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ROLE OF FSH: INSIGHT INTO PREGNANCY COMPLICATIONS

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ABSTRACT:

Follicle-stimulating hormone (FSH) and luteinizing hormone (LH) play pivotal roles in the regulation of female reproductive processes, orchestrating the complex cascade of events necessary for successful conception and pregnancy. This review explores the multifaceted effects of FSH and LH on pregnancy, encompassing their roles in follicular development, ovulation, corpus luteum function, and early pregnancy maintenance.

Keywords: Hormones, Gonadotropin-releasing hormone, Follicle stimulating hormone(FSH), Luteinizing hormone(LH), Infertility.

HORMONES:

Hormones serve as chemical couriers generated by glands within the endocrine system. They travel through the bloodstream to target tissues or organs, where they regulate various physiological processes and maintain homeostasis in the body.

TYPES OF HORMONES:

- Adrenocorticotropic hormone (ACTH)
- Antidiuretic hormone (ADH)
- Gonadotropin-releasing hormone (GnRH)
- Follicle-stimulating hormone (FSH)
- Luteinizing hormone (LH)
- Oxytocin
- Prolactin

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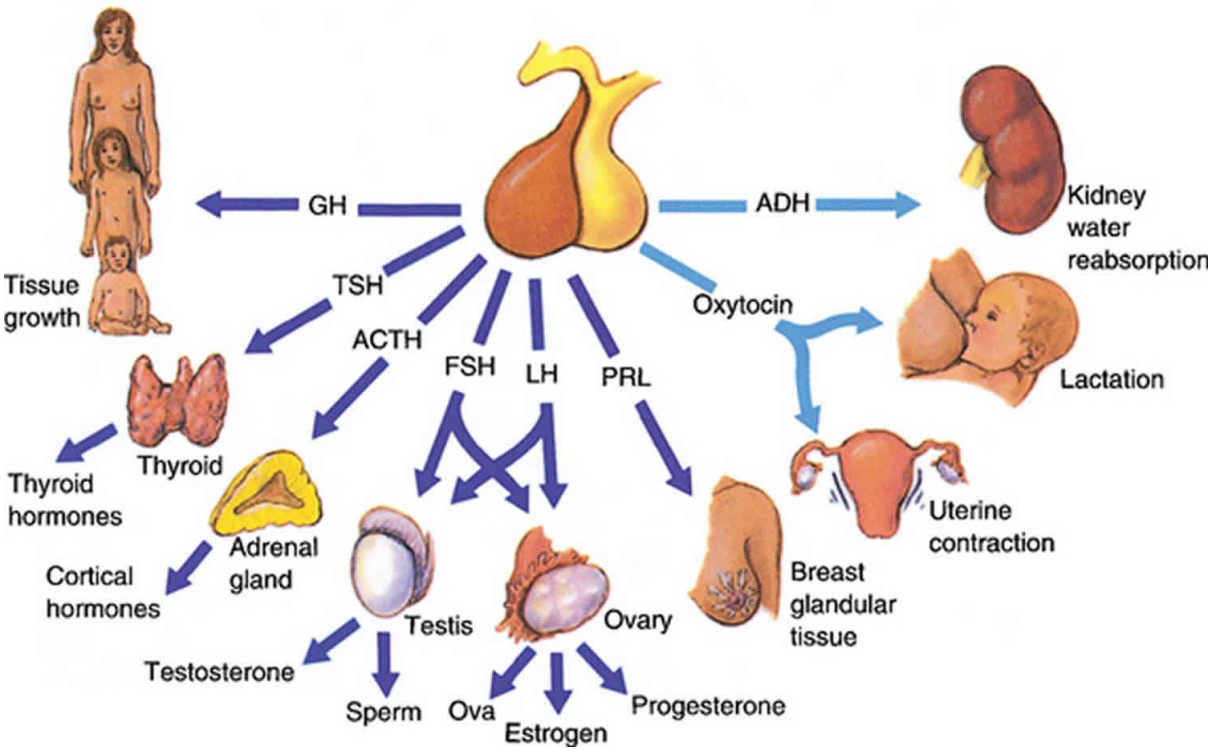
- Thyroid-stimulating hormone (TSH)
- Growth hormone (GH)



ADRENOCORTICOTROPIC HORMONE(ACTH):

