

Exploration of Gestational Development in Ayurveda

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Abstract

Introduction - Growth, development & differentiation are 3 processes of enhancing life starting from Zygote up to an adult individual. In Ayurveda, all the three sequences included under Garbha vridhhi. Apart from maternal diet & regimen, epigenetic factor (Garbhakara bhava), specific nutrition (Upasneha, Upasweda), time (kala) & natural instinct (Swabhava samsiddhi) are the factors stressed by Acharya Charak. Kala or the time factor is svayambhu, remains unaffected and the science lucidly discussed it under Masanumasik Garbha vridhhi i.e. month wise development. Process starts from Kalala which understood as morula, followed by Ghana happened through appositional mechanism leads to formation of Neural tube, Sclerotome, Myotome, formation of limb bud, Dauhridini, development of Mana (intellect), presence or absence of Oja & timely delivery at 9th or 10th month is the overview of whole process. As stressed cellular differentiation, subsequent forming tissue, followed by development of organ & lastly organ system is also understood in different epoch of Masanumasik Garbha Vriddhi. Present study wants to discuss all the available references in Ayurveda highlighting maximum probable interpretation from logical approach.

Material & method- Literary method of Gestational development mentioned in all Ayurvedic classics has collected & logical interpretation of maximum content has discussed.

Result & conclusion- Embryological and structural fetal development from Kalala (morula) to description of Ojas is elucidated with probable interpretation.

Keywords: Masanumasik Garbha Vriddhi, Kalala, mechanism of development, time, cell differentiation & maturation.

1. Introduction

Growth is a process where from the totipotent cell converted finally into tissue. The tissue subsequently forms organ and inclusion of identical function placed under one system. The process of growth starts from the time of conception and continues into a fully mature adult. It can be defined as increase in size of an individual which occurs by multiplication of cells and increase in intracellular substance. This whole process can be understood in following heading i.e.

- i) Presence of bud or its growth (development, differentiation and morphogenetic processes and controlled growth).
- ii) Its development &
- iii) Differentiation

In Ayurveda all the material of outcome of pregnancy interpreted in term of Garbha. Hence, Garbha will include Germinal, Embryonic & Foetal phase and even shukra & artava also sometimes considered as embryo.

Garbha vridhhi is a process by which a fertilized ovum will develop subsequently to form a complete foetus.

Maximum scholar of Ayurveda wants to highlight development of different body parts either in minute form or in apparently visible. The whole research work will be discussed in 4 headings i.e. Introduction including aims & objectives, material & methods, result & discussion.

AIMS & OBJECTIVES

- i) To study the month wise development (masanumasik vridhhi krama) as per Ayurvedic literature.
- ii) Logical interpretation of Gestational development.

MATERIAL & METHOD

- i) Brihatrayi, Laghutrayi, Ashtanga Hrdaya, Kashyap, Harita, Bhavamishra & Garbhoupanishad highlighting month wise development will be assessed.
- ii) Assessment of evaluated findings will be interpreted in the field of embryogenesis and foetal development in maximum probability.

REVIEW LITERATURE & DISCUSSION -

Susruta defines that Garbha forms due to the union of Sukra and Sonita along Atma, Prakriti (asta prakriti- Buddhi, Mahat, Ahankar and Panchamahabhuta) and Vikaras (saudash bikara-panchagyanendriya, panchakarmendriya, panchatanmatra and mana).¹

Charak has enumerated the definition of Garbha as –The conjugation of Sukra, Sonita and Jivatma (soul) inside the Garbhasaya (kukshi) forms Garbha.²

According to ashtanga Hridaya, satva impelled by the afflictions of his own past actions entering into the union of pure sukra and artava giving rise to the formation of embryo.³

MECHANISM FOR DEVELOPMENT OF THE FETUS

सौयं शुक्रमार्तवमान्यमितेषामप्यत्र भूतानां सानिध्यमस्त्युणना विशेषण, परस्परोपकारात् (परस्परानुग्रहात्) परस्परानुप्रवेशाच्च ॥३॥⁴

