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**Anatomy & Physiology of Pregnancy**

**SIGNS OF PREGNANCY:**

**PRESUMPTIVE SIGNS:**

Those changes felt by the woman; amenorrhea, fatigue, nausea & vomiting, breast changes, quickening, urinary frequency.

breast changes – 3-4 weeks

 amenorrhea – 4 weeks

quickening – 16-20 weeks; described as a flutter & is difficult to distinguish from peristalsis; will gradually increase in intensity & frequency.

**PROABABLE SIGNS:** Those changes observed by an examiner. Goodell’s sign, Chadwick’s sign, Hegar’s signs, ballottement, positive pregnancy tests (serum, urine), Braxton Hicks ctx.

**Goodell’s sign** = 5 weeks; a softening of the cervical tip, due to increased vascularity, slight hypertrophy, & hyperplasia of muscle & connective tissue.

**Chadwick’s sign** = 6-8 weeks; the uterus, cervix & isthmus softens perceptibly & progressively, & the cervix takes on a bluish color.

**Hegar’s sign** = 6-12 weeks; softening & compressibility of the lower uterine segment (the uterine isthmus), results in exaggerated uterine anteflexion during the 1st 3 months of pregnancy.(presses on bladder)

pregnancy tests = 4-12 weeks

Braxton Hicks contractions = as early as 16 weeks

ballottement = 16-28 weeks (passive movement of the unengaged fetus).

**POSITIVE SIGNS:** Hearing fetal heart tones, visualization of the fetus, and palpating fetal movement, visualizing fetal movements.

* Visualization of fetus (u/s) = 5-6 weeks; by x-ray = 16 weeks
* Fetal heart tones (u/s) = 6 weeks; by doppler = 8-17 weeks;
* fetal stethescope = 17-19 weeks

Fetal movement palpated = 19-22 weeks

**NAEGELE’S RULE:**

To determine the Expected Date of Delivery (EDD), take the date of the last menstrual period, add 7 days to that date, & count back 3 months.

The 1st day of last period = Jan. 12, 2002; 1/12/02 + 7 days = 1/19/02; counting back 3 months to October, the EDD is 10/19/02.

**4 Digit System: Assessing Gravidity**

An acronym, GTPA:

Gravidity

Total number of term births

Total number of preterm births

Total number of abortions (spontaneous or elective termination of pregnancy before viability).

**5 Digit System: Assessing Gravidity**

An acronym, GTPAL:

Gravity (including the present pregnancy)

Total number of term births

Total number of preterm births

Total number of abortions

Total number of living children

**TPAL: Assessing Parity**

An acronym, TPAL:

T= term birth(s)

P= preterm birth(s)

A= abortion(s) / miscarriage(s)

L= living children

**Physiologic Adaptation of Reproductive System to Pregnancy:**

**Each organ of the reproductive system undergoes dramatic changes during pregnancy.**

**Uterus:**

Changes from an almost solid organ to a thin-walled, hollow organ & can hold 15-20 liters.

Increased production of estrogen & progesterone initiates the process of uterine growth. (hypothesis)

After the 12th week of gestation, growth is attributed to mechanical distention.

**UTEROPLACENTAL BLOOD FLOW**

Changes that begin at conception progress rapidly.

Placenta is mature at 8-10 weeks and remains larger than the fetus until 15-16 weeks.

To achieve adequate exchange of nutrients & waszxte, there is an increase in the supply of blood supply to the uteroplacental unit.

 **UTERINE CONTRACTILITY**

Braxton Hicks contractions (“false labor”) – as the pregnancy progresses these contractions can become more regular, occur at more frequent intervals, and cause discomfort.

Prenatal education needs to include: the symptoms of preterm and term labor and the importance of notifying her health practitioner with questions and concerns

**Cervix:**

The pre-pregnant cervix is firm (like top of ear).

At 4 weeks biochemical changes occur & cause the cervix to become edematous & congested with blood. Occurs in conjunction with the hypertrophy & hyperplasia of the cervical glands.

