at rest.</b> Mostly bedbound patients.

## Management before conception

- ❖ Should be informed about the added risk of pregnancy on her self & the fetus.
- ❖ Class III and IV → mortality rate up to 7% and morbidity 30% → **should be cautioned against pregnancy.**
- ❖ **Factors that predict the woman chance of having adverse cardiac or neonatal complication:**
  - 1) A prior cardiac event.
  - 2) Cyanosis or poor functional class.
  - 3) Valvular or outflow tract obstruction.
  - 4) Myocardial dysfunction (LVEF < 40% cardiomyopathy). [LVEF: Left Ventricular Ejection Fraction]

So if a woman is class III or IV or has one of these criteria, she should be advised not to get pregnant.

## Management after conception

- ❖ Cardiac assessment as early as possible (by cardiologist).
- ❖ Termination of pregnancy if there is a serious threat to maternal health.
- ❖ Close follow up by both obstetrician and cardiologist.
- ❖ Observe for signs and symptoms of heart failure.

## Antibiotic prophylaxis for endocarditis (usually during labor)

- ❖ American Heart Association published a consensus statement that there is **no need for antibiotics prophylaxis** (to prevent bacterial endocarditis in patient with cardiac lesions) **for vaginal delivery nor cesarean section** as the risk of bacteremia is low 1-5%.
- ❖ **IV antibiotics is optional if bacteremia is suspected or for high-risk patients** (prosthetic cardiac valve, previous bacterial endocarditis, complex cyanotic congenital heart disease, surgical pulmonary shunts or conduits, ventricular septal defect, patent ductus arteriosus).
- ❖ **Ampicillin 2 gm + Gentamicin 1.5 mg/kg within 30 minutes** of procedure, followed by **Ampicillin 1 gm after 6 hours**

## Specific cardiac conditions

### 1) Cardiomyopathy (CMP)

- ❖ Look for symptoms and signs of congestive heart failure (CHF).
- ❖ Heart failure is often refractory to treatment.
- ❖ **Serious condition** with 5-year survival rate of 50%.

## 2) Peripartum cardiomyopathy

- ❖ Dilated CMP occurs in late pregnancy or first 6 months post partum
- ❖ Incidence 1:1300-15000
- ❖ Unknown cause (Women at risk are those with a history of preeclampsia, hypertension, and poorly nourished)
- ❖ Mortality 25-50% due to CHF, thrombo-embolism or arrhythmia
- ❖ Need intensive monitoring and treatment during pregnancy and labor by cardiologist and OB

## 3) Septal defects: atrial septal defect (ASD), ventricular septal defect (VSD)

- ❖ Usually tolerate pregnancy well.
- ❖ ASD most common congenital lesion.
- ❖ ASD can cause atrial flutter. Treated after pregnancy by catheter ablation.
- ❖ Rarely uncorrected lesions lead to Lt to Rt shunt, pulmonary hypertension and CHF.
- ❖ Fetal echocardiography: incidence of VSD 4%.

## 4) Patent ductus arteriosus

- ❖ Well tolerated in pregnancy unless there is pulmonary hypertension.

## 5) Mitral regurgitation (MR)

- ❖ Usually well tolerated in pregnancy except in patients with atrial fibrillation or severe hypertension.
- ❖ Patients with severe MR should be advised surgical correction before pregnancy.

## 6) Mitral prolapse

- ❖ Most common congenital defect.
- ❖ Rarely have any implications on maternal fetal health.

## 7) Mitral Stenosis

- ❖ Moderate to severe disease often show deterioration in 3rd trimester or labor → increased blood volume & heart rate → pulmonary edema.
- ❖ Atrial fibrillation → Cardiac failure.
- ❖ Normal vaginal delivery with Swan-Ganz catheter monitoring in severe/moderate cases.
- ❖ Needs good pain relief in labor to reduce maternal heart rate and increase diastole.
- ❖ Can't tolerate the 2nd stage because of decreased preload with pushing therefore require instrumental delivery to shorten the 2nd stage.
- ❖ Post partum auto-transfusion can result in pulmonary edema → requires aggressive diuresis.