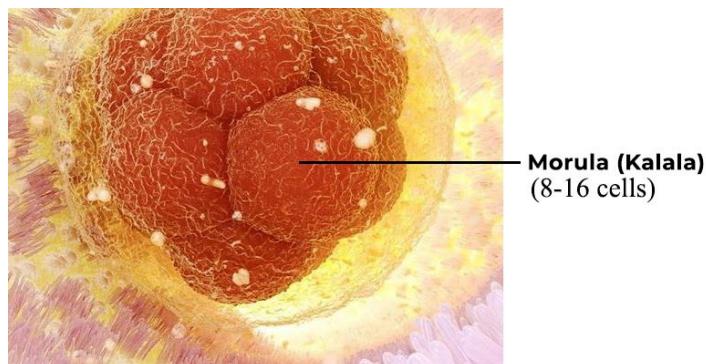
Susruta says that Garbha is generated due to obligation towards each other (parasparapakara), affinity towards each other (parasparanugrahata) and inclusion of one another into each other (parasparanupraveshata). This means due to intermingling of panchamahabhutas in each other's garbha is formed.

Susruta's further opined that the development of Garbha mainly depends upon the inflation done by vayu (marutadhmana nimitta) and supply of nourishment by rasa (rasa nimitta). Behind the umbilicus there is the location of 'Jyotisthana' (the place of light or fire). The vayu by its blowing action stimulates this fire, which in turn causes development of the body. The same vayu in combination with agni spreads in srotases in vertical, horizontal and oblique direction and thus growth of the garbha takes place. Dalhan commenting on the above description explains 'marutadhmana' as vata entering into the srotas in dhatus of the fetus causes their dilatation, which provides space for its growth.⁵

In classical Ayurveda, this complex, stepwise formation of organs and physiological functions is known as *Masanumasik Vriddhi*, the month-wise development of the fetus. Simultaneously, modern embryology describes this process through distinct phases: germinal, embryonic, and fetal. Ayurveda describes fetal development in nine month-wise stages, correlating closely with the three modern phases: Germinal (Weeks 1-2), Embryonic (Weeks 3-8), and Fetal (Weeks 9-40).

1st month-

- **Acharya Charak-** Caraka opines that 'Embryo' takes the form of jelly because of intimate mixture of the panchamahabhutas (which get developed in the subsequent month as the tissue elements: rasa etc of the body). In this month of gestation, it takes the form of jelly like because of the intimate mixture of the five Mahabhutas though body parts are not conspicuous (*Sadasadabhuta angavayava*). Chakrapani mentioned Kalala as jelly like appearance. (ખેટ: શ્લેષ્મા, તેન ખેટભતૂ ઇતિ શ્લેષ્મસદૂષ ઇત્યર્થ:)⁶



- **Susruta:** The shape and size of the Garbha in the first month is like that of a kalala (a small round mass of phlegm- morula). Dalhana mentioned Kalala as semisolid mass like nasal discharge (*singhanaprakasha*)⁷
- According to **Vaghbata I (Ashtanga sangraha) & Vaghbata II (Ashtanga Hrudaya)**, Garbha attains the shape of kalala after one week of fertilization in the first month. **Aruna dutta** in his commentary mentioned that within seven days, the embryo becomes a spherical mass (Garbha golaka shleshma pindibhuta). After seven days, until one month, it becomes an unmanifested jelly form (Kalala). When it has become unmanifested, as long as the distinct features of a man and a woman are not visible, the Pumsavana ritual should be performed in the first month.^{8,9}
- **Bhavamisra:** In the first month sukra and artava remain in the liquid form.¹⁰
- **Kashyap-** Beej dhatu divided by jeevatma prana and sharir pravishta is surrounded by Rakta.¹¹
- **Harita:** On first day kalala is formed from the union of reta and artava. On the 10th day the kalala becomes budbuda (bubble). On 15th day the budbuda becomes solidified and on 20th day the garbha attains pancha mahabhuta and existence of pancha mahabhuta become more prominent at the end of one month (30th day).¹²
- ❖ **Logical interpretation-** The concept of 'kalala' can be emphasized in the Germinal Phase. The formation of the zygote through gamete fertilization is followed by rapid cell division and the formation of the blastocyst approximately after 72 hours of fertilisation. Implantation in the uterine wall occurs, and the primitive germ layers endoderm, mesoderm and ectoderm begin to form and developing buds of different structures arise from these layers. Developing buds of different

structures arise from these layers. But these buds are not well manifested for differentiation and recognition. This stage can be correlated to Charaka's description where he emphasized that organs developed in this period are both manifested and latent. Harita's concept on 10th day Kalala becomes Budbuda which can be interpreted with formation of extra embryonic and intra embryonic part along with germ disc. This happens after the process of embedding which gets completed on 9th day. Thus, Harita's concept during this month can be considered rational.¹³

