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A Conceptual Analytic Study of Sex Determination or *Ling Nirdharana* in *Ayurveda*

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Abstract: ***All parents have long desired healthy, intelligent, and beautiful children, as reflected in concepts from classical texts like "Suputrakameeya." Ayurveda, an ancient Indian system of medicine, provides simple methods to ensure the birth of a healthy child, beginning with partner selection and addressing factors related to fetal development, including fertilization and sex determination. It emphasizes the roles of Shukra (sperm) and Shonita (ovum) in conception, with the dominance of Shonita leading to female offspring and Shukra to male offspring. Similarly, modern science determines sex by the presence of X and Y chromosomes, with the Y chromosome playing a crucial role in male development. Hormones such as Anti-Mullerian Hormone (AMH) and testosterone influence the development of reproductive organs and secondary sexual characteristics. Both Ayurveda and contemporary science provide valuable insights into the genetic and biological aspects of human development.***
Keywords: Shukra, Shonita, Puman, Stri

I. INTRODUCTION

The ancient sages of India provided valuable insights into many scientific facts about the human body, which form the foundation for contemporary scientific knowledge. *Ayurveda* describes various aspects related to the development of the fetus and genetics, including fertilization and sex determination. *Ayurveda* considers two basic factors in human development: *Shukra* and *Shonita*, which represent sperm and ovum in modern medical science and are responsible for fertilization. Nearly all *Acharyas* like *Charaka* and *Sushruta* have recognised three different sexes: *Puman* (male), *Stri* (female) and *Napunsaka* (hermaphrodite). *Charaka* clearly stated that the dominance of *Shonita* during conception results in the birth of a female child, while the dominance of *Shukra* (sperm) leads to the birth of a male child. *Acharya Sushruta* also believes the same.

तत्र शुक्रबाहुल्यात् पुमान्, आर्तवबाहुल्यात् स्त्री, साम्यादुभयोर्नपुंसकमिति ।। (SU.SHA 3/5)

Abundance (predominance) of *Shukra* (semen) makes the foetus to be a male, abundance (predominance of) *Artava* (ovum) makes the foetus to be a female; and when both these are equal, it makes the foetus to be a eunuch.

तत्र यस्या दक्षिणे स्तने प्राक् पयोदर्शनं भवति दक्षिणकुक्षिमहत्त्वं च पूर्व च दक्षिणं सक्थ्युत्कर्षति बाहुल्याच्च पुन्नामधेयेषु द्रव्येष दौर्हदमभिध्यायति स्वप्नेषु चोपलभते पद्मोत्पल- कुमुदाम्रातकादीनि पुन्नामान्येव प्रसन्नमुखवर्णा च भवति तां ब्रूयात् पुत्रमियं जनयिष्यतीति, तद्विपर्यये कन्यां, यस्याः पार्श्वद्वयमवनतं पुरस्तान्निर्गतमुदरं प्रागभिहितं च लक्षणं च तस्या नपुंसकमिति विद्यात्, यस्या मध्ये निम्नं द्रोणीभूतमुदरं सा युग्मं प्रसूयत इति ।। (SU.SHA 3/34)

The pregnant woman in whom, milk appears first in her right breast, the right side of her abdomen is bigger, throbbings appear first in her right leg, whose desires (longings) are for things which bear names of masculine gender, who sees *Padma, Utpala, Kumuda, Amrataka* etc in her dream and which have names of masculine gender only, and whose face and colour are pleasant- should be understood as one giving birth to a son. She, who has features opposite of these as the one giving birth to a daughter. She whose flanks are depressed, her abdomen indrawn in its front and absence of features told earlier (of male and female child) should be understood as the one giving birth to a eunuch. She, whose abdomen has depression (deep furrow) in its centre and appears like *Droṇi* (water trough or a valley) should be understood as one giving birth to twins.

In modern science, the sex of an individual is determined by the presence of XX chromosomes in females and XY chromosomes in males. The distinct content of the X and Y chromosomes contains genes and regulatory sequences, with the sex-determining region Y (SRY) being the key regulator. Hormones such as Anti-Mullerian Hormone (AMH) and testosterone, secreted by the fetal testis, play a role in gonadal and hormonal sexual dimorphism, impacting the development of reproductive organs and secondary sexual characteristics. Additionally, sex chromosome genes directly influence brain sexual dimorphism, which may occur before gonadal differentiation. One must know the fundamental basics for which this study is undertaken.

