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Research Article

MULTIPLE APPROACHES IN AYURVEDA FOR PATHO-PHYSIOLOGY IN POLYCYSTIC OVARIAN SYNDROME

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ABSTRACT
The most prevalent endocrine condition in women is polycystic ovary syndrome (pcos).the clinical presentation of pcos ranges between mild menstrual dysfunction and extreme reproductive and metabolic function disruption. According to modern science, the physiology related to ovulation is controlled by hormones of hypothalamo – pituitary – ovarian axis. This axis is disturbed in pcos. According to ayurveda, patho-physiology involves vitiated doshas i.e. Vata, pitta, kapha and agni – especially dhatwagni. The patho-physiology of pcos is analysed to clarify the precise cause of the disorder in order to prepare therapy for a full cure. Multiple approaches in ayurveda for patho-physiology in polycystic ovarian syndrome. It is evident in conclusion that pcos is an enigma. There is no complete understanding of its fundamental pathophysiology as per modern science. No therapy is a panacea, as therapies have so far been targeted at the symptoms but not at the syndrome itself.

KEYWORDS: Polycystic Ovary Syndrome, Patho-physiology, mild menstrual dysfunction, extreme reproductive, metabolic function

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INTRODUCTION
The most common endocrine disorder affecting women aged 18 to 44 years is polycystic ovary syndrome (PCOS).It affects approximately 2% to 20% women of this age group. The condition accounts for 30% of all cases of infertility, with 73% of women suffering from PCOS experiencing anovulation-related infertility. (1)

In Polycystic Ovarian Syndrome, there is often a common complaint of "irregular menstrual cycle" from almost all the patients. The menstrual cycle is controlled mainly with the help of normal hormonal levels. (2) Here it is necessary to go through physiology of menstrual cycle so that it will help for better understanding of pathology of PCOS due to disturbed hormonal levels of irregular menstrual cycle.

The condition is studied as per Ayurveda to search for signs of the dosha responsible for the illness. To fully understand the dosha responsible, what modern medicine has explained about physiology regarding PCOS, needs to be looked at, and an integrated study is done.

Menstrual cycle control
Menstrual cycle control is a dynamic mechanism carried out by a well-organized regulatory system. The regulatory system, which comprises the hypothalamus, anterior pituitary and ovary, is strongly integrated. The growing follicle of the ovary has a crucial role to play in the whole scenario.

The regulatory system works by hypothalamic-pituitary-ovarian axis(3) hormones.
Following Hormones are involved in the regulation of the menstrual cycle-

1. Hypothalamic Hormone - Gonadotropin releasing hormone (GnRH)
2. Anterior pituitary Hormones - Follicle stimulating hormone (FSH) and Luteinizing hormone (LH)
3. Ovarian Hormones - Estrogen and Progesteron

Function of GnRH:
Gonadotropin releasing hormone
Hypothalamus-secreted gonadotropin releasing hormone-controls the ovarian and uterine cycles. GnRH induces the release from the anterior pituitary of the stimulating follicle stimulating hormone and luteinizing hormone.(4)

Functions of Follicle stimulating hormone (FSH) and Luteinizing hormone (LH)
Follicular development is initiated by FSH, while LH encourages the ovarian follicles to develop further. In addition, ovarian follicles are activated by both FSH and LH to secrete estrogen. To generate androgens, LH stimulates the Theca cells of a developing follicle. The androgens are absorbed by the granulosa cells of the follicle under the

influence of FSH and then converted into estrogens. LH causes ovulation at midcycle and then facilitates Corpus Luteum formation. The corpus luteum, activated by LH, generates and secretes estrogens, Progesterone, relaxin, and inhibin. [5]

Functions of estrogens and Progesterone

From the plasma of human females, at least six different forms of estrogens have been isolated, but only three are found in sufficient amounts.

Estrogens facilitate the production and preservation of characteristics of female reproductive systems, secondary sex and breasts.[6] Significant quantities of estrogen are secreted by the ovarian follicle and the corpus luteum secretes large amounts of Progesterone.

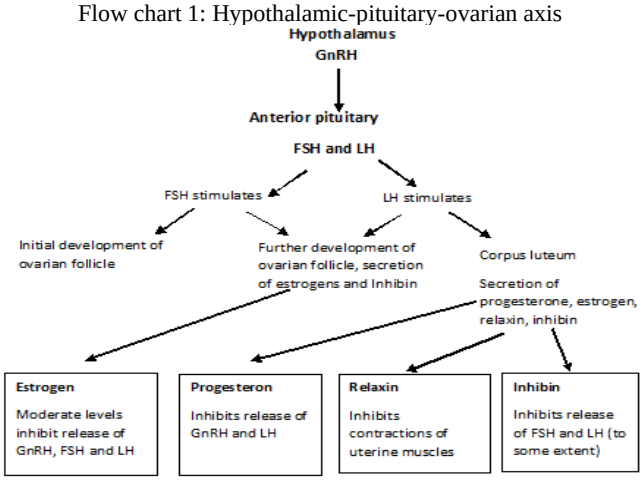
During each period, estrogen secretion peaks twice - once during the follicular process just before ovulation and another one during the luteal phase. Progesterone, on the other hand, is practically absent during the follicular process until before ovulation. But during the luteal process, it plays a vital part.[7]

Estrogen is responsible for follicle growth. The two steroids function together to make improvements in the uterus, cervix and vagina. In order to prepare and preserve the endometrium, Progesterone cooperates with estrogen.