Provides support to maintain an intact pregnancy.

As delivery approaches, it softens and opens to allow delivery of the infant.

**Vagina, Perineum, & Vulva:**

Increased vascularization, softening of the connective tissue & hypertrophy of the smooth muscle (in preparation for delivery).

Vaginal mucosa thickens & the rugae (vaginal folds) become pronounced (to allow expanding without trauma during delivery).

Increased vaginal discharge, and acidic environment (to prevent growth of many bacterial infections).

**Ovaries:**

Production and release of follicles from ovaries ceases with pregnancy.

The corpus luteum is formed within the ovary & secretes progesterone, peaking at 8 days (necessary for maintenance of pregnancy).

At 6-7 wks the placenta begins manufacturing progesterone, & involution of the corpus luteum begins.

**Breasts:**

Changes are due to increased production of estrogen & progesterone.

Become full & tender early in pregnancy.

The number of mammary alveoli increase & breasts become larger (in preparation of breastfeeding).

The prepregnant size of the breasts has no effect on the ability to breastfeed!

**CHANGES OF PREGNANCY:**

**CARDIOVASCULAR SYSTEM:**

Protects normal physiologic functioning, meet the metabolic demands pregnancy imposes on the body, & provide for fetal G&D.

* Slight cardiac hypertrophy – r/t increased bld volume & cardiac output.
* The heart is elevated upward & rotated forward to the left, d/t diaphragm displacement by enlarging uterus.
* Ausculatotory changes d/t all of above. A more audible splitting of S1, S2 & S3 after 20 weeks. Systolic & dyastolic murmurs may be heard over the pulmonic area.
* Btw 14-20 weeks – the pulse increases approx. 10-15 bpm & then persists to term. Palpitations may occur. With twins maternal HR may increase 40% above prepregnant levels.
* Cardiac rhythm may be disturbed. May have sinus arrhythmia, premature atrial ctx, premature ventricular systole. No therapy needed for woman with NO preexisting heart disease; others closely monitored.
* BP: 1st trimester no change, 2nd trimester a decrease in both systolic & diastolic pressure of 5-10 mmHg, 3rd trimester BP should return to prepregnant level.
* Compression of the vena cava – when woman lies on back.
* Blood vol. Increases by approx. 1500 ml or 40-50% above prepregnant levels.
* D/T above, an increase in RBC production, a decrease in normal Hgb values (12-16) and hematocrit values (37-47%).
* Cardiac output increases from 30% to 50% over the prepregnant rate by the 32nd week; declines to approx.20% increase by 40 weeks.
* Circulation & coagulation times: a greater tendency for bld to coagulate (r/t increases in various clotting factors). Fibrinolytic activity (the splitting up or the dissolving of a clot) is depressed during pregnancy & pp period. This provides a protective function to decrease the chance of bleeding but also makes the woman more vulnerable to thrombosis, especially after cesarean birth.

**Respiratory**

Increase in maternal O2 requirements in response to acceleration in metabolic rate & the need to add to the tissue mass in the uterus & breast.

**Renal**

Responsible for maintaining electrolyte & acid-base balance, regulating extracellular fluid vol, excreting waste products, & conserving essential nutrients.

**Skin**: Alterations in hormonal balance & mechanical stretching are responsible for several changes.

* D/T hormone changes and mechanical stretching: increases in skin thickness & sub dermal fat, hyper pigmentation (linea nigra – a pigmented line from the symphysis pubis to the top of the fundus in the midline; darkening of the nipples, areolae, axillae, & vulva occurs @ approx. 16th week; facial melasma – mask of pregnancy), hair & nail growth, accelerated sweat & sebaceous gland activity, and increased circulation & vasomotor activity.
* Coetaneous elastic tissues are more fragile, resulting in striae gravidarum, or stretch marks. Coetaneous allergic reactions are common (increased itching of stretched skin).