It is secreted from the anterior pituitary gland. The hypothalamic-pituitary axis controls it. The release of ACTH triggers adrenal glands to produce cortisol (stress hormone) and androgens (a group of sex hormones).[1]

ANTIDIURETIC HORMONE(ADH):

ADH is produced in the hypothalamus and is secreted into the blood by the posterior pituitary gland. It is also called by the name of Vasopressin. It acts on the kidney and causes retention of water. The release of ADH is controlled by several factors like changes in plasma osmotic pressure, volume status, and blood pressure homeostasis.[2]

GONADOTROPIN-RELEASING HORMONE(GnRH):

Kisspeptin functions within the hypothalamus to prompt the release of the Gonadotropin-releasing hormone, which in turn triggers the pituitary gland in the endocrine system to produce follicle-stimulating hormone (FSH). Those gonadotropins (hormones) make the sex hormones testosterone, estrogen and progesterone. GnRH is vital to your sexual maturity, sex drive, and fertility. [3]

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FOLLICLE-STIMULATING HORMONE(FSH):

FSH is produced by the anterior pituitary gland in response to GnRH. Follicle-stimulating hormone (FSH) plays a crucial role in the reproductive system by promoting the development of ovarian follicles, which in turn produce estrogen and progesterone in the ovaries, contributing to the regulation of menstrual cycles in women. In men, FSH is a part of the development of the gonads and sperm production.[4]

LUTEINIZING HORMONE(LH):

LH is synthesized in the anterior pituitary gland in response to GnRH. It plays a major role in sexual development in children and fertility in adults. It triggers the release of an egg from the ovary in menstruating women. In men, LH causes the testicles to make the hormone testosterone, which is important in making sperm.[5]

OXYTOCIN:

It is produced in the hypothalamus and released into blood bloodstream by the posterior pituitary gland. It is also described as a love hormone. Oxytocin induces labor, the release of milk after birth, and improves human behavior and emotional attachment.[6]

PROLACTIN:

It is secreted from the specialized cells of the anterior pituitary gland. This polypeptide hormone, known as prolactin, governs lactation and breast development. Various factors such as nipple stimulation, light exposure, olfaction, and stress can all influence the initiation of prolactin synthesis in these tissues. Males have characteristically low levels of prolactin.[7]

THYROID-STIMULATING HORMONE(TSH):

The anterior pituitary gland produces TSH. This substance activates the thyroid gland to produce the vital thyroid hormones, thyroxine(T4) and triiodothyronine(T3), by attaching to receptors within the gland. Thyroxine(T4) and triiodothyronine(T3) are indispensable for regulating the body's metabolic rate, heart and digestive functions, muscle coordination, brain maturation, and bone health.

GROWTH HORMONE(GH):

Growth hormone (GH) is released by the anterior pituitary gland. It regulates the fat, muscle, tissue, bone, and other aspects of our metabolism such as insulin action and blood sugar levels. It's crucial for typical physical development in children, with levels increasing steadily throughout childhood and reaching their peak during puberty.[9]

FOLLICLE STIMULATING HORMONE(FSH):

FSH belongs to the category of gonadotropins, which are glycoprotein polypeptide hormones. It is synthesized and secreted by the anterior pituitary gland and regulates the development, growth, pubertal maturation, and reproductive processes of the

