Antenatal Care

DR. NUHA QASEM, ASSISTANT PROFESSOR

FAMILY MEDICINE AND INTERNAL MEDICINE DEPARTMENT/ HASHEMITE UNIVERSITY

HIGHER SPECIALIZATION IN FM, UNIVERSITY OF JORDAN

FELLOWSHIP IN CHILD AND WOMEN HEALTH, UNIVERSITY OF BOLOGNA, ITALY

Lecture Outline

- Preconception counseling
- Nutrition and weight management in pregnancy
- Immunization in pregnancy
- Screening in pregnancy
- Common pregnancy issues
- ANC visits
- Testing for aneuploidy

Preconception Counseling

- The CDC defines preconception care as a set of interventions aimed at identifying and modifying biomedical, behavioral, and social risks to a woman's health or pregnancy outcome through prevention and management.
- The goal is to ensure that the woman is as healthy as possible before conception to promote her health and the health of her future children.
- Preconception care is integral to primary care for women in their reproductive years, even when women are not planning a pregnancy.
- It is not a single medical visit, but rather should be incorporated into every medical decision and treatment recommendation for these women.

Preconception History

- Age
- Chronic diseases
  - eg, DM, HTN, epilepsy, oral health
- Medications known to be teratogens
- Reproductive history
- Genetic conditions and FHx
  - Consanguineous couples should be offered genetic counseling to discuss the increased risk of recessive conditions in their offspring.
- Substance use
  - Tobacco, alcohol, and non-prescribed drugs
- Infectious diseases and vaccinations
  - Immunize if not current on Tdp, MMR, HBV
- Nutrition, folic acid intake, and weight management
- Environmental hazards and toxins
- Family planning
- Social and mental health concerns

Preconception Interventions

- Disease optimization
- Abstinence from alcohol and illicit drugs, smoking cessation
- Reduction of **obesity**
- Medication changes to avoid use of teratogens
  - Warfarin to heparin
  - OHGA to insulin or glyburide (glibenclamide)or metformin
  - Valproic acid to lamotrigine
  - Stop isotretinoin
  - ACE-I/ARB to Nifidipine, Labetalol, Methyldopa
- Behavioral changes to reduce the risk of acquiring infections, such as toxoplasmosis, CMV, and listeriosis

Disease Optimization

- BP control in women with HTN
- DM:
  - Glycemic control in women with DM
  - Screening for pregestational DM in women with risk factors and for gestational DM in all women.
  - Evaluation for and treatment of proliferative retinopathy
- Control of phenylalanine levels in women with phenylketonuria
- Epilepsy
  - Assure good seizure control
  - The lowest possible dose of seizure medication that will control seizures is recommended.
  - Using a single drug if possible
  - Consider tapering (over 3 mo) and stopping medication if no seizure activity in the last 2 years.

Nutritional Interventions

- Folate supplementation: 400mcg/day.
- Iron supplementation: 30-60mg elemental iron/day
- Calcium supplementation:1.5–2.0 g oral elemental calcium/day is recommended for pregnant women in populations with low dietary calcium intake to reduce the risk of pre-eclampsia.
- Vitamin D: ACOG recommends routine supplementation with 600 IU vitamin D in a standard prenatal vitamin

Nutritional Interventions, cont'd

- Vitamin A supplementation: Only recommended for pregnant women in areas where vitamin A deficiency is a severe public health problem, to prevent night blindness. Vitamin A deficiency is not common among Jordanian women(FAO 2010 report).
  - Excessive intake can be teratogenic
  - Avoid animal liver as it is rich in vitamin A
- Limit seafood consumption to about three 4 oz servings per week of certain types (e.g. Salmon, Sardines, some types of canned tuna, crab, shrimp) to minimize fetal exposure to mercury and other water-borne contaminants
- The ATA recommends a daily oral multivitamin supplement that contains 150 mcg of iodine during pregnancy and lactation. Using iodized salt and consuming seafood that is naturally rich in iodine are alternatives.

Nutritional Interventions, cont'd

- ACOG recommends limiting caffeine consumption to less than 200 mg/day in pregnancy
  - Regular brewed coffee: 1 cup (8 oz) contains about 137 mg caffeine.
  - Espresso coffee: 30-50 ml cup contains about 63 mg caffeine.
  - Tea (8 oz)
    - Brewed 48 mg
    - Instant 26–36 mg
  - Caffeinated soft drinks (12 oz) 37
- Fasting: Studies of pregnancy outcome in healthy women who fasted during the month of Ramadan have generally reported no adverse effects on the fetus or uterine blood flow.
- The misconception "eating for two" neither accurately nor appropriately depicts the increased needs of pregnant women. On average, women need only approximately 340 and 450 additional kcal/day in the 2nd and 3rd trimesters, respectively.