## 8) Aortic Regurgitation

- ❖ Generally well tolerated.
- ❖ Severe disease should have surgical repair before pregnancy.

## 9) Aortic stenosis

- ❖ Mild and moderate: well tolerated in pregnancy.
- ❖ Severe: deteriorate in 2nd or 3rd trimester with dyspnea, angina, syncope or CHF
- ❖ May require balloon valvoplasty in pregnancy.
- ❖ Monitoring with Swan-Ganz Catheter in labor.
- ❖ No epidural. (Because it reduces blood pressure and these patients already have hypotension)
- ❖ Instrumental delivery to shorten the second stage.
- ❖ Mortality 17%. Any hypotension can cause sudden death.
- ❖ Postpartum blood loss → reduce preload and volume resuscitation is necessary.

## 10) Congenital Lesions

A- Tetralogy of Fallot (Rt to Lt shunt & cyanosis)

- ❖ Rt ventricular outflow obstruction.
- ❖ Ventricular septal defect (VSD).
- ❖ Rt Vent hypertrophy.
- ❖ Overriding Aorta.

#### Complications:

- ❖ Heart failure 40%.
- ❖ Spontaneous abortions & preterm labor.
- ❖ Intrauterine growth restriction (IUGR).
- ❖ Shunt worsens in labor & postpartum.
- ❖ Requires invasive cardiac monitoring in labor.

#### B- Eisenmenger's Syndrome

- ❖ Communication between pulmonary & systemic circulation (e.g. large VSD).
- ❖ Lt to Rt shunt → pulmonary hypertension → Rt to Lt shunt.
- ❖ **Termination of pregnancy is advisable.**
- ❖ Maternal mortality rate (MMR) is 50% post partum death 1 week after delivery up to 4-6 weeks.
- ❖ Fetal mortality rate (FMR) is 50%.
- ❖ IUGR 30%.
- ❖ Preterm delivery 85%.
- ❖ Management during pregnancy: limitation of physical activity, oxygen and pulmonary vasodilators.
- ❖ **Risk of death is greatest during labor & early postpartum.**
- ❖ **Requires central hemodynamic monitoring in labor with Swan-Ganz catheter & instrumental delivery.**

#### C- Coarctation of the Aorta

- ❖ **Surgical correction in pregnancy only if dissection occurs.**
- ❖ They have fixed cardiac output therefore **maintain demand of pregnancy by increasing heart rate.**

#### D- Marfan's Syndrome

- ❖ Congenital weakness of the connective tissue.
- ❖ They usually have aortic root dilatation, mitral valve prolapse and aneurisms.
- ❖ Severe cases complications in pregnancy: aortic dissection or rupture.
- ❖ **Aortic valve replacement before pregnancy.**
- ❖ Avoid hypertension by using B-blockers from 2nd trimester to avoid tachycardia.
- ❖ Delivery method is controversial, Caesarean section (CS) v.s. spontaneous vaginal delivery (SVD).

#### E- Idiopathic hypertrophic subaortic stenosis

- ❖ Lt Vent outflow tract obstruction.
- ❖ **Worsen in the late 2nd and 3rd trimester.**
- ❖ Lt ventricular failure.
- ❖ Supraventricular arrhythmias.

#### F- Ebstein's anomaly

- ❖ Malformation of the Tricuspid valve.
- ❖ **Surgical correction before pregnancy.**

#### G- Congenital atrioventricular block

- ❖ With pacemaker can tolerate pregnancy well.

#### 11) Arrhythmias

- ❖ Premature atria/ventricular complexes: no adverse outcome in pregnancy.

- ❖ Atrial fibrillation/flutter: **severe problem but** rare in pregnancy.
- ❖ Treated by digoxin & B-blockers.
- ❖ Serious arrhythmias should be treated before pregnancy.