2nd month-

- **Acharya charak, Vaghbata I& II:** During second month, the garbha becomes a solid mass. If the shape of solid mass is like a pinda (ovale) it develops into male, if it has shape like peshi (elongated) then it develops into female and if it has shape like arbuda (semi- circular) then it develops into napumsakam (hermaphrodite). Chakrapani commented that the embryo takes compact form in the shape of pinda, peshi and arbuda. He further emphasized shape of pinda, peshi and arbuda as granthi, mamsa peshi and vartulaunnatam respectively.^{14,15,16}
- **Susruta & Bhavamisra:** Due to influence of the Doshas and Panchamahabhuta the sex determination can be found. After it processed by shita, usma, anila forms a compact mass (ghana-kathina). Then he has similar description as of charaka.^{17,18}

‘यथा- “चतुरसा भवेत् पेशी, वृत्तः पिण्डो घनः स्मृतः। शाल्मलीमुकुलाकारमर्दुं परिचक्षते”- इति”॥¹⁹

Dalhana characterizes shape of pinda, peshi, arbuda as ghana, vritta and bud of shalmali respectively are appeared. Gayi on the basis of bhoja describes peshi as quadrangular and arbuda is like Salmali bud.

- **Kashyap-** formation of asthi, mamsa and snayu in Garbha by Shukra.²⁰
- **Harita:** On 50th day the garbha attains a new bud (ankura).²¹
- ❖ **Logical interpretation-** Sex differentiation can be highlighted in 3 form i.e. Genetic, Gonadal and Somatic. Genetic sex present is identical with the presence of sex chromosomes. Gonadal sex means present of developing of reproductive bud in posterior abdominal wall while Somatic sex is location of testes and ovary in respective area, where testes reach the scrotum by gubernaculum. Modern embryologist's states that the external genitalia differentiation begins towards the end of this month (genital ridge formation). By the end of 8th week, Leydig cell begin production of testosterone and the testes is able to influence sexual differentiation of Genital duct and External genitalia. In 7th week there is formation of cortical cords of ovary. Paramesonephric duct (mullerian) are stimulated to form uterine tube, uterus, cervix, upper part of vagina. In 3rd week there is development of scrotal swellings in male & labia major in female. Testes reach inguinal region by approximately 12th week.²² But sex differentiation of embryo at this stage is not possible.

Tendon formation in fetus starts early (6th-8th weeks) from mesenchyme in limb buds, connecting developing muscles (from somite's) to skeletal precursors from neural crest or mesoderm which coincides with Kashyap's opinion.²³

3rd month-

- **Charak-** All the Indriyas, major and minor body parts appear simultaneously.²⁴ Chakrapani has also mentioned appearance of body hair.²⁵ Spandana (pulsation/heart beat) is also mentioned.²⁶

Dauhridavastha is attained by this month. By the suppression of longings of pregnancy, the vata gets vitiated, moves inside the body, and destroys or deforms the fetus in the formative stage.²⁷

- **Sushruta & Bhavamishra-** In third month, there will be formation of five bud (gatra panchaka) in the Garbha which represent hasta (upper limb), pada (lower limb) and siras (head). The differentiation of the major and minor parts manifested subsequently. (Sukshma).^{28,29} **Dalhana** opines development of murdha, prishta, udara, chibuka, nasa, osthā, sravana, anguli.

- **Vagbhata I-** In the third month there will be five branching in the fetus, such as the two for the legs, two for the arms and one for the head.³⁰ The garbhini attains dauhridiniavastha and if not attained Garbha gets vinasha or vaikruta form. Kubja, pangu, vaikalyata and kilasa etc is formed if douhriniavstha is not fulfilled.³¹

Indu — the structure like teeth, hair which are expected to emerge out during janmottar kala follow their own schedule, with manifestation of Chetana, the knowledge of pleasure, pain also manifest.³²

- **Vagbhata II -** During the third months, the five parts of the body (Gatra panchakam) become manifest, the head, two legs, two arms, and also all minor parts. Simultaneously with the formation of head etc; the knowledge of pleasure and pain also manifested. **Aruna dutta** – the structure like teeth etc. which are expected to emerge out during janmottar kala follow their own schedule.³³

- **Kashyap-** Formation of Sarvangavyava (organogenesis) sequencely, Praspondana Chetyati (heart beat start), Vedana (sensation).³⁴

- **Harita:** Formation of hasta, pada and shiro in this month.³⁵ He also said that douhrida occurs in this month.³⁶

- ❖ **Logical interpretation-** Differentiation of different bud which is clearly highlighted by Dalhana. Limb movement is completed by 3rd month according to modern science, which is elucidated by Dalhana. Modern embryologist opines that center of ossification appears in most bones and the finger and toes differentiate, limbs are long, bent at elbow by 50-56 days.³⁷ which coincides with the development of pada by Sushruta, Vagbhata & Harita.