**Musculoskeletal**

The gradually changing body & increasing weight of the pregnant woman cause noticeable alterations in posture and way of walking.

* Abdominal distention gives the pelvis a forward tilt, decreased abdominal muscle tone, and increased weight bearing which require a realignment of the spinal curvatures late in pregnancy. This shifts the woman’s center of gravity forward.
* Spinal realignments include: an increase in the normal lumbosacral curve (lordosis), and a compensatory curvature in the cervicodorsal region (exaggerated anterior flexion of the head) develops to help maintain balance.
* Aching, numbness, weakness of the upper extremities may result.
* Large breasts and a stoop-shouldered stance will further accentuate the lumbar and dorsal curves. Walking is more difficult (develop a waddling gait).
* The ligamentous and muscular structures of the middle and lower spine may be severely stressed. These and related changes often cause musculoskeletal discomfort (back ache, leg aches).

**Neurologic**

Physiologic alterations resulting from pregnancy may cause neurologic or neuromuscular symptoms.

**GASTROINTESTINAL SYSTEM:**

A variety of changes occur related to pregnancy. Appetite fluctuates. Intestinal secretion is reduced; Liver function is altered; Absorption of nutrients is enhanced.

* The colon is displaced laterally upward and posteriorly.
* Peristaltic activity (motility) decreases, resulting in decreased bowel sounds, constipation, nausea & v..
* Blood flow to the pelvis increases as does venous pressure, contributing to hemorrhoid formation in later pregnancy.

**ENDOCRINE SYSTEM:**

Profound endocrine changes are essential for pregnancy maintenance, normal fetal growth, and postpartum recovery.

* Elevated levels of estrogen & progesterone suppress secretion of follicle-stimulating hormone (FSH) and luteinizing hormone (LH) by the anterior pituitary.
* Although most women experience amenorrhea, at least 20% have some slight, painless spotting during early gestation.
* Oxytocin is produced by the posterior pituitary in increasing amounts as the fetus matures. This hormone stimulates uterine contractions during pregnancy, but high levels of progesterone prevent contractions until near term.
* Oxytocin also stimulates the let-down or milk-ejection reflex after birth in response to the infant sucking at the mother’s breast.
* Thyroid gland activity & hormone production increases.
* The peak level of parathyroid hormone occurs between 15-35 weeks gestation when the needs for growth of the fetal skeleton are greatest.
* In early pregnancy the pancreas decreases its production of insulin. Maternal insulin does not cross the placenta to the fetus.

Adrenal glands change little. Secretion of aldosterone is increased, resulting in re-absorption of excess sodium from the renal tubules. Cortisol levels are also increased.

**Role of Estrogen in Pregnancy:**

Estrogen levels increase rapidly early in pregnancy, slow between 24-32 weeks gestation and increase again toward term.

The production of estrogen is dependent on the interaction between the maternal and fetal components of the placenta.

-Increasing blood flow to the uterus by promoting vasodilatation.

-Changing the sensitivity of the respiratory system to carbon dioxide.

-Softening of the cervix, initiating uterine activity, and maintaining labor.

-Developing the breasts in preparation for lactation and secretion of prolactin by the pituitary gland.

**Role of Progesterone in Pregnancy:**

-Ready the uterus for implantation.

-Relaxes smooth muscle to prevent spontaneous abortion.

-Works to prevent a maternal immunologic response to the fetus.

-Relaxes smooth muscle

-to decrease motility & improve absorption of nutrients.

Enlarges the ureters & bladder to increase capacity.-

-Plays a role in development of the alveoli & ductal system to prepare for lactation.

**Discomforts of Pregnancy:**

**NAUSEA & VOMITING:**

* Can range from mild to severe (hyperemesis gravidarum).
* Occurs throughout the day.
* Speculated to be related to increased levels of hCG and estrogen.
* Dangerous sequelae of hyperemesis can include weight loss, dehydration, electrolyte imbalance, and starvation.
* N&V can be minimized by self-help measures.

