



**AYURVEDIC GARBHA VIKAS KRAM IN CONTEXT TO EMBRYOGENESIS AND FOETAL DEVELOPMENT**

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**ABSTRACT**

Sushrut samhita is one of those Ayurvedic classic which deals with human anatomy and physiology. It gives precise description of *Garbha vriddhi* and *vikas kram* though there were no modern imaging techniques like sonography. Different *Granthas* state various views regarding *Garbha utpatti* and *Garbha vriddhi*. *Acharyas* have also mentioned *Garbhini lakshana* which are helpful in diagnosis of early pregnancy. Charak has mentioned signs observed in *Garbhini* with progression of pregnancy. Whereas modern obstetrics is one of the most cardinal branch which concerned with human reproduction. This science provide each minute detail regarding foetal growth and development. Tremendous research has been done in the field of modern obstetrics.

Foetal deaths and neonatal mortality is always an issue of concern. One can get relevant references of these issues in *Samhitas*. *Acharyas* has mentioned topic of *Garbha* in concise form. Extensive study and discussion is essential to understand ancient concept of *Garbha vikas*. Review of Ayurvedic text along with modern text will help to obtain knowledge regarding this. This study is an attempt to elaborate and compare both ancient and modern concept of embryogenesis. There might be some variation when we consider both perspectives. But it is really interesting to find similarities beside a huge gap of time.

**KEYWORDS:** *Garbhavkranti*, Embryogenesis, *Garbha vikas kram*, Foetal development.

**INTRODUCTION**

Ayurveda is science of life and life begins with fertilisation of ovum. In *Sharirsthana Acharya* Sushrut has elaborated process of *Garbha utpatti*. He has explained characteristics of *Shuddha* i.e. normal *Shukra* (semen) and *Artav* (menstrual flow). *Garbhavkranti* is the word which literally means descent of the soul into the womb.<sup>[1]</sup> There is systematic description of foetal development which starts from *Shukra-shonit sanyog* i.e., fertilization. Medicine is an ever-changing science. Obstetrics is one of the most developed branch of medical science. Advanced imaging and diagnostic techniques facilitate assessment of foetal growth and development. So it is very easy now to understand ongoing events inside uterus during antenatal period. It would be helpful to assess resemblance in Ayurvedic and modern medical viewpoints.

**Material and methods**

**A] Material:** Ayurvedic samhita and their commentaries, modern medical text books and published research papers, Articles, Medical journals and Internet.

**B] Methods**

Type of study: Literary review study

- Literature search related to the title was done from all authentic books, articles, research papers, medical journals and internet.
- Data evaluation was done to determine significance of the literature to understand the topic.
- Analysis of collected data was done.

**Observation**

**First month**

According to Sushrut Samhita, at first month *Kalal* formation takes place.<sup>[2]</sup> *Kalal* is a soft structure with inarticulate tone.<sup>[3]</sup>

Vagbhat states that in first month, after a week *Kalal* formation takes place.<sup>[4]</sup>

**Charak-** After conception, all *Dhatus* get together and get shape of *Kalal*. *Kalal* resembles with *Kheta* (phlegm). All body parts and organs are present in *Kalal* in very tiny form.<sup>[5]</sup>

**Modern science-** Modern obstetrics states that at the end of first month, a fertilised egg grows within a water filled sac which is called as amniotic sac. Development of placenta takes place which has nutritive and excretory functions.<sup>[6]</sup> In process of embryogenesis, after fertilisation, development of morula takes place from embryoblast. Morula contains multicellular mass and fluid. Some fluid passes into the morula from the uterine cavity. As quantity of fluid increases, the morula acquires the shape of cyst. As pregnancy continues morula get transformed into blastocyst. Blastocyst gives rise to three germ layers- 1). Endoderm 2). Ectoderm 3). Mesoderm. All tissues of the body are derived from one or more of these layers.<sup>[7]</sup>

**Second month**

**Sushrut-** In second month, *Panchamahabhut* get aggregated by *Kapha*, *Pitta* and *Vaat*. Due to this process *Garbha* transforms into a solid mass. According to *Acharya* one can predict gender of foetus in this month. If the solid mass i.e. *Garbha* appears round in shape; it will grow as

male, if it gets elongated shape like a muscle then it will grow as female. If the mass is of irregular shape then it will result into eunuch.<sup>[2]</sup>

**Vagbhat** has also mentioned similar reference.<sup>[4]</sup>

**Charak**- similar as Sushrut<sup>[5]</sup>

**Modern science**- At sixth week, baby's heart begin to separate into four chambers and it beats about 150 times in a minute. Embryo has comparatively large head than trunk.<sup>[8]</sup> Central nervous system, sensory organs and digestive system start to develop.<sup>[6]</sup> Branching of nerve cells in foetal brain results into formation of early neural pathways. Although it is not possible to confirm gender of foetus by ultrasound until after 15 weeks, his genitals begin to form at 9<sup>th</sup> week.<sup>[8]</sup>