4th month-

- **Charak-** Garbha attains stability thereby, at that time pregnant women specifically get excessive heaviness in her body.³⁸
- **Sushruta-** In the fourth month Anga Prtyanga Vibhaga (demarcation of organs) is more prominent. The Chetana Dhatu also gets manifested because the Hridaya (heart) becomes obvious. Seat of Chetana (Atma) is Hridaya. The woman now possesses two hearts and is known as Dauhridini. If these desires are ignored, the lady would deliver the child Kubja, Kuni, Khanja, Jada, Vaman and Vikritaksa. Hence, whatever she desires should be provided to her, if desires are fulfilled, she will give birth to a child who will be potent and long -lived. Dalhana mentioned perception of Sabda, Sparsha, Rupa, Rasa, Gandha by sensory organ.³⁹
- **Vagbhata I-** During the fourth month, all the major and minor parts of the body become clearer and the Garbha attains stability.⁴⁰
- **Vagbhata II-** In the fourth month, all the parts become manifest (vyakta). Aruna dutta commented that the body parts which had manifested minutely are completed by this month.⁴¹
- **Kashyap-** Stability of fetus is attained.⁴²

- **Bhavamishra-** All Anga and Pratyanga developed, heart beat and sensation present. Hence during the 4th month, the fetus desires many things so the women will then know as Dauhrdini.⁴³
- **Harita:** lanugo appears in this month.⁴⁴
- ❖ **Logical interpretation-** As per modern embryologists' consciousness of fetus can be understood, quickening in 4th month; where fetal heart sound (FHS) can be auscultated can be interpreted with Sushruta opinion. 'Sthira bhavati' can be understood as maturation of Placenta, stabilization of Placenta does the persistence of fetus.

Acharya Sushruta clearly mentioned about the pratyanga vibhaga (demarcation of organ) which clearly coincides with the formation of bile by hepatocyte, bile is concentrated by gallbladder (13th week), secretion of hormone by pancreas and production of urine by kidney starts by the end of 3rd month. Maturation of midbrain i.e. superior colliculus through Lateral Geniculate Body (LGB) which is meant for eye movement begin at 16-18 weeks can be interpreted with Dalhana's commentary on perception of Rupa.

Exact description of dauhridavastha is not explainable for modern science. As Dauhrda description is given in 4th month that is very much similar to the modern concept of rapid brain growth & starting of myelination of CNS between 13- 20th developmental week.⁴⁵ The critical period in the development of brain is from 3-16 weeks where it has high susceptibility to teratogens. High level of exposure to teratogens has a high risk of congenital anomalies, especially mental retardation from 8-16th weeks of fertilization.⁴⁶ This can be correlated to acharya Sushruta opinion of giving birth to a deformed child in 4th month.

Moreover, at the end of first trimester toxæmia develops in some women which exhibits the identical feature of dauhridini.

The fetus is covered with fine hair called lanugo where Harit's opinion seems to be rationale. The skin is covered by a greasy material called Vernix caseosa.