**HEARTBURN:**

* From reflux of gastric acid contents into the esophagus & sometimes into the mouth.
* Decreased stomach & intestinal motility, softening of the cardiac sphincter & esophagus, & displacement of the stomach by the uterus – all contribute.

**CONSTIPATION:**

* Related to the changes that occur in the gastrointestinal tract, related to the pregnancy.

**FATIGUE:**

* During the 1st trimester, usually disappears by the 4th month.
* No special medical significance.

**FREQUENT URINATION:**

* Most common complaint of pregnancy, especially in 1st and 3rd trimesters.
* Kegel exercises help to prevent urinary stress incontinence.
* Educate clients to differentiate between pregnancy related frequency & UTI.

**NOSE BLEEDS & NASAL CONGESTION:**

* Capillaries inside the nose become engorged with blood during pregnancy, leading to edema & hyperemia of the nasal passages.
* Can worsen in winter when conditions are dry.
* Can be helped by using a cool mist humidifier.

**VARICOSITIES:**

* Dilated veins that occur most often in women with a predisposition for them.
* Related to changes of increased blood volume.
* Occurs most often in veins of the lower extremities, varicosities may also be present in the veins of the vulva & rectum (hemorrhoids).

**HEMORRHOIDS:**

* Varicosities of the rectum.
* May occur outside the anal sphincter or inside the anal sphincter.

**BACK PAIN:**

* Usually occurs in the lumbar region and becomes more problematic as the uterus enlarges.
* Results from changes in posture as the uterus grows.

**LEG CRAMPS:**

* Thought to result from an imbalance between the electrolytes calcium & phosphorus. (is difficult to maintain balance in pregnancy due to changes in renal absorption and diet).

Decreased circulation to the lower extremities produced by the pressure of the uterus may also contribute.

**Adaptation To Pregnancy:**

**3 Phases of attachment:**

1. The woman accepts the biological fact of pregnancy. (“I am pregnant.”)-
2. -The woman accepts the growing fetus as distinct from herself and as a person to nurture. (“I am going to have a baby.”)
3. -The woman prepares realistically for the birth and parenting of the child. (“I am going to be a mother.”)

**Maternal Adaptation:**

Emotional liability – rapid unpredictable changes in mood.

Ambivalence – conflicting feelings simultaneously (normal).

Identifying with mother role.

Marital relationship evolves over time.

Emotional attachment with fetus.

Preparation for childbirth.

**Paternal Adaptation:**

Accepting the pregnancy – may be reflected in the way he views the couple’s relative financial security & the stability of their relationship.

Identifying with the father role.

Redefining personal relationships.

Establishing a relationship with the fetus.

Preparing for childbirth.

**Sibling & Grandparent Adaptation**

**Sibling:**

Mother must devote time & effort to reorganizing her relationship with existing children.

Sibling preparation will begin the process of role transition in the family.

Include the sibling in childbirth preparation.

**Grandparent:**

The grandparent is the historian who transmits the family history, a resource person who shares knowledge based on experience; a role model; and a support person.

**Nursing Care During Pregnancy**

**Definitions Related to Pregnancy**

GRAVIDA: a woman who is pregnant.

GRAVIDITY: pregnancy. The number of pregnancies regardless of the duration or outcome.

MULTIGRAVIDA: a woman who has had two or more pregnancies.

MULTIPARA: a woman who has completed two or more pregnancies to the stage of fetal viability.

NULLIGRAVIDA: a woman who has never been pregnant.

NULLIPARA: a woman who has not completed a pregnancy with a fetus or fetuses who have reached the stage of fetal viability.

PARITY: The number of pregnancies in which the fetus or fetuses have reached viability, not the number of fetuses (example- twins) born. Whether the fetus is born alive or is stillborn (fetus who shows no signs of life at birth) after viability is reached does not affect parity.

POSTDATE OR POSTTERM: a pregnancy that goes beyond 42 weeks gestation.