Folic Acid

- To decrease the occurrence and recurrence of NTDs by at least 70%.
- 1-3 mo preconception through the 1st 3 mo of pregnancy (Grade 2B).
- 400-800 mcg is the recommended dose for most women
- 1 mg/day for :
  - women with FHx of NTD in a first- or second-degree relative
  - Women taking medications other than antiepileptic drugs that have been associated with reductions in available folic acid (eg triamterene, trimethoprim, sulfasalazine)
  - Women with medical conditions associated with reduced red cell folate levels (celiac disease, IBD, and major intestinal resection or bypass)
  - Women with pregestational diabetes

- 4-5 mg/day should be prescribed to :
  - Women with a previous pregnancy affected by an NTD or with an NTD in either parent (Grade 2B)
  - Women on valproic acid or carbamazepine (Grade 2C). (Women taking other antiepileptic drugs: 0.4 mg)

Weight management in pregnancy

- Obesity increases the risks of:
  - Maternal HTN and preeclampsia
  - Maternal diabetes
  - Delivering a macrosomic infant.
- The Institute of Medicine recommendation on total weight gain during pregnancy depends on preconception BMI
- Inadequate weight gain is associated with an increased risk of an LBW infant.
- When excess weight gain is noted, advise patients to avoid foods that are high in fats and carbohydrates, to limit sugar intake, and to increase their physical activity.

Preconception BMI	Recommended weight gain
<18.5 kg/m2	12.5-18 kg
18.5-24.9 kg/m2	11.5-16 kg
25-29.9 kg/m2	7-11.5 kg
≥30.0 kg/m2	5-9 kg

Immunization during pregnancy

- Women should be vaccinated against preventable diseases prior to conception according to the recommended adult immunization schedule.
- Before administering any vaccine, ask the woman if she is pregnant or could become pregnant in the next 4 weeks.
- Pregnancy should be avoided for **28 days** following administration of a live vaccine.
- During **influenza** season, all pregnant women are recommended to receive the IIV regardless of trimester of pregnancy
- Administration of **Tdap** vaccine to all pregnant women in each pregnancy between 27-36 weeks of gestation, even if the woman has a previous history of pertussis or vaccination, and even if consecutive pregnancies occur within 12 months. It aims for maternal and neonatal protection against tetanus and pertussis.

Immunization during pregnancy, cont'd

- Pregnant women with comorbidities or exposures that place them at high risk for hepatitis A, hepatitis B, pneumococcal, Haemophilus influenzae b, or meningococcal infections can receive these immunizations.
- Avoid vaccinating pregnant women with the following vaccines:
  - MMR, Varicella, HPV, VZL, LAIV and BCG.
- Pregnant women who are nonimmune and have been exposed to patients infected with **measles or varicella** should receive a passive immunity with the specific IVIG for that virus ASAP(within 6 days of exposure (measles) and within 10 days of exposure (varicella)).

Smoking and pregnancy

- The use of or exposure to tobacco products by pregnant women is associated with:
  - Placenta previa, placental abruption
  - Preterm premature rupture of membranes and preterm delivery.
  - Spontaneous pregnancy loss.
  - Low birth weight.
  - Ectopic pregnancy.

Smoking Cessation in Pregnancy

Although smoking cessation during pregnancy is of maximal benefit if it occurs early in the1st trimester, quitting at any time during pregnancy can have some beneficial effects.

For pregnant women who want to stop smoking, smoking-cessation counseling should be the first-line treatment (behavioral interventions)

Add pharmacologic therapy (NRT or Bupropion) for women who have been unable to quit with cessation counseling alone

The benefits of quitting with pharmacotherapy outweigh the potential risks of pharmacotherapy and the risks of continued smoking.

Screening in pregnancy

- Screening for DM
- Screening for HTN
- Screening for hypothyroidism
- Screening for IDA
- Screening for asymptomatic bacteriuria

Screening for Hypothyroidism

ACOG , the Endocrine Society, the ATA recommend targeted rather than universal screening in pregnant women:

- Women Living in an area of moderate to severe iodine insufficiency
- Symptoms of hypothyroidism
- Family or personal hx of thyroid disease
- Personal history of:
  - TPO antibodies, goiter or Prior thyroid surgery
  - Age >30 years
  - Type 1 diabetes
  - H &N irradiation
  - Infertility, Recurrent miscarriage or preterm delivery, Multiple prior pregnancies (2 or more)
  - Morbid obesity (BMI ≥40 kg/m2)
  - Use of amiodarone, lithium or recent administration of iodinated radiologic contrast agents

Screening for Hypothyroidism, cont'd

- Screen with TSH serum level: 0.1-4 mU/L can be considered the reference range of TSH in pregnancy
- If the serum TSH is between the trimester-specific lower limit of normal and 2.5 mU/L, most women require no further testing.
- If the serum TSH is 2.5-4 mU/L, measure TPO antibodies:
  - The presence of TPO antibodies may be useful for making treatment decisions in these women
  - The presence of TPO antibodies increases the risk of fetal loss and fetal preterm delivery and increases the risk of developing hypothyroidism in these euthyroid women
  - It is recommended to give thyroid hormone treatment if they have had recurrent miscarriage
  - Some experts also recommend treating such women even without history of miscarriage especially if they have TSH >2.5 mU/L. (2.5-4 mU/L)

Screening for Hypothyroidism, cont'd

- In such euthyroid women with positive TPO antibodies who are not treated with thyroid hormone, TSH should be repeated:
  - Every 4 weeks during the 1st trimester
  - Once during each of the 2nd & 3rd trimesters.
- If the TSH is >4 mU/L, measure free T4 to determine the degree of hypothyroidism.