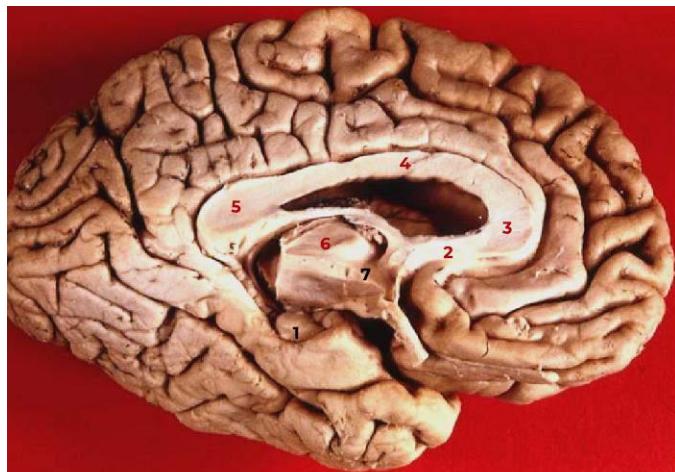
5th month-

- **Charak-** In comparison with previous months, the pregnant women grow excessively thinner because growth (Upachaya) of Mamsa, Shonita in fetus is more prevalent in this month. Therefore, at that time pregnant woman gets excessively emaciated.⁴⁷
- **Sushruta & Bhavamishra-** In the fifth month, mind becomes clearly manifest. **Dalhana** opines same^{48,49}
- **Vagbhata I-** Mind becomes more active and increased Mamsa and Shonita during the fifth month.⁵⁰
- **Vagbhata II-** In the fifth month, the Chetana (consciousness) is manifested completely.⁵¹
- **Kashyap** - Mamsha Shonit Vridhhi (formation) and uses the word "jivaka" which means fetus becomes more active during this month.⁵²
- **Harita:** opines that the fetus appears more sujiva (capable to live independently).⁵³
- ❖ **Logical interpretation-** Acharya Charak, Vagbhata II and Kashyap has mentioned that in comparison to other, there is an rapid growth in muscle and blood volume. In relation with this in modern embryologists it can be found that in week 15-18, myotubes mature into myofibers which are basic muscle fiber. In later period towards the end of 5th month the perimysium, a connective tissue layer begins to surround grouped fiber (week 22-24) and secondary muscle fiber begin to

form and start moving in 2nd trimester.⁵⁴ The fetus weighs more than 300 gm and there is a rapid increment in length.

Modern embryologists mention that the process of erythropoiesis is going to stabilize towards the end of this month i.e. Bone marrow takes over as the primary site of red blood cell formation which is known as Myeloid stage. In relation with this it is found that erythropoiesis going to stabilize towards the end month i.e. in 5th month which coincides with Acharya Charak, Vaghbata I & Kashyap opinion of shonita vriddhi.

Acharya Sushruta has emphasized about the manifestation of Mana. Acharya Vaghbata II have clearly emphasized on Chetana whereas Vaghbata I has said that the mind becomes more active and there is increased mamsa and shonita. Auditory reflexes and peripheral reflexes develop along with sensory perception is the indication of enlightenment of mana can be understood with 'pratibuddhataram bhavati' in 5th month.



1. Uncus, 2. Corpus callosum, Rostrum, 3. Corpus callosum, Genu,
4. Corpus callosum, Truncus, 5. Corpus callosum, Splenium, 6. Thalamus,
7. Hypothalamus

6th month-

- **Charak-** In comparison with other months, there is excessive increase in Bala, Varna of the Garbha during the sixth month of gestation. Therefore, at that time the pregnant women loss her Bala and Varna considerably. Chakrapani also mentioned about the Pushti of dhatu.⁵⁵
- **Sushruta & Bhavamishra-** Intellect of the fetus gets developed during this month.^{56,57}
- **Vaghbata I & II-** All the hard substance such as body hairs, nails, bones, ligaments, blood vessels, skin etc. along with strength and complexion appears in this month.^{58,59}
- **Kashyap-** Bala, Varna and Ojas Vridhhi (Formation) and shrama adhika (tiredness) present in gravida.⁶⁰
- **Harita:** Fetal movement quivering (sphurana) appears from this month.⁶¹
- ❖ **Logical interpretation-** Acharya Charaka has stated in comparison with any other month the strength and complexion excessively increased in sixth month. In relation with this it can be found that layer of skin develops completely by this month along with keratinization though skin appears in the end of 5th month of intrauterine life. Skin, eyes get color by 26th week which get rationale with Charak's opinion. The fetus weighs more than 300 gms and there is rapid increment in length.

Sushruta and Bhavamisra stated that intellect of the fetus gets developed during this month. According to modern science, development of cerebrum becomes completed in this month. The

center of intellect lies in cerebrum. Therefore, Sushruta & Bhvamishra version that intellect of the fetus gets developed during this month can be considered rational. The centre of intellect lies in cerebrum.