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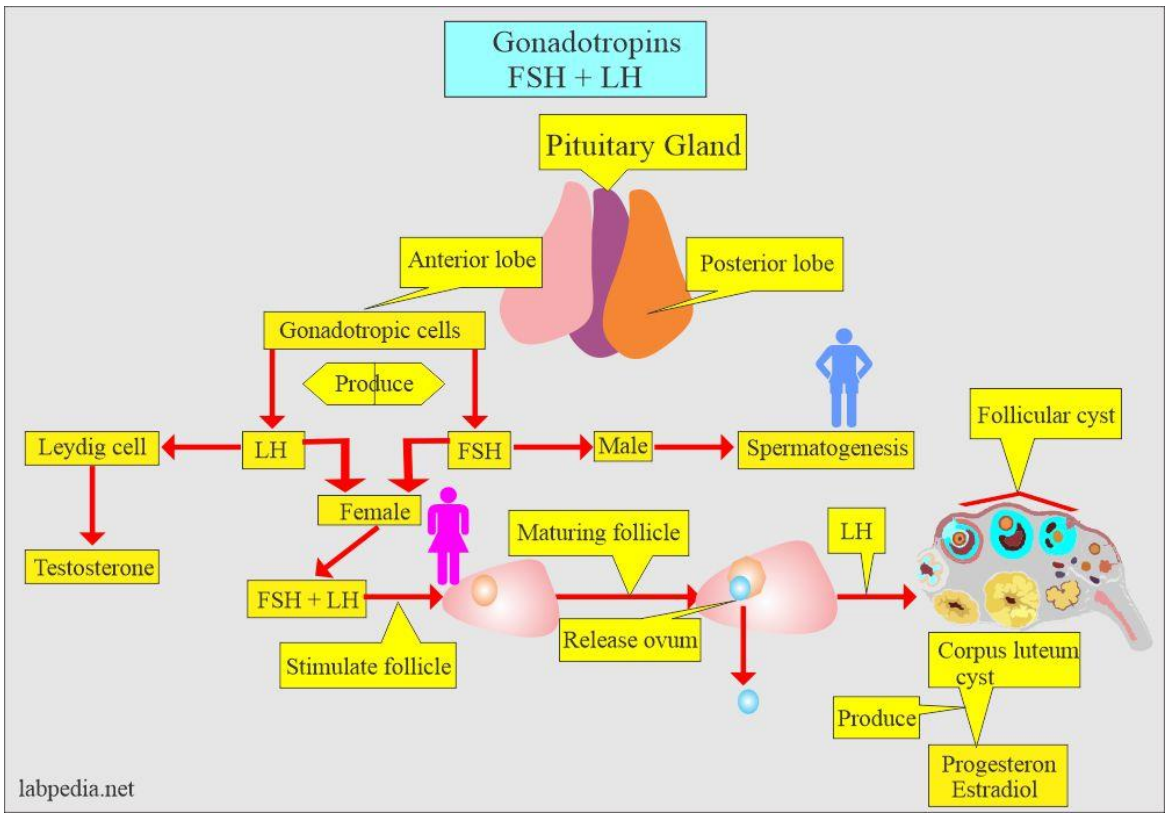
body. FSH levels in women before puberty: 0 to 4.0 mIU/mL (0 to 4.0 IU/L) during puberty: 0.3 to 10.0 mIU/mL (0.3 to 10.0 IU/L) women who are still menstruating: 4.7 to 21.5 mIU/mL (4.5 to 21.5 IU/L) after menopause: 25.8 to 134.8 mIU/mL (25.8 to 134.8 IU/L)

The production and release of FSH are regulated by the levels of several circulating hormones released by the ovaries and testes. This mechanism is known as the hypothalamic–pituitary gonadal (HPG) axis. Gonadotrophin-releasing hormone (GnRH) is released from the hypothalamus. It binds to receptors in the anterior pituitary gland to stimulate the synthesis and release of follicle-stimulating hormone (FSH) and luteinizing hormone (LH). By the description of a hormone, the follicle-stimulating hormone (FSH) released travels through the bloodstream and attaches to receptors located in the testes and ovaries.



In females, as follicle-stimulating hormone (FSH) levels decline toward the conclusion of the menstrual cycle, this triggers the hypothalamus to detect the decrease, prompting increased production of gonadotropin-releasing hormone (GnRH). Consequently, GnRH stimulates the pituitary gland to secrete greater quantities of both follicle-stimulating hormone (FSH) and luteinizing hormone (LH) and release these into the bloodstream. The increase in follicle-stimulating hormone (FSH) fosters the development of the follicle within the ovary. Conversely, in males, the secretion of follicle-stimulating hormone (FSH) is governed by the levels of inhibin circulating in the body. In instances where spermatogenesis faces obstacles, reduced production of inhibin by the testes occurs. Normally, inhibin acts to restrain the release of FSH from the pituitary gland. Consequently,