Hyperthyroidism in Pregnancy

- Uncommon during pregnancy
- Graves' disease and hCG-mediated hyperthyroidism are the most common causes
- Hyperthyroidism (most often due to Graves' disease) is associated with increased rates of the following :
  - Spontaneous abortion and stillbirth
  - Premature labor, low birth weight
  - Preeclampsia, heart failure
- hCG-mediated hyperthyroidism is usually transient and does not require treatment
- Most women with Graves' disease are treated with thionamides (Methimazole is preferred to PTU except during the first trimester of pregnancy)
- There is no evidence of adverse pregnancy outcomes from subclinical hyperthyroidism.

Screening for DM in early pregnancy

- Women who are hyperglycemic in early pregnancy are at increased risk of having a child with a congenital anomaly, and they may have unrecognized complications (nephropathy, retinopathy) from diabetes
- ADA and ACOG suggest early pregnancy testing for undiagnosed type 2 diabetes in women **with** risk factors.
- Standard ADA criteria for diagnosis of diabetes in nonpregnant adults may be used to diagnose overt diabetes in early pregnancy (using FPG, A1C, Two-hour 75-gm OGTT or RPG in symptomatic patients)

The ADA defines women at increased risk of overt diabetes based on BMI ≥25 kg/m2 **plus** one or more of the following:

- Gestational DM in a previous pregnancy
- A1C ≥5.7 %, IGT, or IFG on previous testing
- First-degree relative with diabetes
- High-risk race/ethnicity.
- History of CVD
- HTN
- HDL cholesterol level <35 mg/dL and/or a TG level >250 mg/dL .
- PCOS
- Physical inactivity
- Other clinical condition associated with insulin resistance (eg, severe obesity, acanthosis nigricans)

Screening for gestational DM

- The ADA defines gestational diabetes as "diabetes diagnosed in the second or third trimester of pregnancy that was not clearly overt diabetes prior to gestation".
- Two approaches for the screening
  - ACOG guidelines suggests a two-step approach (50-gram oral glucose challenge followed by 100-gram three-hour oral GTT in screen positive women).
  - One-step screening with 75-gm two-hour GTT.

- Glu challenge test: 50 gm glu.
  - 1-hr serum glucose $\geq$ 140 mg/dl considered positive.

IADPSG and ADA criteria for a positive two-hour 75-gram oral glucose tolerance test for the diagnosis of gestational diabetes

Two hour 75-gram oral glucose tolerance test	
Fasting	≥92 mg/dL (5.1 mmol/L)
OR	
One-hour	≥180 mg/dL (10.0 mmol/L)
OR	
Two-hour	≥153 mg/dL (8.5 mmol/L)

The diagnosis of gestational diabetes is made at 24 to 28 weeks of gestation when one or more plasma glucose values meets or exceeds the above values.

Diagnostic criteria for the 100-gram three-hour GTT to diagnose gestational diabetes mellitus

	Plasma or serum glucose level Carpenter/Coustan		Plasma level National Diabetes Data Group	
	mg/dL	mmol/L	mg/dL	mmol/L
Fasting	95	5.3	105	5.8
One hour	180	10.0	190	10.6
Two hours	155	8.6	165	9.2
Three hours	140	7.8	145	8.0

100-gram oral glucose load is given in the morning to a patient who has fasted overnight for at least 8 hours. Glucose concentration greater than or equal to these values at two or more time points are generally considered a positive test, but in 2017 an American College of Obstetricians and Gynecologistisc practice bulletin stated that clinicians may reasonably consider one elevated value diagnostic of a positive test[1]. Two

Diabetic Control in Pregnancy

- Monitoring of blood glucose levels daily at the following times in all patients:
  - Fasting : The target is < 95mg/dl
  - Preprandial and/or postprandial (1 or 2 hrs after the 1st bite of each meal):
    - One-hour postprandial blood glucose concentration <140 mg/dL
    - Two-hour postprandial glucose concentration <120 mg/dL
    - Preprandial glucose concentrations ≤100 mg/dL (5.6 mmol/L)
  - Bedtime.
- ACOG guidelines recommend measuring A1C at least in each trimester, beginning at the initial prenatal visit
- Target HbA1C during pregnancy is < 6%