PRETERM: a pregnancy that has reached 20 weeks of gestation but before completion of 37 weeks of gestation.

PRIMIGRAVIDA: a woman who is pregnant for the first time.

PRIMIPARA: a woman who has completed one pregnancy with a fetus or fetuses who have reached the stage of fetal viability.

TERM: a pregnancy from the beginning of week 38 of gestation to the end of week 42 of gestation.

VIABILITY: capacity to live outside the uterus; about 22 to 24 weeks since last menstrual period, or fetal weight greater than 500 grams.

**Initial Nursing Examination:**

**Initial interview**

Reason for seeking care; current pregnancy; Ob/Gyn Hx; medical Hx; Nutritional Hx; drug use; family Hx; social & experiential Hx; review of systems.

**Physical exam**

Provides a baseline for assessing subsequent changes; pelvic examination; assessment of the bony pelvis.

 PHYSICAL EXAM: Includes – BP, height, weight, pelvic exam, complete head-to-toe exam of all systems and extremities.

* Particular attention is paid to the size of the uterus, as this is an indicator of the timing of gestation.
* Posture and body mechanics – supine hypotension, as pregnancy progresses. Proper use of seat belts. Safety.
* Breasts – assess for inverted nipples, skin breakdown, previous breast surgery.

**Laboratory tests**

Analysis of specimens obtained during examination.

* Hgb; Hctl WBC; differential Hgb electrophoresis; Blood type; Rh & irregular antibody.
* Rubella titer; TB skin testing; U/A; Urine culture; Renal function tests (BUN, creatinine, electrolytes, creatinine clearance, total protein excretion); PAP test.
* Vaginal or rectal smear (for Chlamydia, HPV, GBS, VDRL).
* HIV antibody, hepatitis B surface antigen, toxoplasmosis; 1 hr glucose tolerance.
* 3 hour glucose tolerance.
* Cardiac evaluation; ECG, chest x-ray film & echocardiogram (for women with a history of hypertension or cardiac disease).

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**Follow-up Visits: During Pregnancy**

Visits every 4 weeks up to 28 weeks gestation (during the 1st & 2nd trimesters).

29-36 weeks visits are scheduled q2 weeks.

37-40 weeks gestation visits are q week.

Although less intense, visits include additional interview data & physical examination.

**SUBSEQUENT VISITS INCLUDE:**

* BP (to identify pregnancy-induced hyopertension – characterized by increased BP, persistent edema, and proteinuria).
* Weight (assessed for appropriate wt gain).
* Fundal height (should be consistent with dates). Uterus is palpable above the symphysis at about 12 weeks gestation; is midway between the symphysis pubis and umbilicus at 16 weeks; and at the umbilicus at 20 weeks (also measuring 20 cm). Fundal height changes arre generally considered reflective of fetal growth.
* Fetal Heart tones (assessed for rate and rhythm; 120-160bpm).
* Urine (tested for glucose or protein.
* Edema (evaluated at each visit). Dependent edema of feet & legs is not unusual toward end of pregnancy.
* Other: each visit should include an opportunity for the client to ask questions & share concerns.

**Additional Prenatal Assessments:**

**PELVIC EXAMS:**

* Usually not necessary until the time of weekly visits (the last 3-4 weeks of pregnancy).
* Cervix is evaluated for softening, thinning, and dilation.
* Fetal presenting part and status of descent after lightening are assessed.
* Leopold’s maneuvers used to evaluate the size & position of the fetus.

**LABORATORY TESTS:**

* In the absence of anemia @ initial screening, Hbg & HCT aren’t reassessed until 28-34 weeks.
* Alpha-fetoprotein screening is done at 16-18 weeks. (neural tube defects)
* Glucose screening at 24-28 weeks.
* Vaginal culture for group B Streptococcus (GBS) at 35-37 weeks.
* Antibody titer for Rh negative clients is done at 22 weeks & as necessary.
* Triple screening (maternal serum alpha-fetoprotein, hCG, & estriol) sometimes is done at 16-18 weeks as a combined evaluation of fetal well-being and for predictors of genetic or congenital anomalies.