### Third month

**Sushrut**- In third month *Pancha pindaka* (five small bud like projections) develop. Later hands, legs and head develop from these projections. Also distinctness of major and minor body parts exhibit minutely.<sup>[2]</sup>

**Vagbhat** mentioned that now *Garbh* can feel pleasure and pain.<sup>[4]</sup>

**Charak**- All the sense organs and extremities emerge together.<sup>[5]</sup>

**Modern science**- Centres of ossification appear in third month. Fingers and toes get differentiated. Development of skin, nails and hairs takes place. Variation in external genitalia begins.<sup>[9]</sup>

### Fourth month

**Sushrut**- All major and minor body parts become clearly distinguished. According to Vedic literature, *Atma* or soul resides at heart. In fourth month heart development completes. So its resident *Atma* or *Chetana dhatu* becomes expressive. Now pregnant woman called as *Dauhradini* (having two hearts). It is believed that foetus expresses his desires through mother. Ignorance of these desires leads to congenital malformations like hump back, dwarfism, deformed eyes and extremities, dumbness and abnormalities in sense organs. Fulfillment of these desired facilitate birth of a healthy child. <sup>[2]</sup>

**Vagbhat** states differentiation of all body parts.<sup>[4]</sup>

**Charak**- *Garbha* get stabilized so mother gain weight and feel heaviness in body.<sup>[5]</sup>

**Modern science**- Eye movements begin which indicates maturation of midbrain.<sup>[9]</sup> The part of foetal brain responsible for complex thoughts, such as problem solving and memory starts to form at 13<sup>th</sup> week.<sup>[8]</sup> Determination of foetal sex is possible as external genitalia show definitive signs of male or female.<sup>[9]</sup> Total weight gain during the course of singleton pregnancy for a healthy women averages 11 kg. Major weight gain occurs during second and third trimester which is around 5 kg in each.<sup>[10]</sup>

### Fifth month

**Sushrut**- Mind exhibit clearly.<sup>[2]</sup>

**Vagbhat** - *Chetana* i.e. consciousness become manifest.<sup>[4]</sup>

**Charak**- There is greater increase in anabolism of blood and flesh in foetus so weight loss observed in mother.<sup>[5]</sup>

**Modern science**-Foetus becomes more active. It shows lanugos covering all the body and hairs at scalp.

Maturation of cochlear function begins so foetus can respond to sound.<sup>[9]</sup> At 19<sup>th</sup> week foetal brain start to form separate areas which are specialized for sense of smell, test, hearing, vision and touch.<sup>[8]</sup>

### Sixth month

**Sushrut**- "*Shashthe buddhi*" Development of foetal intellectual capacity takes place. <sup>[2]</sup>

**Vagbhat**- Manifestation of *Snayu, Sira, Roma, Bala, Varna, Nakha* and *Twacha* takes place.<sup>[4]</sup>

**Charak**- There is greater accession of strength and complexion in foetus. So mother feel exhausted. Also there are changes in her skin complexion.<sup>[5]</sup>

**Modern science**- Eyebrows and eyelashes become recognizable. Lung development almost completed. A foetus born at this time will die due to absence of terminal sacs. Development of neural pain system take place.<sup>[9]</sup>

### Seventh month

**Sushrut**- Differentiation of all major and minor parts becomes clear.<sup>[2]</sup>

**Vagbhat**- Foetus become well nourished and well developed.<sup>[4]</sup>

**Charak**- Foetus develops in all ways therefore mother feel tired and drowsy.<sup>[5]</sup>

**Modern science**- Skin become red and get covered with vernix caseosa. Foetus show isolated eye blinking.<sup>[9]</sup> Production of blood cells start at bone marrow at seventh month. It take place in liver and spleen before seventh month.<sup>[8]</sup>

### Eighth month

**Sushrut**- *Acharya* says that in this month *Ojas* become unstable. It keep moving between mother and foetus. If birth occurs in this month then there are chances of death of foetus due to absence of *Ojas*. Sushrut believes that there are some evil spirits or demons called *Nairutya*. It causes death of child born in eighth month.<sup>[2]</sup>

**Vagbhat**- He has mentioned similar reference in addition he stated that if delivery occur in this month, there are also chances of mother's death. However he don't support theory of evil spirits.<sup>[4]</sup>

**Charak**- He has mentioned same reference as Vagbhat. Charak describes this month as *Aganya* (unsuitable for delivery). As *Ojas* keep moving, pregnant women undergoes mood swings.<sup>[5]</sup>

**Modern science**- Brain become more complex. Bones continue to harden. Skin become more smooth.<sup>[7]</sup> Most internal systems are well developed.<sup>[6]</sup> Final trimester of pregnancy can bring about stressful emotions and mood swings. Hormone levels change during pregnancy which affects brain chemicals in charge of regulating moods. The first and third trimesters are the most common times for irritability and issues of mood swing.<sup>[11]</sup>