Screening for HTN

- BP measurement should be performed at each ANC visit
- In contrast to nonpregnant individuals, BP in pregnant women is either:
  - Normal (<140/90 mmHg),
  - Mild to moderate HTN (140-159/90-109 mmHg),
  - Severe HTN (≥160/110 mmHg).
- HTN in pregnancy can be:
  - Preeclampsia-eclampsia
  - Chronic (preexisting) hypertension : HTN that antedates pregnancy, is present before the 20th week of pregnancy, or persists longer than 12 weeks postpartum
  - Gestational hypertension
  - Preeclampsia-eclampsia superimposed upon chronic hypertension

BP control in HTN with pregnancy

- Treatment of severe HTN (BP ≥160 /110mmHg) is always recommended because it is believed to reduce the risk of maternal stroke and other serious maternal complications.
- There is no proven maternal or fetal benefit from treatment of mild to moderate HTN
- Lowering maternal blood pressure excessively may be associated with decreased placental perfusion, and exposure of the fetus to potentially harmful effects of medications.
- For pregnant women with complicated hypertension (e.g, target-organ damage ,dyslipidemia, maternal age over 40 years, history of stroke, previous perinatal loss, diabetes) treat even mild HTN

- For patients receiving antihypertensive drugs BP should be maintained at levels between 130-150/ 80 -100 mmHg, and <140/90 in women in the presence of target organ damage.
- The use of low-dose aspirin (81 mg/d) is recommended after 12 weeks of gestation in women who are at high risk for preeclampsia
- For hypertensive pregnant women with mild to moderate gestational HTN **ACOG** recommends **monitoring BP once or twice weekly in the office and weekly assessment of proteinuria, platelet count, creatinine, and liver enzymes.**
- Weekly testing with nonstress test or BPP beginning at 32 weeks

Screening for IDA

- Anemia is estimated to affect 38.2% of pregnant women globally
- It is associated with iron, folate and vitamin A deficiencies
- Anemia during pregnancy increases the risk of:
  - Maternal death from hemorrhage.
  - Stillbirth, LBW, prematurity, and neonatal death.
- CDC has defined anemia in pregnancy as:
  - Hb levels < 11 g/dL (Htc < 33 %) in the 1st & 3rd trimesters.
  - Hb <10.5 g/dL (Htc <32 %) in the 2nd trimester.
- If a woman is diagnosed with anemia during pregnancy, her daily elemental iron should be increased to 120 mg until her Hb concentration rises to normal

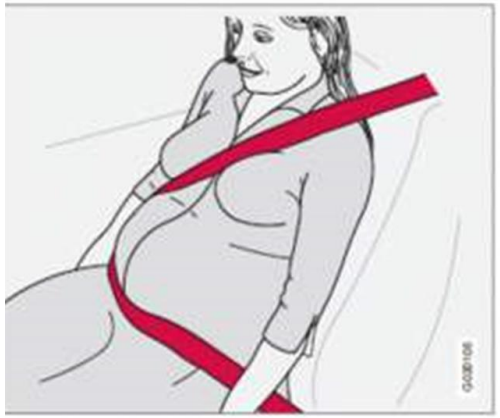
Screening for **Asymptomatic Bacteriuria**

- Urine culture performed at 12-16 weeks gestation or first ANC visit, if later
- Untreated asymptomatic bacteriuria in pregnancy is associated with:
  - High risk of developing pyelonephritis
  - Modest risk for preterm birth.
- Retest women with asymptomatic bacteriuria 1 week after completion of antibiotic treatment to check for resolution.

Common pregnancy issues

- Physical activity:
  - Most patients are able to maintain their normal activity levels in pregnancy; however, heavy lifting and excessive physical activity should be avoided.
  - In the absence of medical or obstetric complications, current ACOG recommendations advocate for **30 minutes** or more of moderate exercise daily.
- Back pain is a common complaint in pregnancy that affects over 50% of women. Backache can be prevented to a large degree by avoidance of excessive weight gain and a regular exercise program before pregnancy.
- Nausea and vomiting

- **Travel**:
  - A pregnant woman should be advised against prolonged sitting during car or airplane travel because of the risk of venous stasis and possible thromboembolism.