The small amount of **relaxin** released during each monthly cycle by the corpus luteum relaxes the uterus by inhibiting myometrium contractions.[8]

Inhibin is secreted by the granulosa cells of the developing follicles and by the corpus luteum after ovulation. It inhibits FSH secretion and to a smaller degree, LH.[9]

Flow chart 1: Hypothalamic-pituitary-ovarian axis



Regulation of levels of hormones during menstrual cycle

Follicular phase

GnRH release stimulates the secretion of anterior pituitary FSH and LH.

The synthesis of androgens from theca follicle cells is caused by LH, resulting in the conversion of androgens to estrogen.

Estrogen exerts on GnRH a double feedback power.

- Initially, it exerts a **negative feedback** influence on GnRH when estrogen secretion is moderate, so that GnRH secretion is inhibited. This contributes to reduced FSH and LH secretion due to **negative feedback**.[10]
- It exerts a **positive feedback** effect on GnRH secretion during the later period of the follicular process, when a significant amount of estrogen is secreted by the maturing follicle. GnRH secretion is now improved, resulting in significant amounts of FSH and LH being secreted. [11]

Ovulation

A large quantity of LH is secreted prior to ovulation because of positive estrogen feedback on GnRH.[12]

Luteal phase

- FSH and LH hormones play an important part in this process. If the ovum is not fertilized, or if ovum implantation does not occur, hormone changes are made.
- By **negative feedback**, progesterone and estrogen secreted from the corpus luteum inhibit the secretion of FSH and LH from the anterior pituitary.
- A further hormone called inhibin is secreted by Granulosa lutein cells. It also inhibits FSH and LH secretion by **negative feedback**.
- The corpus luteum becomes inactive in the absence of FSH and LH.
- Finally, the corpus luteum regresses, so there is no supply of progesterone and estrogen.
- The absence of progesterone and estrogen causes hypothalamus release of GnRH.

GnRH activates the secretion of anterior pituitary FSH and LH.

FSH and LH stimulate the new immature follicle, contributing to the beginning of the next cycle.

Proliferative phase

- The repair of damaged endometrium occurs predominantly by estrogen during the proliferative process.

Secretary phase

- At this point, under the influence of FSH and LH, the structures and functions of the uterus are affected by corpus luteum-secreted estrogen and progesterone.

Menstrual phase

- If pregnancy does not occur, secretion of significant quantities of progesterone and estrogen from the corpus luteum prevents secretion of FSH and LH from the anterior pituitary through **negative feedback** two days prior to the start of menstruation.
- The corpus luteum becomes inactive in the absence of LH and FSH and there is a drastic decrease in estrogen and progesterone levels.
- The lack of ovarian hormones triggers the release of anterior pituitary gonadotropins. This result in the initiation of growth of new ovary follicles and the cycle repeats once more.

RESULT

Pathophysiology of PCOS as per Ayurved

Ayurveda classifies PCOS as a kapha condition, and we can compare the presenting features of the disease with the dominant dosha responsible for the disorder by looking at the findings of modern medicine. The organs in the female body responsible for reproduction are called artava dhatu. Artavavahasrota is called the channel that supplies, nourishes and makes the practical operation of bringing the ovum to the uterus. In the procedures behind female reproduction, which include the ovarian cycle and the menstrual cycle, all three doshas play significant and distinctive roles.

Role of Vata Dosh

During the ovarian cycle, Vata is responsible for the follicle movement, the rupture of the ovary wall releasing the matured ovum, the movement of the fimbriae, the finger like projections that direct the ovum into the fallopian tubes, and the ovum movement to the uterus (Due to ChalaGunaofVata). These acts are attributed to Apana vayu, the force from the navel down behind downward movement. Apana vayu is also responsible for the menstrual movement during menstruation and the force behind a baby's downward movement during labour through the birth canal.

Role of Pitta Dosh

The essence of pitta, the energy responsible for Pachana (transformation), is demonstrated by the action of the hormones. The interplay of hormones is a function of all phases of the female reproductive process. The spark of knowledge behind the transformation of each stage is due to the impact of the hormones on the various phases of the ovarian and menstrual cycles expressed in the pitta.