## 12) Ischemic heart disease

- ❖ Uncommon in pregnancy.
- ❖ 67% occurs in 3rd trimester.
- ❖ **If myocardial infarction (MI) occurs before 24 weeks → termination of pregnancy.**
- ❖ **If delivery occurs within 2 weeks of MI: mortality rate is up to 50%.**

## Summary of specific cardiac conditions

Cardiomyopathy	<ul style="list-style-type: none"> <li>❖ Heart failure is often refractory to treatment</li> <li>❖ Serious condition with 5 year survival rate of 50%</li> </ul>
Peripartum cardiomyopathy	<ul style="list-style-type: none"> <li>❖ Mortality due to CHF, thrombo-embolism or arrhythmia</li> <li>❖ Needs intensive monitoring and treatment</li> </ul>
Septal defects	<ul style="list-style-type: none"> <li>❖ Well tolerated</li> <li>❖ ASD can cause atrial flutter. Treated after pregnancy by catheter ablation</li> </ul>
Patent ductus arteriosus	<ul style="list-style-type: none"> <li>❖ Well tolerated unless there is pulmonary hypertension</li> </ul>
Mitral regurgitation	<ul style="list-style-type: none"> <li>❖ Severe MR should be advised surgical correction before pregnancy</li> </ul>
Mitral prolapse	<ul style="list-style-type: none"> <li>❖ Rarely have any implications on maternal fetal health</li> </ul>
Mitral Stenosis	<ul style="list-style-type: none"> <li>❖ Moderate/severe disease deteriorate in 3rd trimester or labor</li> <li>❖ Normal vaginal delivery with SG-catheter monitoring in mod/severe cases</li> <li>❖ Instrumental delivery to shorten the 2nd stage</li> </ul>
Aortic Regurgitation	<ul style="list-style-type: none"> <li>❖ Severe disease should have surgical repair before pregnancy</li> </ul>
Aortic stenosis	<ul style="list-style-type: none"> <li>❖ Severe deteriorate in 2nd or 3rd trimester</li> <li>❖ Monitoring with SG-Catheter in labor</li> <li>❖ No epidural</li> <li>❖ Instrumental delivery to shorten the 2nd stage</li> </ul>
Tetralogy of Fallot	<ul style="list-style-type: none"> <li>❖ Complications: Spontaneous abortions &amp; preterm labor</li> </ul>
Eisenmenger's Syndrome	<ul style="list-style-type: none"> <li>❖ Termination of pregnancy is advisable</li> <li>❖ Central hemodynamic monitoring in labor with Swan-Ganz catheter</li> <li>❖ Instrumental delivery</li> </ul>
Coarctation of the Aorta	<ul style="list-style-type: none"> <li>❖ Surgical correction in pregnancy only if dissection occurs</li> </ul>
Marfan's Syndrome	<ul style="list-style-type: none"> <li>❖ Aortic valve replacement before pregnancy</li> <li>❖ Delivery method is controversial</li> </ul>
Idiopathic hypertrophic subaortic stenosis	<ul style="list-style-type: none"> <li>❖ Worsen in the late 2nd and 3rd trimester</li> </ul>
Ebstein's anomaly	<ul style="list-style-type: none"> <li>❖ Surgical correction before pregnancy</li> </ul>
Congenital atrioventricular block	<ul style="list-style-type: none"> <li>❖ Pacemaker can tolerate pregnancy well</li> </ul>
Arrhythmias	<ul style="list-style-type: none"> <li>❖ Premature atria/ventricular complexes: no adverse outcomes</li> </ul>
Ischemic heart disease	<ul style="list-style-type: none"> <li>❖ MI before 24 weeks → termination of pregnancy</li> </ul>

CVS Drugs In Pregnancy (Just have an idea about it, you don't have to memorize it. The doctor only mentioned the drugs colored in red)