- **Seat belt use**
  - Proper use is advised: the lap belt should be

placed under the gravid abdomen, over the thighs, with the shoulder harness off to the side of the uterus, between the breasts and over the midline of the clavicle. Airbags should not be disabled during pregnancy

Nausea and Vomiting

- Up to 90% of pregnant ladies suffer from nausea with or without vomiting
- Risk factors:
  - Nonpregnant women who experience nausea and vomiting related to
    - Estrogen-based medication,
    - Motion sickness
    - migraine
  - Supertasters
  - Younger primigravid women , Multiple gestation or hydatidiform mole
  - Nonuse of multivitamins before six weeks of gestation or during the peri-conceptional period
  - Heartburn and acid reflux

Nausea and Vomiting

- The onset is usually at 5-6 weeks of gestation, peaking at 9 weeks, and usually abate by 16-20 weeks of gestation.
- The symptoms of the "morning sickness" persist throughout the day in 80% of the cases and may occur only in the evening.
- Hyperemesis gravidarum represents the severe end of the symptom spectrum and characterized by persistent vomiting accompanied by
  - Significant weight loss (loss of >5% of prepregnancy weight)
  - Ketonuria

Management of Nausea and vomiting in pregnancy

- The initial treatment approach involves counseling about dietary changes and trigger avoidance.
- Ginger and/or pyridoxine (vitamin B6) or doxylamine-pyridoxine is added if symptoms do not improve
- If still there is vomiting switch to antihistamine (H1 antagonists): dimenhydrinate, meclizine or diphenhydramine.
- Hyperemesis may require treatment with ondansetron &/or short courses of glucocorticoids
- Inpatient therapy may be needed for patients with hypovolemia for rehydration and nutrition.
- Thiamine should be added to IV fluids to prevent Wernicke's encephalopathy

Initial Antenatal Visit

- The initial visit should include a detailed history (medical, surgical, obstetric, reproductive) along with physical examination.
- If a patient has a history of a previous neonatal death, stillbirth, or PTB, records should be carefully reviewed so that the correct diagnosis is made and recurrence risk is appropriately assessed.
- Confirmation of **intrauterine** pregnancy and number of fetuses
- Estimation of **EDD**
- **Laboratory** evaluation
- **Schedule ANC visits** throughout pregnancy
  - The typical intervals for prenatal visits for nulliparous women with uncomplicated pregnancies are:
    - Every 4 weeks until 28 weeks of gestation
    - Every 2 weeks from 28 to 36 weeks
    - Then weekly until delivery
- Discuss screening tests options for **aneuploidy**

EDD

- Calculation from the date of the LMP.
- Sonographic estimation before 20 weeks of gestation is desirable in all pregnancies.
  - Better estimation of GA than menstrual dates
  - Particularly important when:
    - Menses are irregular
    - LMP is unknown or uncertain
    - In patients who conceive while taking OCPs
    - The uterine size is discordant with menstrual dates.
- The crown–rump length is more accurate during the 1st trimester.
- The **biparietal diameter** and **femur length** are used more during the second trimester.

Calculating EDD

- **Naegle's Rule:**
  - Add 1 year, subtract 3 months, and add 7 days to the LMP.
  - Another way is to add 9 months and 7 days.
  - The result is approximately 280 days (40 weeks) from the start of the LMP.
  - This 280 days represents the median duration of pregnancy (the day at which half of all births occur earlier, and half of all births occur later).
  - Assumes an average cycle length of 28 days, which is not true for everyone.
- **Parikh's formula:**
  - Calculation method that considers cycle duration.
  - Add 9 months to the start of the LMP, subtract 21 days, then add duration of previous cycles.

Laboratory Tests in the 1st ANC visit

- **Rhesus type and antibody screen**
- **Hematocrit or hemoglobin and MCV**
- **Documentation of rubella immunity** (Rubella IgG antibodies)
- **Documentation of varicella immunity**
- **Urine protein** (with a dipstick) as a baseline.
- **Urine culture (12-16 week)**

Laboratory Evaluation, cont'd

- **Hepatitis B virus**
  - All pregnant women are tested for **HBsAg**, regardless of previous vaccination status.
  - Women who carry the HBsAg can transmit HBV to the fetus, typically during delivery.
  - Passive and active immunization of the newborn within **12 hours** of delivery can reduce the risk of HBV transmission by more than 95 %.
  - Women who are HBsAg-negative and are at high risk for HBV infection should be tested for anti-HBs and anti-HBc.
  - Mothers without evidence of prior HBV infection or exposure (negative for anti-HBs and anti-HBc) should be vaccinated.

Laboratory Evaluation, cont'd

- **Cervical cancer screening**
  - The frequency of screening is not influenced by pregnancy,
- **HIV**
  - ACOG supports universal HIV testing of pregnant women early in each pregnancy
- **Syphilis**
  - Serologic testing using both nontreponemal and treponemal tests.
- **Chlamydia**
  - ACOG recommends screening all pregnant women for chlamydia.
  - CDC and SPSTF recommend screening all pregnant women <25 years of age and those pregnant women ≥age 25 with risk factors for STI.
  - A swab of the endocervix or vagina, or urine testing.
  - Nucleic acid amplification tests (NAAT) is superior to culture.