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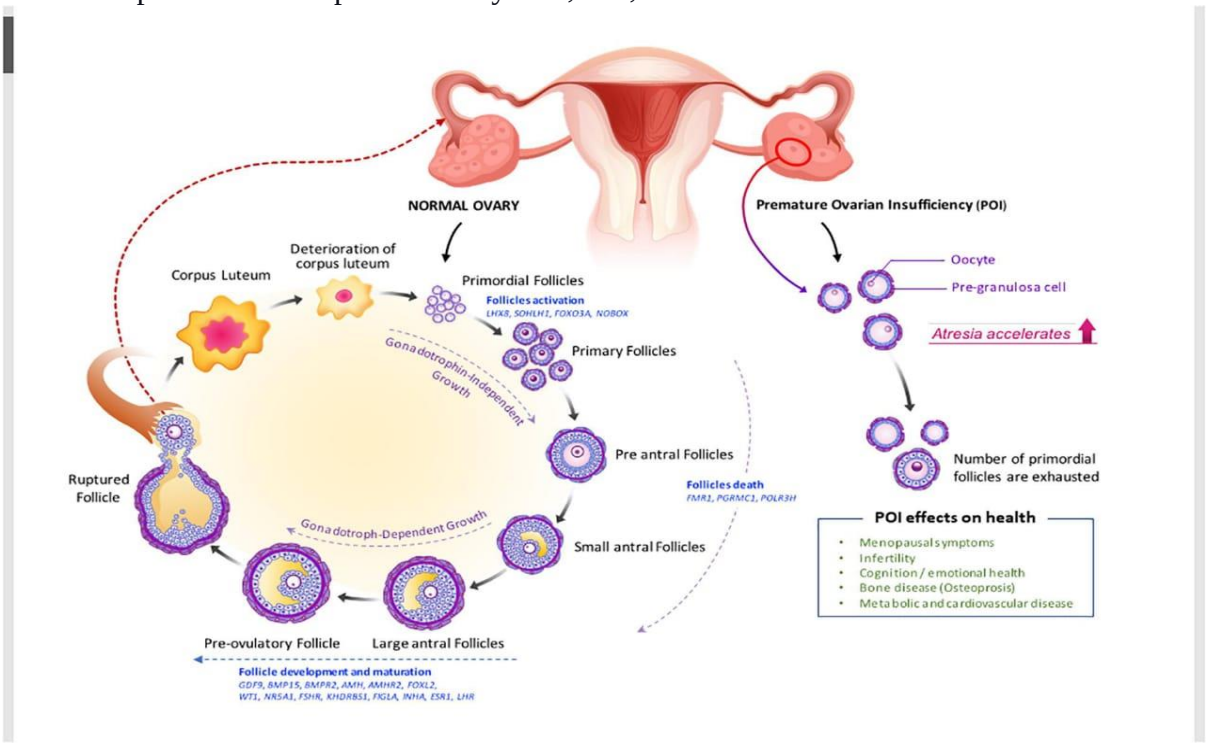
compromised spermatogenesis results in diminished inhibin levels, prompting an elevation in FSH secretion from the pituitary gland.[10],[11]

INFERTILITY:

Infertility is a medical condition characterized by the inability to conceive a child or carry a pregnancy to full term after a prolonged period of unprotected sexual intercourse. Infertility can be temporary or permanent and may require medical intervention, such as fertility treatments or assisted reproductive technologies, to achieve pregnancy.

REASONS FOR INFERTILITY IN WOMEN:

- Ovarian reserve syndrome
- Endometriosis
- Polycystic ovarian syndrome (PCOS)
- Primary ovarian insufficiency
- Damaged fallopian tubes
- Structural problems of Reproductive system, etc.,



EFFECTS OF FSH&LH ON FERTILIZATION:

The patients who produce high levels of FSH >10mlU/ml are most likely to have Ovarian reserve syndrome which ultimately means the quality and the quantity of the primordial follicular pool is reduced. The levels of FSH & LH levels increase simultaneously. Both the FSH and LH stimulate normal follicular growth and ovulation. Whereas the high levels of

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FSH & LH are causing the premature release of an ovule, it is because the high FSH & LH levels of these hormones trigger the release of egg from the ovary. Due to the underdevelopment of the egg fertilization is highly impossible.

FSH levels are generally increased during menopause, mitochondrial dysfunction, low levels of sex hormones, etc. The increase in FSH is mostly seen when the levels of sex hormones (estrogen, progesterone) are decreased then the hypothalamus gets stimulated and signals the anterior pituitary to release GnRH. It increases the secretion of FSH & LH. These kinds of problems are rectified using ART techniques (Assisted reproductive technologies) in this FSH levels are controlled by hormonal therapy i.e., progesterone and estrogen are given to the patient to control the FSH&LH.