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II. MATERIAL & METHOD

Ayurved compendia, modern textbooks, research papers and articles related to this topic were extensively studied.

A. Ayurvedic Review

Here a few concepts of sex determination have been taken to describe as:

1) *1st Concept:* According to *Ayurveda, Garbha lingam* or sex is determined by the combination of *Shukra Dhatu* and *Artava*. The predominance of *'Shukra'* and *'Artava'*, particularly at the time of *'Shukra Artava Samyoga'* (time of fertilization), determines the sexuality according to Indian thoughts. *Acharyas Charaka* and *Sushruta* have recognized three different types of sexes, namely, *'Puman'* (male), *'Stri'* (female) and *'Napunsaka'*. They have also mentioned the factors that play a role behind these three states of sexes. According to them, the predominance of *Shukra* leads to the formation of a male child, the predominance of *Artava* leads to the formation of a female child and their equality in strength leads to the formation of a *Napumsaka. Dalhana* has also explained the predominance of *Shukra* and *Artava.* He says that *Artava* is four times the quantity of *Shukra* but it is not so. The quantity of pure *Artava* situated in the uterus is responsible for fertilization. Occasionally, due to over-excitement, the quantity of ejaculated *Shukra* (semen) may be more or due to physiological depression it may be less, which influences the relative amount of *Shukra* and *Artava.* Citing the opinions of others, he has mentioned that the functional potency of *Shukra* and *Artava* influences the formation of sex. *Sharngdhara* says that besides the role of *Shukra* and *Artava*, the will of God is responsible for the formation of sex.
2) *2nd Concept:* According to the *Yogaratnakara*, the gender of the child is influenced by the dominance of *Shukra* (semen) and *Artava* (ovum). It states that a male child is born from the right side (*Dakshina-nadi*) and a female child is born from the left side.
3) *3rd Concept: Bhavamishra* introduces a new perspective on the birth of male and female children. He mentions the role of three distinct *'Nadees'* in the process. According to him, the discharge of semen in the *'Sameerana'* results in wastage, while discharge in *'Chandramasi'* leads to the birth of a female child and discharge in *'Gauri'* results in the birth of a male child.

Furthermore, it is believed that coitus on even days leads to the birth of a male child while coitus on odd days leads to the birth of a female child. According to *Vagbhata*, maintaining abstinence for three days during the *ritukala* (up to the 7th day of menstruation) is advised for those seeking offspring of high quality. Additionally, it is believed that a child conceived on *Ekadashi* and *Trayodashi* would be a *Napunsaka* (hermaphrodite). The gender of the child is said to be determined by the level of *Artava*, with less on even days leading to the birth of a male child and more on odd days resulting in the birth of a female child.

III. MODERN REVIEW

The sex determination system is a biological system that regulates the development of sexual characteristics in an organism. The X chromosome is involved in the determination of sex and is also known as the allosome (sex chromosome). Another chromosome, called the 'Y' chromosome, is also involved in the sex determination process. In mammals, including humans, a normal female has two X chromosomes, while a normal male has one X and one Y chromosome. Female gametes only carry the X chromosome, making females belong to the homozygotic sex. Male gametes can carry either the X or Y chromosome, classifying males as the heterozygotic sex.

A. Correlation of First Concept

• Shettles studied sperm cells to observe their differences. He theorized based on his observations is that Y-carrying sperm are lighter, smaller and have round heads.
• He also studied sperm in some rare cases where man had fathered either mostly male or mostly female children. In the cases where the man had mostly male kids, Shettles discovered that the man had far more Y- carrying sperm than X- carrying sperm.

B. Correlation of Second Concept

The X and Y chromosomes in males act as homologous chromosomes during meiosis and pass into different gametes. Thus, males produce two types of gametes and are described as heterogametic i.e. (22+X) and (22+ Y) while the female which produces only one type of gamete is homogametic. Otto Schooner's theory: It is examined in research when the right ovary ovulated ova will fertilize produces a male child as well as when left ovary ovulated ova will fertilize produces a female child. So left ovary ovulated ova is more potent than the right one.