Acharya Vagbhata II said that all the hard substances such as body hairs, nails, bones, ligaments, blood vessels etc. along with strength and complexion appears in this month. According to modern Embryologists, Centre for primary ossification for almost all bones also appear. Nails and bones harden further by this month. The eyelids and eyebrows are well developed and the lanugo darkens. So Vagbhata I & Vagbhata II concept about growth of the fetus in 6th month also seems to be rational. Also, embryologists mentioned that in 6th month the specific sensory receptor Meissner and Pacini body gets developed in 24th weeks of gestation. Thalamocortical pathways is important for perception of sensory impulses, reach the somatosensory cortex around 23rd week correlating with the development of synapses in the cortical plate. All these can be incorporated with total functional aspect of skin. These highlight the development of twaka as specified by Vagbhata I & II.⁶²

7th month-

- **Charak-** There is an all-round development of the Garbha. Therefore, a Garbhini (pregnant woman) becomes exceedingly deficient in all aspects of her health. Chakrapani emphasized on enrichment of mamsa- shonita.⁶³
- **Sushruta-** According to Acharya Sushruta, in the seventh month differentiation of major and minor body parts will become clearly manifested. The word 'pravyaktotara' defines exfoliation or the specific development of body parts.⁶⁴
- **Vagbhata I & Kashyap:** During this month all the doshas and dhatus are brought to their mature state (both structure and function). Garbha becomes viable if he/she delivers in this month.^{65,66}
- **Vagbhata II:** All body parts and bhavas of fetus get developed and nourished well.⁶⁷

Aruna dutta- Baby born in the seventh month is considered premature, though able to live, will not have the same longevity as a full-term baby.

- **Bhavamishra** - During this month all the major and minor body parts become prominent.⁶⁸
- **Harita:** Jatharagni develops.⁶⁹
- ❖ **Logical interpretation-** The fetus shows complete organ formation; further growth focuses on maturation and weight gain. The mother may experience fatigue, back pain and nutritional strain as the baby rapidly grows which seems rational with charak's opinion.

During the 7th month, the CR length is 250-270 mm and the weight is 1000 to 1300 gm. the chance of survival is nearly 90%.⁷⁰ Live birth is possible after 7th month which coincides with Vagbhata opinion. Lung alveoli begin to secrete surfactant, which helps to maintain the patency of the alveoli of the lungs sign of respiratory system maturity.

Harita's concept of function of Jatharagni can be understood with the peristalsis, begin between 14 and 23 weeks (end of 6th month) i.e. the metabolic activity of Gastrointestinal tract.

8th month-

- **Charak-** The ojas formed in the Garbha becomes unsteady moves to the body of mother, so the pregnant women often have a wavering feeling of joy & sorrow.⁷¹
- **Sushruta & Bhavamishra-** In the eight months, Ojas becomes unstable; if Garbha born in this month does not survive firstly because of the absence of 'Ojas' and secondly because of the 'NaRta' (demons). So, the demons should be offered oblation of rice cooked along the meat. Commentator Dalhan has explained this 'NaRta' as part of the rakshasas bestowed upon the child by Rudra.⁷²
- **Vagbhata I-** Ojas is unstable and moves between her body and of the fetus along with rasa. Some other says that death of the fetus (born during eight month) is due to influence of 'NaRta'.⁷³
- **Vagbhata II-** During the eight months, Ojas travel between the mother and the child alternately; because of this, they become fatigued or contented respectively; the child born during this month does not survive, and life of the woman is also doubtful, because of the absence of the Ojas.⁷⁴
- **Kashyap-** Ashtira Oja (unstable life)⁷⁵
- **Harita:** opines that in this month the Pachakagni (digestive enzymes) starts functioning.⁷⁶
- ❖ **Logical interpretation-** In Therapeutic application of disorder that occurs in pregnant women that especially in 8th month treated with micronutrients that may cover deficiency of Protein and Carbohydrate as well as Hb which is clear exhibition of Acharya Sushruta application of Mamsaodana. The above phenomenon of Sushruta may be depiction of deficiency of nutrients occurs to mother and their baby in its excess condition. Otherwise in order to maintain proper nutrients in 8th month kshira yavagu is mentioned in Masanumasik Garbhini Paricharya.

Pepsin secretion is fully developed in full term infants at 3-8 months of age.

