TASHREEH AZA-E-TANASULYA-WA-GHAIR TABAIEE SHAKLEIN (ANATOMY OF FEMALE GENITAL TRACT AND ITS VARIATIONS, SUPPORTS AND DEVELOPMENTAL ANOMALIES)

- The female reproductive system is an intricate arrangement of structures that can separate into external and internal genitalia.
- The external genitalia comprise the structures outside of the true pelvis, including the labia majora and minora, vestibule, Bartholin glands, Skene glands, clitoris, mons pubis, perineum, urethral meatus, and periurethral area.
- The internal genitalia is the structures within the true pelvis, including the vagina, cervix, uterus, fallopian tubes, and ovaries.

Uterus

- The uterus is the central anatomical landmark of the female internal genitals and pelvic anatomy.
- It is a highly muscular, childbearing organ in females, approximating 3 x 2 x 1 inches in size in a nulliparous.
- Even though the uterus is primarily a pelvic organ, but during later stages of pregnancy due to hypertrophy and hyperplasia of the myometrium, it can reach up to the epigastric region.
- The most common anatomical position of the uterus is anteverted-anteflexed.
- Anteversion is the angulation between the long axis of the cervix and the vagina, which nears the right angle.
- Anteflexion is the angulation between the long axis of the body and the cervix, which is an obtuse angle around 120 to 125 degrees.
- The uterus is a muscular, pear-shaped organ where a fertilized egg implants and develops into a fetus during pregnancy.
- It consists of three layers: the endometrium (innermost lining), myometrium (middle muscular layer), and perimetrium (outermost layer).

Ovary

- The ovaries are the primary organs of the female reproductive system.
- They are oval-shaped gonadal structures, approximately 3 x 1.5 x 1 cm in size, and homologous with the testis in males.
- They are present in pairs with the long axis oriented downward and forward.
- The ovaries are within the pelvis, just lateral to the uterus.
- They lie within the ovarian fossa, in front of the ureters, and behind the external iliac vessels.
- In nulliparous females, they are pinkish with a smooth outer surface, but in multiparous, they are more greyish with a puckered surface due to repeated ovulations.
- The ovaries are entirely covered with peritoneum except for the mesovarian (anterior) border through which all the blood vessels, nerves, and lymphatics pass.
- They contain thousands of follicles.
- Each month, one follicle will develop into the dominant follicle (Graafian follicle), which releases an ovum during ovulation.

- The ovaries secrete two steroid hormones, estrogen, and progesterone under the direct control of follicle-stimulating hormone (FSH) and luteinizing hormone (LH) secreted by the pituitary.

Fallopian Tubes (Uterine Tubes)

- There are two fallopian tubes, one on each side of the uterus, which serve as passageways for eggs to travel from the ovaries to the uterus.
- Fertilization typically occurs within the fallopian tubes when a sperm meets an egg.
- The fallopian tubes (also known as oviduct, uterine tube) divide into the fimbriated infundibulum, ampulla, isthmus, and intramural parts.
- The ampullary part is the usual site for fertilization.
- The fallopian tube also helps in bringing the sperm and ovum to this site of fertilization.
- The infundibulum is the most later part, that is funnel-shaped with finger-like projections hanging from the sides called fimbriae.
- This part opens into the peritoneal cavity and is in contact with the ovaries through some of its fimbriae.
- The intramural is the most narrow and medial part of the fallopian tube that is present within the wall of the uterus.
- Each region represents characteristic physiologic features.
- Salpingitis is a bacterial infection of the fallopian tube. It may be acute or chronic inflammation and most commonly results from Neisseria gonorrhoeae or Chlamydia trachomatis.
- It may lead to scarring of the fallopian tubes and predispose to infertility and ectopic tubal pregnancy.
- Ectopic tubal pregnancy most commonly occurs in the ampulla of the fallopian tube.