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C. Correlation of Third Concept

• This method also correlated with Shettles method that male sperm tend to swim more quickly in alkaline environment like in the cervix and uterus and female sperm tend to survive longer in acidic conditions of the vaginal canal.

So, when sperm falling in *Upasthgeha* having *Gauri Nadi* (i.e. fornix part of the vagina very near to the cervix)

Male child

Thus when sperm falling in *Kandarpageha* (mid vaginal canal) having *Chandramansi Nadi*

Female child

The discharge of *'Virya'* (semen) gets wasted, if happens to fall in the mouth of the *Sameerana* (introitus part of the vagina).

• Here *Nadi* can be correlated with the nerves also. This concept is considered with sexual physiology as follows:

a) Erectile tissue (from the introitus to the clitoris) controlled by the parasympathetic nerves of the sacral plexus

Dilate the arteries of erectile tissue thus allowing rapid accumulation of blood

Introitus tighten around the penis for sexual stimulation

b) Parasympathetic signals also pass to the bilateral Bartholin's glands secretes mucus immediately inside the introitus responsible for lubrication during sexual intercourse, although mucus is also secreted from the vagina.

c) During the orgasm the peripheral muscles of the female contract rhythmically, which increases uterine and fallopian tube motility

Helping to transport the sperm upward through the uterus towards the ovum

Which ultimately helps in the conception

• Female orgasm seems to cause dilation of cervical canal for up to 30 minutes thus allowing easy transportation of sperms.

D. Correlation of Fourth Concept

Acharya Sushruta advises expectant parents to have intercourse on even days after the end of the menstrual flow or closer to ovulation to conceive a male baby and on odd days to conceive a female baby. According to *Acharya Dalhana*, on even days, there is less predominance of X chromosome *(Rajah)* and on odd days, *Rajah* is predominant. Therefore, engaging in sex during even days of menstruation may result in a male baby, while engaging in sex on odd days may result in a female baby. It would be interesting to conduct research on why and how the X chromosome predominance varies during these days.

IV. DISCUSSION

The knowledge possessed by our ancient seers is scientific and forms the basis of other sciences. Our classics provide detailed descriptions of *Garbha Sharir*, which deals with the developmental events that occur during intrauterine life, corresponding to modern embryology. *Garbha Sharir* is defined as the union of *Shukra* and *Shonita* along with *Atma*, which can be seen as similar to the union of sperm and ovum in modern science. Our classics describe that the predominance of *Shukra* in the fertilized product gives birth to a male child, predominance of *Shonita* leads to the birth of a female child, and predominance of both results in a *Napunsaka*. *Shukra* and *Shonita* can be compared to sperm and ovum, where sperm contains XY chromosome and ovum contains XX chromosome.

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In the 1960s, Landrum B. Shettles developed the Shettles method, a procedure for couples to use before and during intercourse to increase their chances of conceiving a fetus of their desired sex. Shettles observed physical differences between X-carrying sperm and Y-carrying sperm. He noticed that male-producing Y chromosomes were found in small, round-headed sperm (endosperm), while female-producing X chromosomes were found in large, oval-shaped sperm (gymnosperm). Shettles also found that most samples did not contain an equal number of both types of sperm. After checking the family history of the men who provided the sperm specimen, he found that men with a male-dominant family history had more round-headed endosperm, and those with a female-dominant family history had more oval-shaped gymnosperm. This led to the correlation of *Shukrabahulya* with Y-carrying sperms and *Artavabahulya* with X-carrying sperms.

