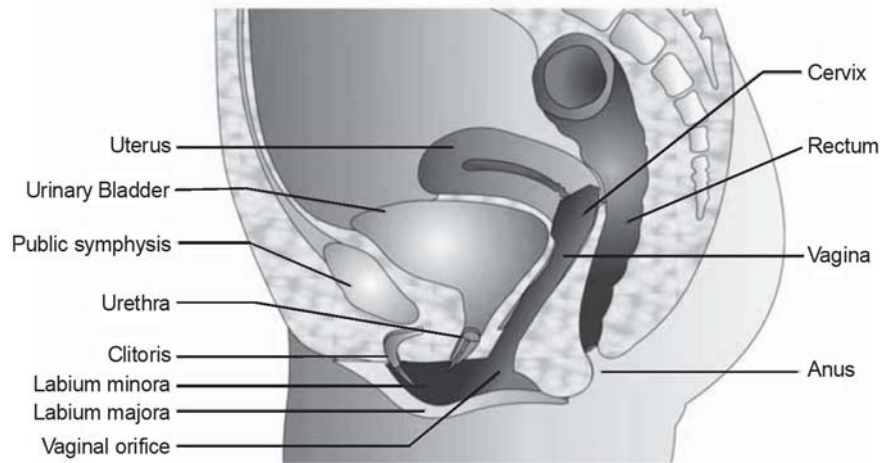
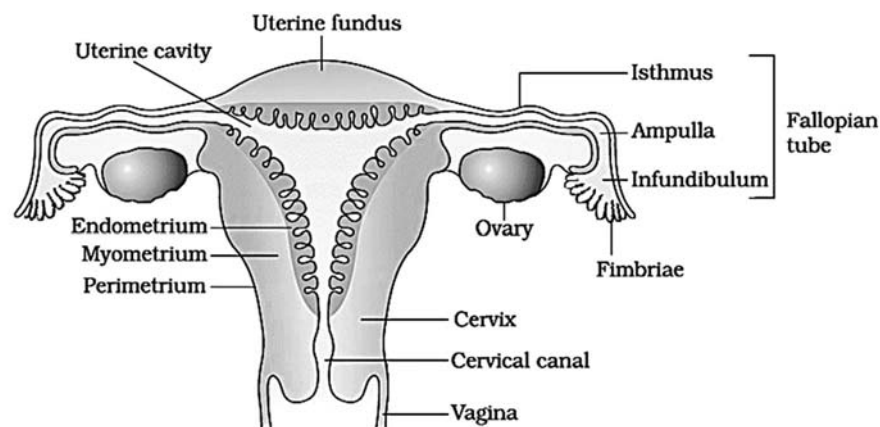


## FEMALE REPRODUCTIVE SYSTEM

The main and most important organs in the female reproductive system are the ovaries, which come in a pair. These ovaries are found in the abdominal cavity within a space called the ovarian fossa. Each ovary is connected to the back layer of the broad ligament, also known as the peritoneal ligament, using something called mesovarium. Mesovarium is a short fold of peritoneum, acting as a path for vessels and nerves to reach the ovary.



**Fig. :** Diagrammatic sectional view of female pelvis showing reproductive system



**Fig. :** Diagrammatic sectional view of the female reproductive system

### Ovaries

- Ovaries come in pairs and are responsible for creating secondary oocytes as well as important hormones like progesterone, estrogen (the main female hormone), inhibin, and relaxin.
- These almond-shaped organs, each measuring 2-4 cm, develop from the same embryonic tissue as the testes.
- Positioned on either side of the pelvic cavity, each ovary is secured by ovarian ligaments connected to the uterus wall and linked to the peritoneal ligament through the mesovarium. Blood vessels and nerves enter through the mesovarium.
- The ovary is covered by a cuboidal-shaped visceral peritoneum. Inside, there's a layer called germinal epithelium or primordial germ cells. Below this layer, you'll find connective tissue known as the tunica albuginea. Inside the ovary, the ovarian stroma is divided into a dense cortex on the periphery containing ovarian follicles, and a less dense medulla in the center housing blood vessels and nerves.

**Accessory organs**

Just like the testes, the female reproductive system also has various additional organs that play important roles. These include:

**i. Oviduct:**

- The oviduct, also called the fallopian tube, is a pair of tubes in females. These tubes stretch from the uterus sideways and carry secondary oocytes from the ovaries to the uterus.
- They are about 10-12 cm long and, just like the ovaries, are connected to the peritoneal ligament.

**Histology Of Oviduct :****a. Outer Layer**

Known as serosa or adventitia, it is the outermost layer of the visceral-peritoneum (Perimetrium).