Vagina

- The vagina is a fibromuscular canal ranging from 6 to 8 cm. in length.
- It is anatomically located anteriorly to the rectum and posteriorly to the wall of the urinary bladder and the urethra.
- This canal directs downwards and forwards, because of the oblique nature of the vagina, the anterior wall is slightly shorter, (i.e., about 6 cm compared to the posterior wall, which is about 8 cm)
- The upper segment of the vaginal forms a vaginal vault by being enclosed within the vaginal portion of the cervix.
- The vagina is a muscular, elastic tube that connects the cervix to the external genitalia.
- It serves as the birth canal during childbirth and also functions in sexual intercourse.
- Thus the cervix is divided into a supravaginal and a vaginal part.

Cervix

- The cervix is the narrow, lower portion of the uterus that connects to the vagina.
- It contains a canal that allows for the passage of menstrual blood from the uterus to the vagina and provides a pathway for sperm to enter the uterus during intercourse.

Vulva

- The vulva is the global term that describes all of the structures that make the female external genitalia.
- The components of the vulva are the mons pubis, labia majora, labia minora, clitoris, vestibular bulbs, vulva vestibule, Bartholin's glands, Skene's glands, urethra, and vaginal opening.

Mons Pubis

- The mons pubis is the fatty area located over the pubic bone and is covered with pubic hair in post-pubescent females.

Labia Majora

- These are the outer "lips" of the vulva, which enclose and protect the other external genitalia. They are typically covered in hair and contain sweat and oil glands.

Labia Minora

- These are the inner "lips" of the vulva, which are usually hairless and more delicate.
- They surround the openings of the vagina and urethra.

Clitoris

- The clitoris (which is homologous to the glans penis in males) is a sex organ in females that functions as a sensory organ.
- The clitoris can be divided into the glans clitoris and the body of the clitoris.
- It is primary source of sexual pleasure

Vestibular bulbs

- The vestibular bulbs (homologous to the bulb of the penis in males) are structures formed from corpus spongiosum tissue.
- The vestibule bulbs are two bulbs of erectile tissue that starts close to the inferior side of the body of the clitoris.
- The vestibular bulbs then extend towards the urethra and vagina on the medal edge of the crus of the clitoris.
- Eventually, the vestibular bulbs will split and surround the lateral border of the urethra and vaginal.
- The vestibular bulbs are believed to function closely with the clitoris.
- This exertion of pressure onto the clitoris is believed to induce a pleasant sensation during sexual arousal.

Vulva Vestibule

- The area between the labia minora is the vulva vestibule.
- This is a smooth surface that begins superiorly just below the clitoris and ends inferiorly at the posterior commissure of the labia minora.
- The vulva vestibule contains the opening to the urethra and the vaginal opening.
- The borders of the vulva vestibule are formed from the edge of the labia minora.
- There is a demarcation between the vulva vestibule and the labia minora called Hart's lines.

Bartholin's Glands

- The Bartholin's glands also known as the greater vestibular glands (homologous to the bulbourethral glands in males) are two pea-sized glands located slightly lateral and posterior to the vagina opening.
- These two glands function to secrete a mucus-like substance into the vagina and within the borders of the labia minora.

Perinium

- The perineum is the area of skin and tissue between the vaginal opening and the anus.

Skene's Glands

- The Skene's glands, which are also known as the lesser vestibular glands (homologous to the prostate glands in males), are two glands located on either side of the urethra.
- These glands are believed to secrete a substance to lubricate the urethra opening.
- This substance is also believed to act as an antimicrobial.
- This antimicrobial is used to prevent urinary tract infections.

Urethra

- The urethra is an extension of a tube from the bladder to the outside of the body.
- The purpose of the urethra is for the excretion of urine.
- The urethra in females opens within the vulva vestibule located inferior to the clitoris, but superior to the vagina opening.

Muscle Support to Female Genital Track

- The female genital tract, including the uterus and pelvic organs, is supported by a complex system of muscles, ligaments, and connective tissues.

- This support system is essential for maintaining the position and stability of these structures within the pelvis.
- Many muscles act on the external female genitalia either by forming and supporting the perineum or the pelvic floor.
- The major ligaments that support the uterus include the round ligament, transverse cervical ligament (cardinal ligament), uterosacral ligament, and broad ligament.