ANC in the 2nd & 3rd trimesters

The goal of 2nd & 3rd trimester visits is to assess fetal growth and maternal well-being:

- Routine assessment
- Specific issues at specific time periods of pregnancy:
  - 15-24 weeks
  - 24-28 weeks
  - 28-36 weeks
  - 36-41 weeks

Routine Assessment

Warning signs and symptoms that should be reported immediately:

- Vaginal bleeding
- Leakage of fluid per vagina
- Decreased fetal activity
- Signs of preterm labor
- Signs of preeclampsia

Routine assessments, cont'd

- The following should be performed at **each** prenatal visit:
  - Measurement of **BP**
  - Measurement of **weight**
  - **Urine** dipstick for protein.
  - Assess fetal **growth.**
  - Documentation of fetal **heart rate**
  - Assessment of maternal perception of **fetal activity** (in the 2nd & 3rd trimesters)
  - Assessment of fetal **presentation** (in the third trimester)
  - Placenta and amniotic fluid.
  - Assessment of significant **events** since prior visit, such as recent travel, illness, stressors, or exposure to infection.

15-24 weeks

- **Neural tube defects** : maternal serum AFP and US are both effective methods
- **Trisomy 21** : The quadruple test between 15 - 22 weeks of gestation.
- **Fetal anomalies** : detailed fetal scan by US, performed between 18-22 weeks of gestation .
- **Cervical length** :TVUS measurement of short cervical length (<25mm) between 16-28 weeks of gestation is associated with an increased risk of spontaneous preterm birth <35 weeks. Interventions such as
  - Treatment with vaginal progesterone have reduced the rate of subsequent preterm birth.
  - Cerclage or a cervical pessary may be effective.

24-28 weeks

- **Gestational diabetes** : using either the one-step or the two-steps approaches.
- **RBC antibodies** : In Rh(D)-negative women, RBC antibody screening is repeated at 28 weeks of gestation and anti-D IG is administered.
- **Hemoglobin or hematocrit**

28-36 weeks (3rd trimester)

- **Estimated fetal weight** : calculated from fetal growth parameters (BPD, HC, FL, AC)
- **Fetal surveillance (nonstress test or biophysical profile)**
  - For pregnancies in which the risk of antepartum fetal demise is increased.
- **External cephalic version** :
  - For pregnancies with breech presentation, offer ECV at 36 weeks of gestation.
- **Group B beta-hemolytic streptococcus testing** :
  - Pregnant women should be screened at 35-37 weeks of gestation for GBS colonization with swabs of both the lower vagina and rectum.
  - Intrapartum chemoprophylaxis of colonized women has been proven to reduce the incidence of early-onset neonatal GBS.

28-36 weeks, cont'd

- **STD:** The CDC recommends testing for HIV, syphilis, chlamydia, gonorrhea, hepatitis [hepatitis B surface antigen, anti-hepatitis C virus antibodies]) in the 3rd trimester (28-36 weeks) in women who :
  - Were diagnosed with a STD earlier in pregnancy
  - Continue to have risk factors for acquiring a STD
  - Acquired a new risk factor during pregnancy (eg, a new or more than one sex partner, evaluation or treatment for a STD, injection of nonprescription drugs)
- The CDC recommends that all women ≤25 years of age be retested for Chlamydia trachomatis late in pregnancy.

36-41 weeks

- **Patient education in preparation for labor and delivery**
  - Management of and support during labor
  - Route of delivery
  - Induction of labor
  - Postterm pregnancy (≥41 weeks of gestation)

- **Patient education regarding postpartum issues**
  - Postpartum contraception
  - Postpartum care and complications
  - Breastfeeding
  - Neonatal circumcision
  - Newborn safety and care

Testing for Aneuploidy

- 1st trimester combined screening test
- 2nd trimester quadruple screening test
- The Integrated screening tests
- Cell-free DNA
- Diagnostic testing

Maternal serum marker pattern in selected fetal syndromes

	Second trimester markers				First trimester markers		
Genetic disorder	**AFP**	**uE3**	**hCG**	**Inh A**	**PAPP-A**	**beta hCG**	**Nuchal translucency**
Down syndrome	↓	↓	↑	↑	↓	↑	↑↑
Trisomy 18	↓	↓↓	↓↓	↔	↓↓	↓↓	↑↑
Trisomy 13	↔	↔	↔	↔	↓↓	↓	↑
Turner syndrome with hydrops	↓	↓	↑	↑	↓↑	↓↑	↑
Turner syndrome without hydrops	↓	↓	↓	↓	↓↑	↓↑	↑
Triploidy (paternal)	↔	↓	↑	↑	↓↑	↑↑	↑
Triploidy (maternal)	↔	↓	↓	↓	↓↑	↓↓	↑
Smith-Lemli-Opitz syndrome	↓	↓↓	↓	NR	NR	NR	NR