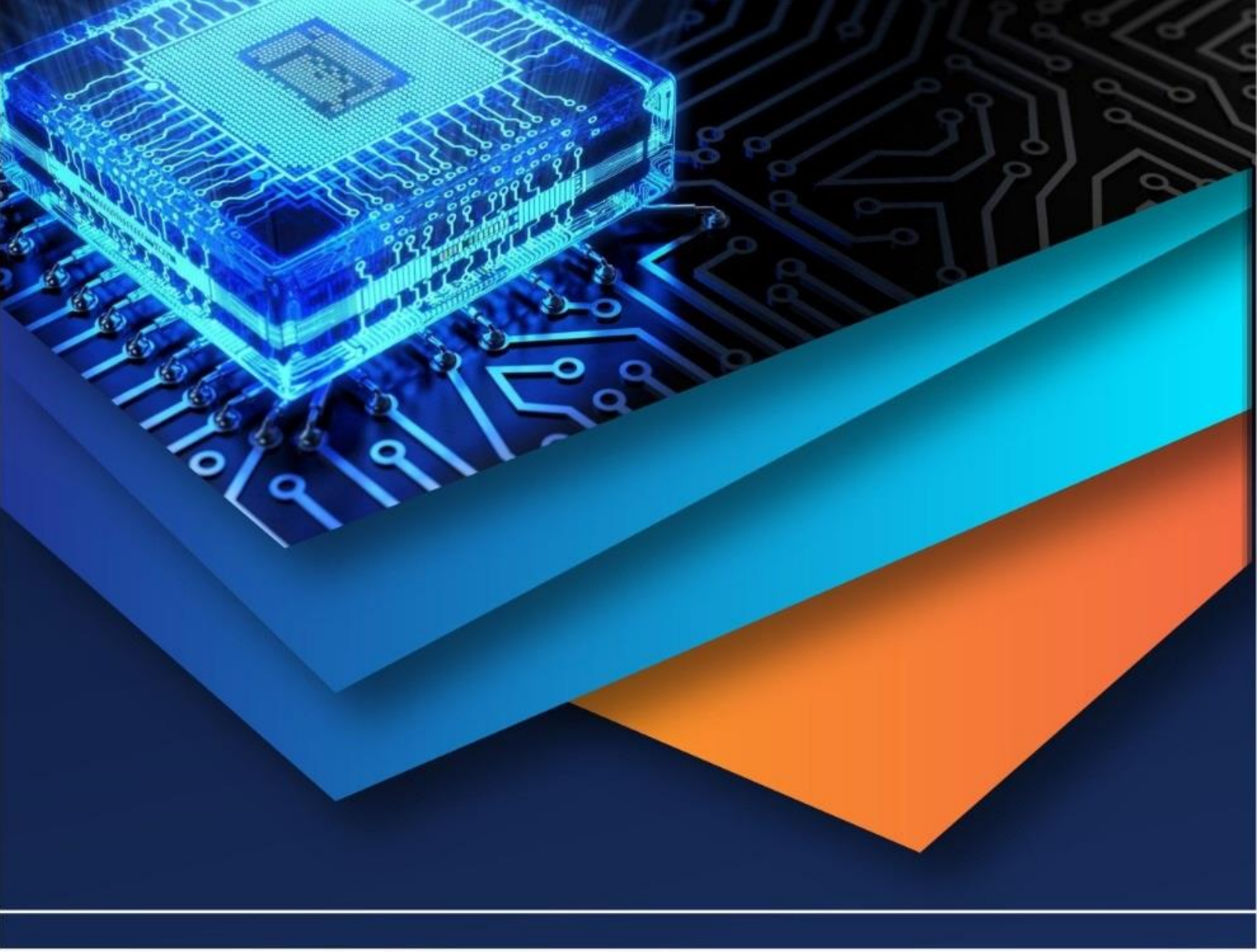
Additionally, the Shettles method indicates that male sperm tend to swim more quickly in an alkaline environment like the cervix and uterus, while female sperm tend to survive longer in the acidic conditions of the vaginal canal. This experimental theory seems to justify the concept of the three *Nadis* in the vaginal canal.

V. CONCLUSION

Ayurveda, a traditional life science, provides insights into sex determination that align with contemporary science. This demonstrates the depth of embryological knowledge possessed by our ancient scholars. While modern medical technologies offer more detailed descriptions, we can infer that our *Acharyas* must have conducted extensive research to establish these concepts. The similarity between the two approaches indicates that our ancestors had a solid grasp of sex determination. In *Ayurveda*, *Shukra* is considered as sperm with a Y chromosome, while *Shonita* is implied to have an X chromosome. This understanding extends to the concept of X chromosomes in eggs as well.

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