Pelvic Floor Muscle

- The pelvic floor is a group of muscles that forms the base of the pelvis.
- These muscles play a crucial role in supporting the pelvic organs, including the uterus, bladder, and rectum.
- The pelvic floor muscles also help control urination and defecation.
- We can divide these muscles into three layers:
  (1) Superficial
  (2) Intermediate,
  (3) Deep pelvic floor muscles.
- Some of the specific muscles in this region include the
  (1) Pubococcygeus
  (2) Iliococcygeus
  (3) Coccygeus muscles

Uterosacral Ligaments:-

- The uterosacral ligament plays a major role in keeping the uterus in the anteverted position.
- These ligaments connect the cervix of the uterus to the sacrum, a triangular bone at the base of the spine.

Broad Ligaments:-

- The broad ligament is a double folding of the peritoneum, divided into four regions composed of the mesosalpinx, mesovarium, mesometrium, and the suspensory ligament of the ovary.
- It overlies the ovaries, uterus and fallopian tubes, and secures the uterus laterally to the sidewall of the pelvis
- The broad ligaments are sheets of connective tissue that extend from the sides of the uterus to the walls of the pelvis.
- They provide lateral support to the uterus and help keep it in place.

Round Ligaments:-

- These ligaments extend from the front of the uterus, through the inguinal canal, and attach to the labia majora.
- The round ligaments help keep the uterus anteverted (tilted forward) and provide support to prevent excessive movement.

Cardinal Ligaments:-

- These cardinal ligament reaches from the cervix to the sidewall of the pelvis and appears at the base of the broad ligament.

- Cardinal ligaments provide important support to the uterus and upper part of the vagina.

Pubocervical Ligaments:-

- These ligaments extend from the cervix to the pubic bone, providing anterior support to the uterus, helping to prevent cystocele and upper vagina.

Transverse Cervical (Mackenrodt's) Ligaments:-

- These ligaments run horizontally across the cervix, providing additional support to the uterus and upper vagina.

Arterial Supply:-

Ovarian Arteries:-

- Each ovary is primarily supplied by the ovarian artery, which arises from the abdominal aorta.
- These arteries provide blood to the ovaries, where they play a crucial role in supplying oxygen and nutrients to the developing eggs (ova) and the ovarian tissue itself.

Uterine Arteries: -

- The uterus receives its blood supply from two uterine arteries, one on each side.
- These arteries branch off from the internal iliac arteries.
- The uterine arteries provide blood to the uterine wall, including the endometrium, myometrium, and perimetrium.
- This vascular supply is essential for the menstrual cycle, implantation, and pregnancy.

Vaginal Arteries: -

- The vagina receives its blood supply from branches of several arteries, including the uterine arteries, vaginal arteries, and pudendal arteries.
- These arteries provide blood to the vaginal wall and play a role in sexual arousal and lubrication.

Internal Pudendal Artery:-

- The internal pudendal artery perfuses the majority of the external female genitalia.
- The internal pudendal artery is a branch of the internal iliac artery.
- Once the pudendal artery branches from the internal iliac artery, it descends towards the external genitalia.
- The internal pudendal artery will then become the dominant blood supply to the female external genitalia.
- The internal pudendal artery gives rise to various branches that supply blood to the structures of the external genitalia (vulva).
- This includes the labia majora, labia minora, clitoris, and surrounding tissues.

Superficial External Pudendal Artery:-

- This artery supplies blood to the mons pubis and surrounding skin.
- The labia majora also received blood from the superficial external pudendal artery.

- The superficial external pudendal artery is a tributary of the femoral artery.

Venous

- The venous drainage of the external female genitalia is via the external and internal pudendal veins.
- The external pudendal vein will drain towards the great saphenous vein.
- The saphenous vein will drain back into the femoral vein.
- As the femoral vein ascends pass the inguinal ligament, it becomes the external iliac vein.
- While the internal pudendal vein drains back into the internal iliac vein.
- Both the external and internal iliac veins will ascend and merge to form the common iliac veins. The common iliac veins from both sides of the body will ascend to about the level of the fourth lumbar vertebra.
- At the level of the fourth lumbar vertebra, the common iliac veins merge to drain venous blood back into the inferior vena cava.
- The inferior vena cava will ascend towards the heart.