**NUTRITIONAL ASSESSMENT:**

 is an ongoing assessment at each prenatal visit.

Refer to “Screening Tests in Pregnancy” chart on page 467 of text.

**Fetal Assessment @ Prenatal Visits:**

**Fundal Height**

Measurement of the height of the uterus above the symphysis pubis, includes the upper curve of the fundus.

**Gestational Age**

Determined from the menstrual Hx, contraceptive Hx, pregnancy test result, and other clinical evaluations.

**Health Status**

Includes consideration of fetal movement, the FHR & rhythm & abnormal maternal & fetal symptoms.

**Potential Warning Signs**

**1st Trimester:**

Severe vomiting, chills, fever, burning on urination, diarrhea, abd. cramping; vag. bleeding.

**Possible causes in 1st Trimester:**

* Hyperemesis gravidarum
* Infection
* Spontaneous abortion

**2nd and 3rd Trimesters:**

Persistent severe vomiting, PROM, UTI, severe backache or flank pain, change in fetal movement pattern, ctx.,visual disturbances, swelling of face or fingers.

H/A, convulsions, epigastric pain, glycosuria, sudden wt gain 2+kg/wk.

**Possible Causes in 2nd & 3rd Trimesters:**

* Hyperemesis gravidarum
* PROM, Spontaneous AB, placenta previa, placental separation
* Infection
* Kidney infection or stones; preterm labor
* Fetal jeopardy or intrauterine fetal death
* Preterm labor
* Hypertensive conditions, PIH, Pre-eclampsia
* Gestational diabetes mellitus
* PIH

**Diagnostic Assessment of Fetal Development:**

* **-Chorionic villi sampling (CVS)**
* Done btw 10-12 weeks gestation.
* Involves the removal of a small tissue specimen from the fetal portion of the placenta (which reflects the genetic makeup of the fetus.Approx. 90% are done d/t advanced maternal age (over35). Other indications include biochemical & molecular assays for infections or metabolic disorders.
* **-Amniocentesis**
* Done to obtain amniotic fluid which contains fetal cells.
* Possible after week 14 of pregnancy (when uterus becomes an abd. organ & sufficient fluid is available to test).
* Often done in advanced maternal age.
* Done to identify sex (important when considering genetic disorders); lung profile (looking for ferning, L/S ratio) to test lung maturity; genetic makeup (to rule out genetic disorders).
* **-Alpha-fetoprotein**
* Biochemical analysis of enzymes in amniotic fluid, can detect inborn errors of metabolism.
* High AFP levels help confirm the diagnosis of a neural tube defect such as spina bifida or anencephaly or an abd. wall defect such as omphalocele.
* May also be elevated in a normal multifetal pregnancy & with intestinal atresia, presumably caused by lack of fetal swallowing.

**-Ultrasonography**

**Lecithin – Spingomylelin Ratio**-

**Signs & Symptoms of Preterm Labor**

Periodic tightening or hardening of the uterus. Regular, frequent, hard.

Suprapubic cramping, abdominal cramping, backache

Uterine ctx q10 min or more frequently for 1 hour.

A bloody spotting or leaking of fluid from vagina.

**Educate patients:**

* Empty their bladder. Drink 3-4 glasses of water for hydration.
* Lie down tilted on side, placing a pillow on back for support.
* Check contraction sro 1 hour. Time ctx from the beginning of one ctx to beginning of the next.
* It is normal to have some ctx throughout the day. Usually occur when woman changes position.
* Call their health care provider if experiencing any of the following symptoms.

**NOTE: In Pregnancy…**

Individualized care may be implemented through the assessment process, formulation of nursing diagnoses, and planning mutually derived outcomes with the woman and her family when appropriate; evaluation of care is an ongoing process.

Culture, age, parity, and multiple pregnancy may have a significant impact on the course and outcome of the pregnancy.