### Ninth month

**Sushrut**- Birth may takes place in any one of the ninth, tenth, eleventh or twelfth month.<sup>[2]</sup>

**Vagbhat**- After eighth month, even after one day is the time for birth of child.<sup>[4]</sup>

**Charak**- After eighth month, till the tenth month is the right time for delivery.<sup>[5]</sup>

**Modern science-** Pregnancy is considered as full term at end of this month. Foetus swallow lanugos hairs and vernix caseosa which result into meconium after birth.<sup>[8]</sup>

**Discussion:** As mentioned earlier in introduction, aim of the study is to compare both the perspectives.

- 1) According to Ayurveda, in first month of foetal development, embryo resembles with a jelly like mass or phlegm. This can be co-related with the morula stage which contains cell mass and fluid. While Charak states presence of all body parts and organs in *Kalal*, modern science also state similar reference in form of germ layers. These layers play vital role in organogenesis.
- 2) Though there are no similarities between foetal developments in second month, modern science states that foetal genitals begin to form at ninth week.<sup>[8]</sup> Today we have modern techniques which can notice each and every change during foetal development. So it is possible to verify whether we can presume gender of embryo according to its shape.
- 3) While modern obstetrics states that at 8<sup>th</sup> week, nerve cells in foetal brain undergo branching to form early neural pathways, Charak has mentioned that all sense organs i.e. *Indriya* emerge together at third month. These two processes show resemblance. Also the elbow and knee get established at 8<sup>th</sup> week.<sup>[12]</sup> Sushrut has stated development of *Panch pindaka* which later develop into extremities and head. This process can be co-related.
- 4) According to Sushrut, fourth month is most important regarding *Garbha vikas* as expression of soul or *Chetana dhatu* occurs in this month. *Chetana* has different meanings like alive, consciousness, intelligence, sentient, life.<sup>[13]</sup> Obstetric states that the part of foetal brain responsible for complex thoughts such as problem solving and memory starts to form at 13<sup>th</sup> week. So these two things can very well be co related as we can relate *Chetana dhatu* with intelligence or reasoning faculty.

In this month, pregnant woman is considered as *Daurhudini*. Most of the pregnant women feel dietetic and other unusual desires in second trimester which is called as *Daurhudavastha*. Fulfillment of these desires provide nourishment as well as mental peace to pregnant women which enhance proper foetal growth.<sup>[14]</sup> Recent research also support this theory. psychological distress during pregnancy has been associated with negative repercussion in the offspring, including adverse birth outcomes, long-term defects in cognitive development, behavioural problems during childhood and high baseline levels of stress related hormones.<sup>[15]</sup> Charak has stated that *Garbhini* feels heaviness in body. As there is major weight gain during second trimester, pregnant woman may experience heaviness.

- 5) In 19<sup>th</sup> week foetal brain start to form separate areas which will be responsible for his senses of smell, test, hearing, vision and test. Sushrut states that mind develop in this month. Now it is essential to understand concept of mind according to Ayurveda.

Charak states that the sense faculties are capable of perceiving their respective objects only when they are motivated by *Mana (mind)*.<sup>[16]</sup> *Mana* get associated with *Indriya* and enables them to accept their *Artha*. Here *Indriya* are sense organs while *Artha* means the knowledge perceived by sense organs.<sup>[17]</sup> From these references we can state that both viewpoints indicate same fact which is related to development of sense organs.

- 6) Sushrut has stated, intellect of the foetus predominantly develop during sixth month. Obstetric say that there is rapid brain growth in foetus at 24<sup>th</sup> week. Development of intellect obviously related to brain growth and development. Occurrence of chloasma gravidum or pregnancy mask observed during 24<sup>th</sup> week. It is an extreme form of pigmentation around the cheek, forehead and around the eyes.<sup>[18]</sup> Charaka mentioned *Varna haani* (damage to skin complexion). Hyper pigmentation due to chloasma and *Varna haani* show resemblance.
- 7) There is no similarity in foetal development in seventh month according to both fields.
- 8) Ayurveda states that if baby delivers in eighth month, there are no chances of survival. He also describes theory of evil spirits. These references might be relevant to that ancient period. But in today's era neonatal deaths in premature babies rarely occurred due to advanced neonatal care tools. While references regarding mood swings are observed in both perspectives.

## CONCLUSION

As we observe both viewpoints, there are some prominent similarities between Ayurvedic *garbha vikas* and modern foetal development. Though there were no advanced techniques, *Acharyas* have described a detail of foetal development which is appropriate in this era also. Modern science is in process of continuous development. Every day, there are discoveries of new facts. So my work is a pathway for future research which intend to verify old facts with modern tools.

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