Developmental anomalies of the female genital track

- These are reffer to structural variations or abnormalities that occur during the embryonic development of the female reproductive system.
- These anomalies can affect the anatomy of the uterus, fallopian tubes, cervix, and vagina. Here are some common developmental anomalies of the female genital tract:

Mullerian Duct Anomalies:-

- The female reproductive system develops from two Müllerian ducts, which eventually fuse to form the uterus, fallopian tubes, cervix, and upper part of the vagina.
- Anomalies can occur during this fusion process, resulting in various structural abnormalities

Uterine Anomalies

- These anomalies can include a bicornuate uterus (heart-shaped), septate uterus (a wall or septum within the uterus), unicornuate uterus (one-sided), and didelphic uterus (double uterus).

Cervical Anomalies

- Abnormalities of the cervix may include a duplicated cervix or cervical agenesis (absence of the cervix).

Vaginal Anomalies

- The lower part of the vagina can be affected by anomalies like vaginal agenesis (absence of the vagina) or a vaginal septum (partition within the vagina).

Vaginal Agenesis

- Vaginal agenesis is a condition in which the vagina does not develop or is underdeveloped.
- It can occur as an isolated anomaly or in association with other congenital conditions.

Turner Syndrome

- Females with Turner syndrome have only one X chromosome instead of the typical two (45,X).
- This condition can lead to a range of reproductive system anomalies, including underdeveloped or absent ovaries and a streak gonad (abnormal ovarian tissue).

Diameters of fetal skull

Diameters	Measurement in cm (inches)	Attitude of the head	Presentation
Sub occipito-bregmatic - extends from the nape of the neck to the center of the bregma	9.5 cm (3 ¾)	Complete flexion	Vertex
Sub occipito-frontal- extends from the nape of the neck to the anterior end of the anterior fontanelle or center of the sinciput	10cm (4 inches)	Incomplete flexion	Vertex
Occipito-frontal- extends from the occipital eminence to the root of the nose (Glabella)	11.5 cm (41 ½ inches)	Marked defluxion	Vertex
Mento-vertical- extends from the mid point of the chin to the highest point on the sagittal suture	14 cm (51 ½ inches)	Partial extension	Brow
Sub mento-vertical- extends from junction of floor of the mouth and neck to the highest point on the sagittal suture	11.5 cm (4 ½ inches)	Incomplete extension	Face
Sub mento-bregmatic - extends from junction of floor of the mouth and neck to the center of the bregma	9.5 cm (3 ¾ inches)	Complete extension	Face

Transverse diameter

1. Bimastoid diameter = 7.5 cm (3 inches)
2. Bitemporal diameter = 8cm (3 ¼ inches)
3. Super-subperietal = 8.5 cm (3 ½ inches)
4. Biparietal diameter = 9.5 cm (3 ¾ inches)

Shape of pelvis inlet

1. Gynecoid pelvis = Round
2. Android pelvis = Heart / Triangular
3. Anthropoid pelvis = Oval
4. Platypelloid pelvis Flat (kidney)

Female Pelvis

- The pelvic cavity is a bowl-like structure that sits below the abdominal cavity.
- It is divides into True Pelvis & False Pelvis
- Pelvis is houses and protects the reproductive and urinary organs.
- Here are some key features and differences of the female pelvis:

Some special characters of Female Pelvis

Wider and shallower:-

- The female pelvis is generally wider and shallower than the male pelvis.
- This wider shape allows for the passage of a baby's head during childbirth.

Greater Angle:-

- The angle formed by the pelvic bones (pubic arch) is wider in females, making it more open.

Broader Sciatic Notches: -

- The sciatic notches, located on each side of the sacrum, are wider and more U-shaped in females, which provides more space for the passage of the sciatic nerve.
- In males, they are narrower and V-shaped.