**b. Muscle Layer**

The middle part of the oviduct is composed of unstripped muscle. In the uterus, you can find thick bundles of smooth muscle known as myometrium.

**c. Mucous membrane**

This is the innermost layer, made up of mucous membrane. The mucosa has a simple columnar epithelium containing both ciliated and secretory cells. The secretory cells produce a thick liquid film that provides nutrition and safeguards the ovum. In the uterus, this mucosa is called the endometrium, containing tubular glands, many fibroblasts, and blood vessels. During pregnancy, the embryo attaches to the endometrium. The uterus walls have the longest unstripped muscles in the body.

**ii. Uterus**

The uterus, also known as the womb or hystera or metra, sits between the urinary bladder and the rectum and has the shape of an upside-down pear.

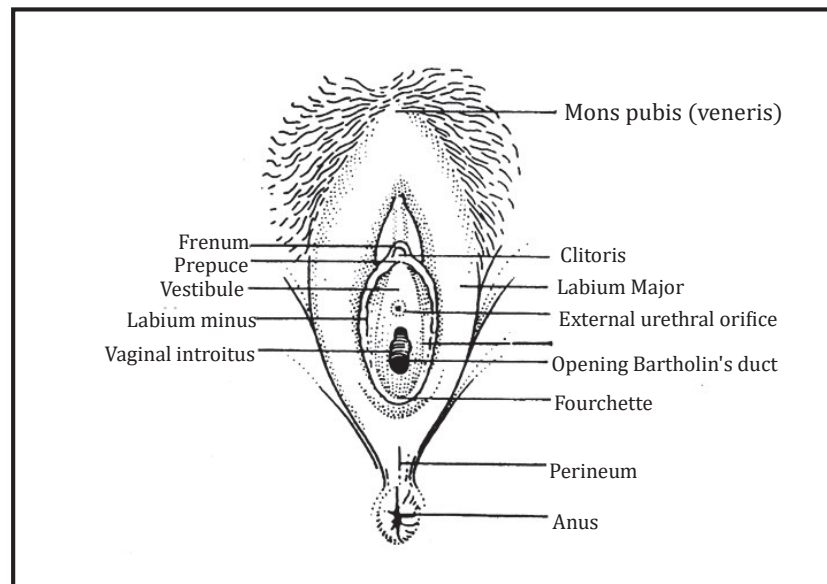
- The uterus has different parts: the top, dome-shaped section above the uterine tubes is called the fundus, the narrowing central part is the body (or corpus), and the slender portion opening into the vagina is the cervix. Inside the body of the uterus is the uterine cavity.
- The cervix connects to the front wall of the vagina and opens into it. The cervix has two openings: one called internal is that connects to the upper part of the uterus, and the other called external os that connects to the vagina. Together, the cervix and vagina create the birth canal.
- Supporting ligaments are attached to the back of the pelvic wall. The uterus wall has three layers: the outermost layer at the edges is called perimetrium (visceral peritoneum).
- The middle muscular layer is the myometrium, consisting of strong, thick, and long smooth muscles. During childbirth, these muscles work together to push out the fetus.
- The innermost layer is the endometrium, made up of stratum Basale and a more superficial stratum functionable. It includes tubular glands for producing mucous. The endometrium has many glands whose secretions nourish sperm and the zygote. It either nourishes a developing fetus or is shed every month during menstruation if fertilization doesn't happen.

**Types Of Uterus :**

- Duplex:** This is the simplest type of uterus, where both uteri are entirely separate and each has its own opening into the vagina. For example, in rats.
- Bipartite:** In these uteri, the lower parts are fused, and there is a dividing wall between them. This is seen in carnivorous mammals.
- Bicornuate:** The lower parts of the two uteri are joined, but there is no dividing wall between them. This is found in rabbits.
- Simplex:** Both uteri are completely fused to form a single structure. This is the most developed form, seen in humans.
- In humans,** the most developed form of the uterus results from the complete fusion of both uteri, forming a pear-shaped structure.

**(iii) Vagina:**

- The vagina is a tube that runs from the outside of the body to the cervix of the uterus. It acts as a passage for the penis during sexual intercourse, lets out menstrual flow, and serves as the pathway for childbirth, made of smooth muscles.
- It's a muscular tube approximately 8 cm long, internally lined with non-keratinized stratified squamous epithelia.
- The vagina's mucosa contains a lot of glycogen. When *Lactobacillus* bacteria break down glycogen, it produces organic acids, creating an acidic environment with a pH of around 3.5. This acidity slows down the growth of microbes and is also not suitable for sperm.
- There's a thin fold of mucous membrane called the hymen that partly covers the vaginal opening. The vagina itself does not have glands.