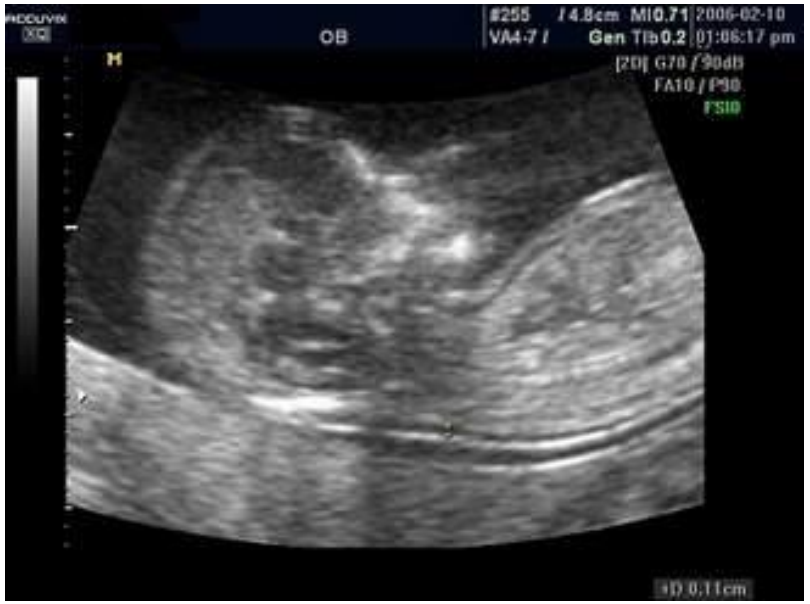
Second trimester markers: AFP (alpha-fetoprotein); uE3 (unconjugated estriol); hCG (human chorionic gonadotropin); inh A (inhibin A).
First trimester marker: PAPP-A (pregnancy-associate plasma protein A); beta hCG (beta human chorionic gonadotropin); nuchal translucency.

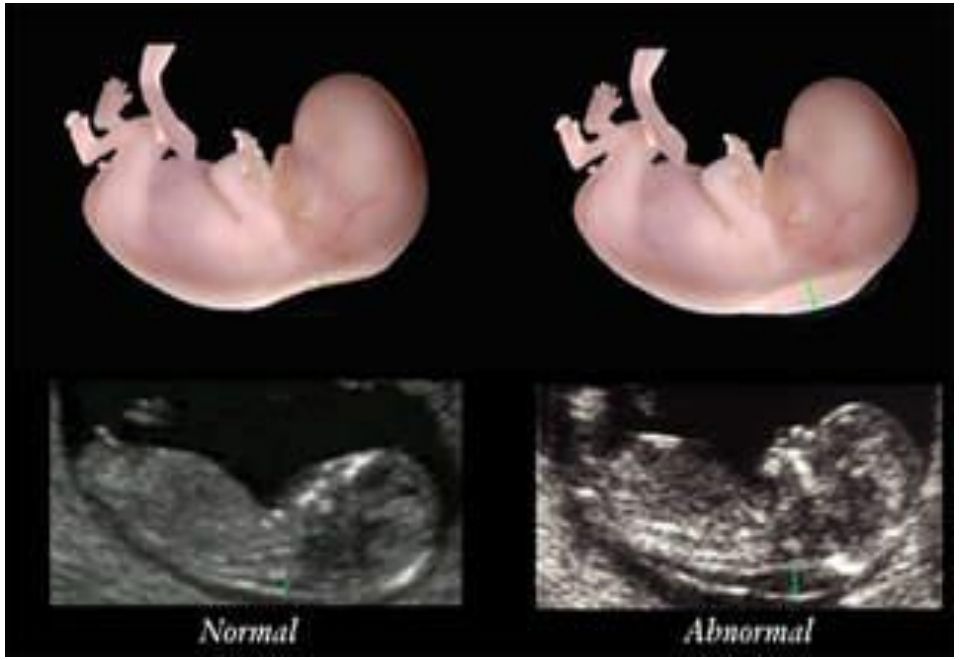
↑: increased; ↓: decreased; ↔: unchanged; ↓↑: variable; NR: not reported.