Ischial Spine:-

- The ischial spines, found on the ischium bone, are shorter and blunter in females compared to the longer, sharper ischial spines in males.

Pubis Symphisis:-

- The pubic symphysis, where the two pubic bones meet at the front of the pelvis, is more flexible in females. This allows for some movement during childbirth.

Pelvis outlet:-

- The pelvic outlet, at the bottom of the pelvis, is wider in females to facilitate childbirth.

Two types of pelvis are present True Pelvis & False Pelvis

Characters	True Pelvis / Lesser pelvis / Pelvic cavity	False Pelvis / Greater pelvis / Upper pelvis
Location	The true pelvis is situated below the pelvic brim or inlet, which is formed by the pelvic bones (ilium, pubis, and ischium) and the sacral promontory (the anterior edge of the sacrum).	The false pelvis is situated above the pelvic brim, which is formed by the pelvic bones (ilium, pubis, and ischium) and the sacral promontory (the anterior edge of the sacrum).
Shape	The true pelvis is typically described as a bony basin with an inlet, outlet, and sidewalls. It has a more rounded shape compared to the broader, flatter false pelvis.	It has a flatter and more bowl-like shape compared to the true pelvis, which is located below the pelvic brim and has a more rounded, bony basin shape.
Function	The primary function of the true pelvis is to provide support and protection for the pelvic organs, including the urinary bladder, uterus (in females), rectum, and part of the sigmoid colon. It also serves as the birth canal during childbirth.	The primary function of the false pelvis is to support and protect the abdominal organs, including the intestines, stomach, and part of the liver. It provides a stable base for the abdominal cavity.
Attachment's	Numerous muscles, such as the pelvic floor muscles, and ligaments provide support and stability to the true pelvis. The pelvic floor muscles, including the levator ani and coccygeus muscles, are particularly important in maintaining pelvic organ support and controlling urination and defecation.	The false pelvis also serves as an attachment point for several muscles and ligaments that connect to the spine and the lower limbs. For example, the psoas major muscles, which are important for hip flexion, originate in the false pelvis.
Cavity Dimensions	The true pelvis can vary in size and shape among individuals. These variations can impact childbirth and may be important considerations in obstetrics.	The dimensions of the false pelvis, also known as the greater pelvis or upper pelvis, can vary among individuals, but it is generally characterized by its broader and flatter shape compared to the true pelvis, which is located below the pelvic brim.

Shape of different Pelvis

Gynecoid Pelvis	**Round Shape**
Android Pelvis	**Heart Shape**
Anthropoid Pelvis	**Oval Shape**
Platypelloid Pelvis	**Transverse Oval Shape**

Boundaries & diameters of pelvis

	Pelvic Inlet	Pelvic Cavity	Pelvic Outlet
Shape	**Round**	**Circular**	**Diamond**
Diameter (Anterio-posteriorly)	**11**	**12**	**13**
Obliquely	**12**	**12**	**12**
Transversely	**13**	**11**	**-**

Important Points

- The shortest diameter in a foetal skull is bitemporal
- An abnormal attitude is illustrated by face presentation
- The smallest diameter of the true pelvis is interspinous diameter
- The shortest diameter of fetal head is bimastoid diameter (7.8cm) <bitemporal (8cm)
- Shortest diameter is obstetric conjugate
- Longest diameter of fetal skull is mento-vertical(14cm)>submento-vertical (11.8cm)
- Critical obstetric conjugate for trial of labour is 10cms
- Most important diameter of pelvis during labor is inter spinous diameter.
- Best method of detecting CPD is Trial of labor> pelvic assessment
- One ala of sacrum absent— NAEGELE'S PELVIS
- Both ala of sacrum absent — ROBERT PELVIS

Resuscitation of a newborn

NEONATAL RESUSCITATION AND APGAR SCORE

1. True regarding neonatal resuscitation Mouth suctioning earlier than nasopharyngeal suctioning
2. Bag and mask ventilation is contraindicated in Congenital Diaphragmatic hernia
3. Not a component of APGAR Score: Respiratory rate per minute