9th month

- **Charak-** From the first day of the ninth month till the end of the tenth month is known as the period of Prasava-Kala (period of parturition). Retention of Garbha in the Kukshi thereafter is abnormal.⁷⁷
- **Sushruta & Bhavamishra-** Birth may take place in any one of the ninth, tenth, eleventh or twelfth months. Birth taking place apart from these months is abnormal.^{78,79}
- **Vagbhata I & II** – From completion of eight months to twelfth month is the time for the birth of the child; if afterwards fetus is retained inside the abdomen afflicts by Vata, leading to abnormalities.^{80,81}
- **Kashyap:** Delivery occurs in this month.⁸²
- **Harita:** Appearance of chesta in fetus i.e organ systems able to function and at 10th month delivery occurs.⁸³
- ❖ **Logical interpretation-** Regarding the delivery of baby, the classics has got certain dissimilarity. Charak's concept of delivery of crossing 9th and 10th month is found logical as Expected Date of Delivery (EDD) is calculated after 9 month ± 7 days of LMP (Naegele's rule).

Garbhupanishad-

Another text related to embryological description of ancient system of medicine i.e. Garbhupanishad where certain references are available and can be interpreted.

1st month – The Garbha appears Kalala in first night, formation of Budbuda in 7th day followed by pinda in 15th day and in a month, it forms a hard mass (kathina).

- ❖ **Logical interpretation-** Kalala can be understood as morula; blastocyst is formed after 96 hours can be interpreted with Budbuda.

2nd month – The Shiro is formed.

- ❖ Logical interpretation Cerebral hemisphere visible by week 5.

3rd month- Appearance of limbs (Padapradeshi)

- ❖ **Logical interpretation-**According to modern embryologists, limbic musculature completely form, limb movements start completely by 3rd month.

4th month- In the fourth month appearance of Gulpha, jathara, kati.

- ❖ **Logical interpretation-**Modern embryologists opine that in the process of development stomach completes its rotation around its longitudinal axis, taking its final position by 16th week.⁸⁴ Macroscopically, all infantile configuration of the hip joint is achieved and complete differentiation is completed by 20th week. At 16th week, ossification of femur is complete, flexion of hip, knee, ankle occur further and the left leg is slightly overlapping the right leg.

5th month - The pristhavamsa is formed

- ❖ **Logical interpretation-** Spinal cord present in the vertebral column develops completely by 20th week

6th month-In the sixth month, Mukha, nasika, Akshi, srota are formed.

- ❖ **Logical interpretation** – Embryologists mentions that Eyelid open, Optic reflex by week 26, Ear distinguishes voice by week 25 and Nasal pits are established after 5th week and later nasal septum fuse with each other.

7th month -In the seventh month, Jeevana Samyukta bhavati, fetus becomes viable.

- ❖ **Logical interpretation** Live birth possible after seventh month.

8th month- the fetus becomes complete in every sense (Sarvalakshana sampurna)

9th month -Sarvalakshana gyanakarana

- ❖ **Logical interpretation-** In 9th month baby attains all consciousness and gains maturity.

Conclusion

Embryological development detailed in classics specifically in Brihatrayi, Ashtanga Hridaya, Kashyapa, Harita & Garbhupanishad also mentioned segregately. This process of Garbha vriddhi completes in all three methods of development i.e. Growth, Development & Differentiation. Embryological (Kalala), structural development (Gatra Panchak), excess of Mamsa -Shonita (Myogenesis, Rhytropoiesis), perception of Rupa (Maturation of midbrain i.e. superior colliculus through Lateral Geniculate Body (LGB) meant for eye movement), probable interpretation of Dauhridini, Pratyanga vibhaga (demarcation of different organ), Manifestation of Mana (Complete development of Cerebrum), increased Bala, Varna (Keratinization of skin along with development of Meissner and pacini body), development of Jathragni (Metabolic activity of Gastrointestinal Tract) along with probable interpretation of description of ojas are being explained. A probable evaluation of Garbhupanishad is also being illustrated. Certain features align remarkably modern embryological concept while some concepts are difficult to interpret. Yet therapeutic interpretation of whole discussion definitely plays role in forming a healthy wellbeing. A holistic approach can enhance prenatal care, offering a comprehensive model for healthy pregnancy and improved fetal development.