**(iv) External Genitalia/Vulva**

- The word vulva or pudendum describes the outer parts of a female's private area.
- Vulva is a term for the external genitalia of females, which includes the mons veneris, labia majora, labia minora, clitoris, vestibule, and the surrounding perineum.

**Mons veneris (mons pubis)**

It's a cushion of tissue under the skin located in front of the pubic bone. In adult females, it's covered by pubic hairs.

**Labia Majora**

The vulva is surrounded on each side by raised areas and folds of skin and tissue beneath the skin. Its inner surface doesn't have hair.

On the outer side, there are sebaceous glands, sweat glands, and hair follicles. It is similar to the scrotum in males.

**Labia Minora**

These are two thin skin folds found just inside the outer lips (labia majora). The lower part of the inner lips (labia minora) comes together in the middle and creates a skin fold known as the fourchette.

**Clitoris**

The clitoris is a small, cylindrical, and erectile body formed by the fusion of two inner lips (labia minora), located at the front part of the vulva. It's comparable to the penis in males and is also made up of two erectile bodies called corpora cavernosa. The covering skin on the clitoris's tip is called the prepuce.

Towards the end of the vagina, the urethra opens separately, forming a shared area called the vaginal vestibule or urinogenital sinus. The vagina exits through a narrow opening or triangular space known as the vestibule. The vulva has three openings:

- a. Urethral opening – found at the front
- b. Vaginal orifice – located at the back  
It is partly closed by a membrane called the hymen, but this may not necessarily indicate virginity.
- c. Openings of Bartholin's duct on either side.

**Female accessory reproductive Glands:****(i) Bartholin / Greater vestibular glands**

1 pair on each side of vagina. Homologous to Cowper's gland of male. Secretion is clear, alkaline and viscous.

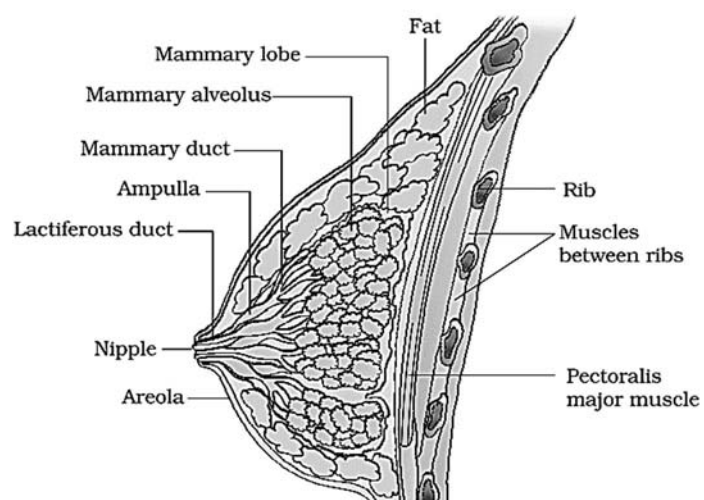
**(ii) Skene's/Paraurethral/Lesser Vestibular Glands**

Many in number, open on each side of vagina. Homologous to prostate gland of male.

**(iii) Mammary Gland:**

- The mammary glands, found in the breasts, are modified sweat glands that produce milk. Each breast has a pigmented projection called the nipple, surrounded by circular pigmented skin called the areola.
- Internally, each mammary gland is made up of 15-20 lobes arranged in a circular pattern, separated by fat tissue and connective tissue strands known as suspensory ligaments (Cooper's ligaments) that support the breast. Each lobe is further divided into smaller lobules, containing milk-secreting glands called alveoli. The alveoli cells release milk, stored in their cavities. Alveoli open into mammary tubules, and these tubules from each lobe join to create mammary ducts. Several ducts join to form a wider mammary ampulla, connected to a lactiferous duct through which milk is drawn out.
- At birth, mammary glands are underdeveloped, appearing as slight elevations on the chest. With the onset of puberty influenced by estrogens and progesterone, the duct system matures, and fat is deposited, increasing breast size. Areola and nipple also grow larger and become darker.
- The mammary gland's functions involve synthesizing, secreting, and ejecting milk, collectively known as lactation, associated with pregnancy and childbirth. Nipples are vestigial in males.
- Gynaecomastia is the development of breasts in males due to the underproduction of DHEA from the adrenal cortex.
- The pathway of milk secretion is as follows:

Alveoli → Mammary tubules → Mammary duct → Mammary Ampulla → Lactiferous ducts.



**Fig.** A diagrammatic sectional view of mammary gland