**Class B: No risk in controlled animal studies**

Anticoagulants	Antihypertensives	Antiarrhythmic	Diuretics	Anti hyperlipidemic
1. <b>Enoxaparin</b> (Lovenox) for patients with recurrent fetal loss 2. Dalteparin (Fragmin) 3. Danaparoid (Orgaran) 4. <b>Heparin</b>	1. <b>Methyldopa</b> (Aldomet) most widely used 2. <b>Acebutolol</b> (1st trimester only) 3. <b>Pindolol</b> (1st trimester only) B-blockers are advisable in 1st trimester only	1. Encainide 2. Sotalol (Betapace) – 1st trimester only	1. Torsemide (Demadex) 2. Amiloride	1. <b>Cholestyramine</b> 2. Colestipol

**Class C: Small risk in controlled animal studies**

Antiplatelet Medications	Antiarrhythmic	Diuretics	Diuretics	Antihypertensive
1. Clopidogrel (Plavix) 2. Dipyridamole (Persantine) 3. Ticlopidine	1. <b>Atropine</b> 2. <b>Digoxin</b> 3. Disopyramide (Norpace) 4. Lidocaine 5. Procainamide 6. Quinidine 7. Amiodarone ❖ Neonatal Hypothyroidism ❖ Intrauterine Growth Retardation ❖ Cardiac disturbance	1. Acetazolamide (Diamox) 2. <b>Furosemide</b> (Lasix) 3. Mannitol	1. <b>Niacin</b> 2. Gemfibrozil (Lopid)	1. <b>Hydralazine</b> 2. Diazoxide 3. Clonidine 4. Nitroprusside (Nipride) 5. Prazosin 6. Reserpine 7. All Calcium Channel Blockers: ❖ <b>Nifedipine XL (is a drug of choice for severe Hypertension in Pregnancy)</b> ❖ <b>Avoid other Calcium Channel Blockers in pregnancy</b> 8. Most Beta Blockers (1st trimester only) ❖ <b>Labetolol (drug of choice for severe Hypertension in Pregnancy)</b> ❖ Metoprolol ❖ Nadolol ❖ Propranolol ❖ Timolol ❖ Esmolol (Class C in all trimesters)

**Class D: Strong evidence of risk to the human fetus**

Anticoagulants	Antihypertensive	Diuretics
<p>1. Coumadin (Warfarin) causes congenital warfarin syndrome</p> <p>2. Dicumarol</p>	<p>1. ACE Inhibitors</p> <p>2. Angiotensin II Antagonists</p> <p>3. Most Beta Blockers (second and third trimester)</p> <ul style="list-style-type: none"> <li>❖ Associated with Intrauterine Growth Retardation</li> <li>❖ Metoprolol</li> <li>❖ Nadolol</li> <li>❖ Propranolol</li> <li>❖ Timolol</li> <li>❖ Acebutolol (second and third trimester)</li> <li>❖ Pindolol (second and third trimester)</li> <li>❖ Atenolol</li> </ul>	<p>1. Ethacrynic Acid</p> <p>2. Triamterene (Class B per manufacturer)</p> <p>3. Bumetanide (Bumex)</p> <p>4. Hydrochlorothiazide</p> <p>5. Spironolactone</p>

**Summary of CVS drugs in pregnancy:**

**Class B:**

- ❖ In general B-blockers are advisable (and safest) in 1st trimester only.
- ❖ The anticoagulant Enoxaparin (Lovenox) is for patients with recurrent fetal loss.
- ❖ Methyldopa is the most widely used b-blocker.

**Class C:**

- ❖ Nifedipine XL (Ca channel blocker) is the drug of choice for severe Hypertension in Pregnancy. Avoid other calcium channel blockers in pregnancy.
- ❖ Labetolol (B-blocker) is the drug of choice for severe Hypertension in Pregnancy.
- ❖ Esmolol (B-blocker) is classified as class C in all trimesters.

**Class D:**

- ❖ Coumadin (Warfarin) causes congenital warfarin syndrome.
- ❖ ACE Inhibitors are contraindicated.