The primary determinant influencing egg quality is age, although various other factors such as certain medical conditions, medications, genetic predispositions, and environmental elements can also contribute to diminished egg quality. Endometriosis, commonly known as chocolate cyst, is among the causes of egg poor quality. Incorrect chromosome numbers, smoking, chemotherapy, radiotherapy, some immunological diseases, obesity, and ovarian cysts can cause negative egg quality. Antibiotics, which are used irregularly and without the recommendation of a doctor, lead to disruption of the vaginal flora in women and the appearance of fungal infections. This diminishes the capacity of sperm, the male reproductive cell, to effectively navigate, thereby decreasing the likelihood of fertilizing the egg or impeding the ability of the fertilized egg to implant in the uterus. Stress alone can constitute a significant factor contributing to infertility. That's why it's important to stay away from stress. Caffeine, cigarettes, and alcohol use do not reduce stress levels but are also factors that negatively affecet ovarian quality. [12]

Infertility due to high levels of FSH can be treated by hormonal therapy. For women who are facing problems due to high follicle-stimulating hormones - estrogen and progesterone are used in hormonal therapy. Some people opt for Assisted Reproductive Technology (ART). ART encompasses all fertility interventions that involve the manipulation of eggs or embryos. Typically, ART procedures entail the surgical extraction of eggs from a woman's ovaries, followed by, combining them with sperm in the laboratory, and returning them to the woman's body or donating them to another woman. Women who opt for ART procedures are prescribed Progesterone throughout the pregnancy.[13]

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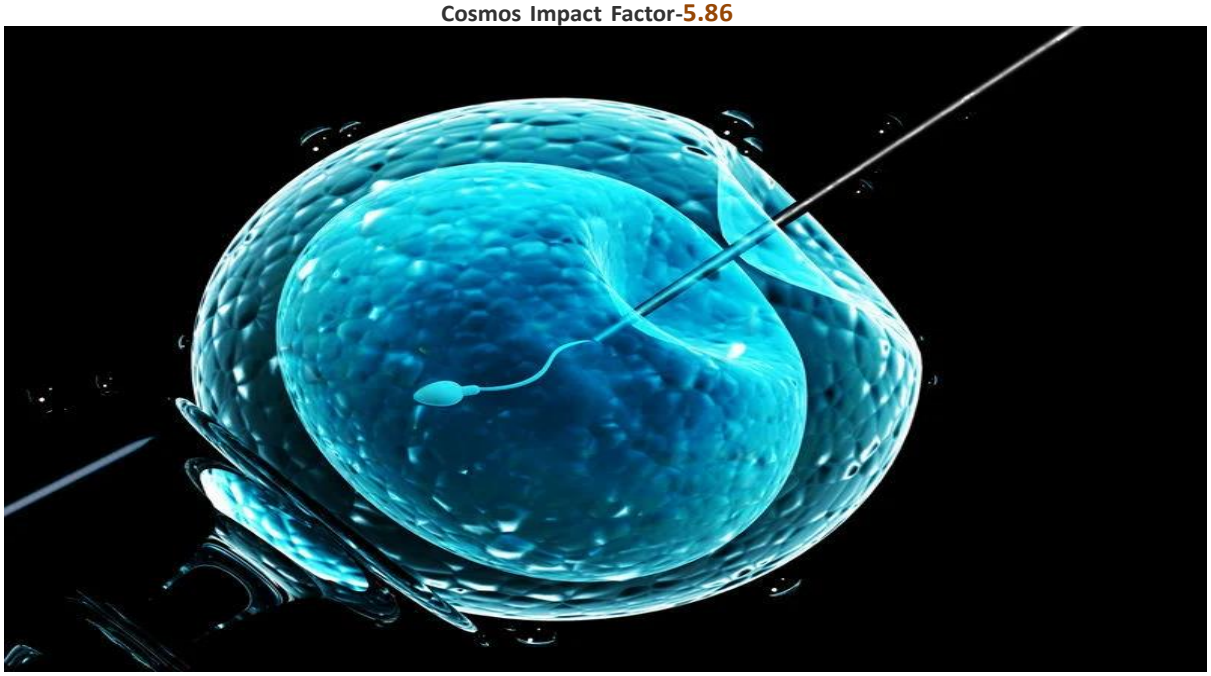

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