Equipment Required for Neonatal Resuscitation:

- Resuscitation Table or Firm Surface: A flat, firm surface is used to provide a stable platform for resuscitation procedures.
- Warmth Source: A radiant warmer or a heat source like a pre-warmed radiant heat mattress or warm towels is used to maintain the baby's body temperature.
- Suction Device: A bulb syringe or suction catheter is used to clear the baby's mouth and nose of any fluids or mucus that may obstruct breathing.
- Positive-Pressure Ventilation Device: This can include a bag-mask device or a T-piece resuscitator, used to deliver positive-pressure breaths to assist the baby's breathing.
- Oxygen Source: An oxygen supply, usually via an oxygen blender, is used to provide supplemental oxygen if needed.
- Monitoring Equipment: This may include a pulse oximeter to measure the baby's oxygen saturation and a cardiac monitor to assess heart rate.

Drugs Used for Neonatal Resuscitation:

- Epinephrine: Epinephrine is administered in certain situations, such as when the baby's heart rate remains low or absent despite adequate ventilation and other resuscitative measures.

Steps for Neonatal Resuscitation:

1. Initial Steps:
   - Ensure a clear airway by suctioning the baby's mouth and nose if necessary.
   - Dry the baby and place them on a warm surface.
   - Assess the baby's heart rate, breathing effort, and color.
2. Positive-Pressure Ventilation:
   - Provide positive-pressure ventilation with a bag-mask device or a T-piece resuscitator if the baby is not breathing or has ineffective breathing efforts.
   - Ensure the baby's airway is open and deliver gentle breaths.
3. Chest Compressions:
   - If the baby's heart rate remains low or absent despite adequate ventilation, chest compressions may be initiated.
   - The technique and ratio of chest compressions to ventilation depend on the specific circumstances and guidelines in place.
4. Medications:
   - In some cases, if the baby's heart rate does not respond to ventilation and chest compressions, epinephrine may be administered under specific dosing guidelines.
5. Continued Monitoring and Support:
   - The baby's vital signs, heart rate, breathing, and oxygen saturation are continuously monitored during resuscitation.
   - Additional interventions, such as intubation or other advanced procedures, may be considered if needed.

Examination of a Newborn

- The examination of a newborn baby, also known as the newborn assessment, is a comprehensive evaluation of the baby's overall health and well-being.

- This examination is typically performed shortly after birth by a healthcare professional, such as a pediatrician, midwife, or nurse. Here are the key components of a newborn examination:

General Observation:

- The healthcare professional will observe the baby's general appearance, including their skin color, activity level, and responsiveness.
- They will note any obvious abnormalities or signs of distress.

Vital Signs:

- The baby's vital signs will be measured, including heart rate, respiratory rate, temperature, and blood pressure.
- This provides an assessment of the baby's basic physiological functions.

Measurements:

- The baby's weight, length, and head circumference will be measured and recorded.
- These measurements serve as indicators of growth and development.

Eye Examination:

- The healthcare professional will inspect the baby's eyes for normal alignment, red reflex (indicative of proper eye development), and signs of infection or abnormalities.

Nose Examination:

- The healthcare professional will assess the baby's nasal passages for patency and the presence of any blockages or abnormalities.

Heart and Lung Examination:

- The healthcare professional will listen to the baby's heart and lungs using a stethoscope to detect any abnormal heart sounds, murmurs, or respiratory issues.

Abdominal Examination:

- The baby's abdomen will be gently palpated to check for any masses, organ enlargement, or abnormalities.

Genital Examination:

- The healthcare professional will assess the baby's genitalia, looking for normal development and any signs of abnormality.

Skin Examination:

- The healthcare professional will examine the baby's skin for rashes, birthmarks, skin color abnormalities, bruising, or any signs of infection.

Neurological Examination:

- The baby's reflexes, muscle tone, and overall neurological function will be assessed.
- The healthcare professional will check for the presence of primitive reflexes, such as the Moro reflex and rooting reflex.