Role of Kapha Dosh

The Guru (Heavy) and Sheet (Cool) qualities of Kaph nourish the production of the tissues that form and sustain the reproductive system, including the nurturing energy that during the ovarian cycle supports follicle formation. The mucosa layer of the fallopian tubes and uterus is responsible for shielding the tissues from the drying effect of the ever-present vata. Kapha is responsible for the mucosal lining in the GI tract, which prevents the tissues from developing digestive enzymes.

PCOS is due to the blocking of vataand pitta bykapha, so motion is obstructed and the mechanism of transformation is suppressed.

DISCUSSION

Jatharagni begins to affect the metabolic component of the seven tissues called dhatwagni, Kapha having first influenced the Jatharagni. Each dhatwagni is responsible for the nourishment and growth of that specific tissue in which it resides. Rasa dhatu (lymph and plasma), meda dhatu (adipose tissue), and artava dhatu (the female reproductive system) are affected in the case of PCOS.

Because of factors that aggravate kapha, the amount of kledaka kapha residing in the Amashaya - GI tract increases and as mentioned, affects the jatharagni in the Amashaya. As kapha's Guru (Heavy), Sheet (Cold), Pichchil (sticky) properties inhibit the Agni, food ingested is not properly digested and ama (toxins) is formed. It mixes with the toxins as kledakakapha increases and is absorbed to pass out of the GI tract into the rasavahasrotasa. Rasa dhatu rises in quantity, influencing the rasaDhatwagni-the lymph and plasma metabolism. The Upadhatu of Rasa (superior by-product of rasa dhatu in females) is raja-menstrual fluid. The menstrual fluid will also take on the consistency of kapha, which will in turn begin to block apanavayu in the channel that supports the functional operation of the menstrual fluid, artavavahasrotasa.

Increased rasa dhatu circulating through the circulatory system of the body is combined with increased kledakakapha and ama starts to coat the body's cells, impacting Dhatwagni at the level of the cells responsible for the cell membrane's permeability. The cell membrane of the tissues is covered with suffocating Dhatwagni, which affects cellular intelligence, due to the sticky heavy characteristics of increased rasa dhatu, kaphaand ama, causing insulin receptors on the cell not to recognize chemical structures that normally engage them. In the blood stream, insulin unable to engage cellular receptors starts to build up, heading towards artava dhatu where it comes across free receptors that engage its molecular structure.

Aggravated kaphaand ama that have impacted rasa dhatu travel through the meda dhatu channels as kapha, ama andmeda dhatu have similar characteristics, so they are easily attracted to each other. Meda dhatu, together with rasa dhatu to represent a kapha aggravation, is always one of the first dhatus. Having been conditioned by the existence of increased kaphadoshaand ama, Meda dhatu agni causes medavruddhi, increased meda dhatu causes obesity. As medavruddhi is allowed to raise the increased meda, kaphaand ama begin to block the body's channels. At the meda dhatu stage, free androgens moving around the body are processed where it takes on the meda's heavy cool quality expressed as estrogen.

Having influenced meda dhatu, Kledakakapha and ama move towards artava, where they affect it, causing increased tissue formation, artavavruddhi.

It should be clearly understood that vata is the concept that moves stuff in the body (and nature). Without vata, both pitta andkapha are immobile. In turn, if vata becomes constrained, it prevents both kapha and pitta from working properly.

In artavavahasrota, Artava dhatu, inspired by the strong sticky qualities of kaphaand ama, creates srotodushti. In artavavahasrota, Apana vayu becomes stagnant (sanga), due to excessive accumulation of kaphaand ama blocking the channel that impedes vata flow in the ovarian cycle. Since vata is blocked, both pitta and pitta are blocked in order to act as the intellect behind transformation requires vata's motion in order for its energy to have potential. The hormones which carry the energy of transformation are unable to initiate their action as pitta is blocked. In the formation of the cyst in the ovary, the

accumulated kapha is conveyed as it takes on a clear white sticky consistency that expresses kapha and ama.

The other roles of both these doshas are beginning to become exacerbated becausevata and pitta are blocked in Artava dhatu. Pitta aggravation presents itself as acne and increased body hair at the level of Bhrajaka pitta andRanjaka pitta. Due to the aggravation of all three doshas, but primarily Apana vayu, menstrual problems manifest.

CONCLUSION

It is evident in conclusion that PCOS is an enigma. There is no complete understanding of its fundamental pathophysiology as per modern science. No therapy is a panacea, as therapies have so far been targeted at the symptoms but not at the syndrome itself. To make treatment more effective and to postpone the severe long-term effects of the disease on the health of patients, comprehensive attempts should be made to thoroughly examine the syndrome. In this scenario, Ayurveda throws clear light on the pathophysiology of PCOS. Hence accordingly, treatment for the disorder can be planned.

CONFLICT OF INTEREST

Nil

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