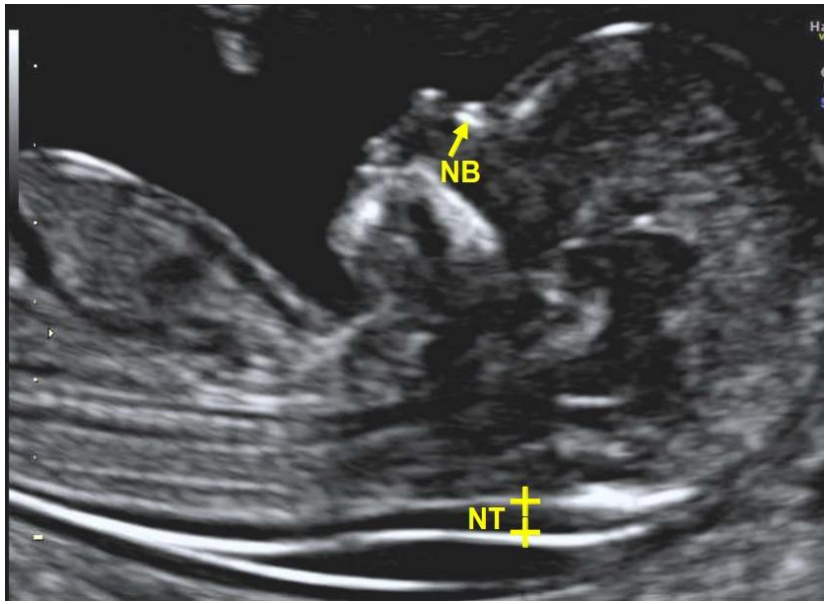
1st Trimester combined test

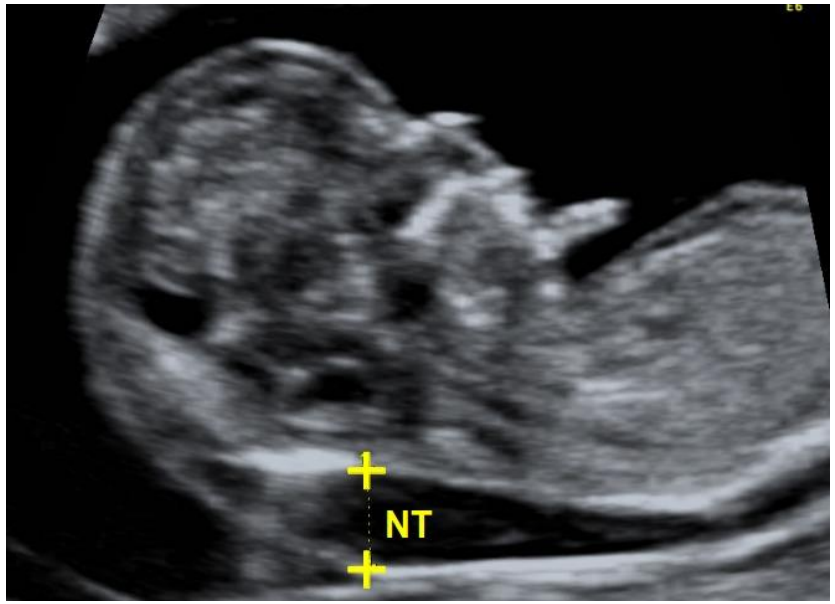
- Combines sonographic determination of NT with determination of biochemical markers associated with aneuploidy:
  - PAPP-A
  - Free or total hCG.
- Performed at 11-13 weeks of gestation.
- The combined test is the best available screening test for Down syndrome for women in whom early diagnosis is the priority.
- **NT** measurement above the 95th centile is said to be an increased NT, the thickness of which is based on CRL
- The median NT is 1.5 mm and the 95th centile is 2.5mm in most of the studies.
- The rate of aneuploidy when the NT is <2 mm is less than 1%.
- NT >3.5mm (99th centile) is associated with multiple chromosomal and non-chromosomal congenital anomalies.
- If the combined test is offered, CVS should be available for definitive prenatal diagnosis.

Nuchal Translucency






NB
NT


NT

2nd trimester Quadruple test

- Measures the level of the biochemical markers AFP, uE3 , hCG, and inhibin A in maternal serum.
- Ideally performed at 15-18 weeks of gestation but can be done as late as 22 weeks.
- It has replaced the triple test (AFP, uE3, hCG).
- For women who first present for prenatal care in the second trimester, the quadruple test is the best available biochemical marker-based screening test for Down syndrome.
- Since it involves measurement of AFP, it also serves as a screening test for open NTD.

Integrated screening tests

- The **full integrated test**
  - Combines the results of first trimester combined test with the results of the quadruple test (performed on a second serum sample collected at 15-18 weeks) .
  - Lower false positive rate than the combined test, the quadruple test, or the serum integrated test.
- The **serum integrated test**
  - Differs from the full integrated test by not including US measurement of NT.
  - Lower false positive rates than the quadruple screen
- **Step-wise sequential testing**
  - Involves performing the first trimester portion of the full integrated test, reporting risks of Down syndrome :
    - Offers CVS to women whose results place them at very high risk of an affected fetus (eg, ≥1 in 50).
    - Women whose screen does not place them at very high risk go on to complete the second trimester portion of the test.

Screen positive biochemical tests

- May undergo secondary screening or a definitive diagnostic procedure.
- Secondary screening is performed with a cell-free DNA test (high sensitivity and specificity)
  - If Negative reclassified as screen-negative.
  - Secondary screen-positive should be offered an invasive test for definitive diagnosis because false positive results are possible (<0.1 percent).
- Diagnostic procedures: Invasive testing (CVS in the first trimester, or amniocentesis to obtain fetal cells in the second trimester).
- Biochemical marker screening tests should not be repeated.

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