References

1. Sushruta Samhita, Sharir sthana,5/3, Edited by Kaviraja Ambikadutta Shastri, Chaukhamba Sanskrit Sansthan, Part I, Edition, 1997, Page 41
2. Caraka Samhita, Sharir sthana,4/5, Edited by Prof.Ravi Dutt Tripathi and Acharya Vidyadhar Shukla, Chaukhamba Sanskrit Pratishthan, Delhi. Reprint,2007. Page 726.
3. Astanga Hridaya of Vaghbata with the commentaries sarvanga sundara of Arundatta and Ayurved rasayana of hemadri, Sharir sthana 1/1 arundatta commentary
4. Sushruta Samhita, Sharir sthana,3/3, Edited by Kaviraja Ambikadutta Shastri, Chaukhamba Sanskrit Sansthan, Part I, Edition, 1997
5. Sushruta Samhita, Sharir sthana,4/56-58, Edited by Kaviraja Ambikadutta Shastri, Chaukhamba Sanskrit Sansthan, Part I, Edition, 1997
6. Caraka Samhita, Sharir sthana,4/9, Edited by Prof.Ravi Dutt Tripathi and Acharya Vidyadhar Shukla, Chaukhamba Sanskrit Pratishthan, Delhi. Reprint,2007
7. Sushruta Samhita, Sharir sthana,3/18, Edited by Kaviraja Ambikadutta Shastri, Chaukhamba Sanskrit Sansthan, Part I, Edition, 1997
8. Tripathi R.D, AstangaSamgraha, Chowkhamba Sanskrit Pratisthan, Delhi, Astanga Sangraha, Sarira Sthana 2/7
9. Astanga Hridaya of Vaghbata with the commentaries sarvanga sundara of Arundatta and Ayurved rasayana of hemadri, Sharir sthana 1/37 arundatta commentary
10. Shri. Brahmashankara Mishra and Shri Rupalalji Vaishya, Bhavamishra. Bhavprakasha, Varanasi edited with Vidyotini, Chaukhamba Sanskrit Series, 2006, Bhava Prakasa of Bhavamisra, Purvakhanda, 3/289
11. Shri Satyapal Bhisagacharya, Vidyotini Commentary on Kashyap samhita of pt. Hemraj Sharma, sharir sthan, garbhavkranti sharir, Kasyapa Samhita, Sarira Sthana 2/3
12. Mahatama Nath Dutta, Harit samhita English edition, H.C. das press Calcutta, 1906, Harita samhita, Sastha sthana 1/ 17-19
13. An Approach To Fetal Growth In Ayurveda with Its Applied Aspects 1Dr. Boro Mitali, 2Dr. Sarma Tikendrajit, 3Dr. Khakhlyary Kaushalya, 4Dr. Deka Dharendra nath International Journal of Ayurvedic & Herbal Medicine 8(6) Nov.-Dec. 2018 (3392-3404)
14. Caraka Samhita, Sharir sthana,4/10, Edited By Prof.Ravi Dutt Tripathi And Acharya Vidyadhar Shukla, Chaukhamba Sanskrit Pratishthan, Delhi. Reprint,2007
15. Tripathi R.D, AstangaSamgraha, Chowkhamba Sanskrit Pratisthan, Delhi, Astanga Sangraha, Sarira Sthana 2/7
16. Astanga Hridaya of Vaghbata with the commentaries sarvanga sundara of Arundatta and Ayurved rasayana of hemadri, Sharir sthana 1/49 arundatta commentary
17. Sushruta Samhita, Sharir sthana,3/18, Edited By Kaviraja Ambikadutta Shastri, Chaukhamba Sanskrit Sansthan, Part I, Edition, 1997S
18. Shri. Brahmashankara Mishra and Shri Rupalalji Vaishya, Bhavamishra. Bhavprakasha, Varanasi edited with Vidyotini, Chaukhamba Sanskrit Series, 2006, Bhava Prakasa of Bhavamisra, Purvakhanda, 3/290
19. Sushruta Samhita of Sushruta with Ayurved Tatva Sandipika Hindi commentary by Kaviraja Ambika Dutta Shastri, Sharir sthana 3/18 dalhana commentary

20. Shri Satyapal Bhisagacharya, Vidyotini Commentary on Kashyap samhita of pt. Hemraj Sharma, sharir sthan, garbhavkranti sharir, Kasyapa Samhita, Sarira Sthana 2/3
21. Mahatama Nath Dutta, Harit samhita English edition, H.C. das press Calcutta, 1906, Harita samhita, Sastha sthana 1/19
22. Textbook of embryology, Suresh d Gangane, Shahbana M. Borate, chapter 14, page no 173-183.
23. Early fetal development of the intermediate tendon of the human digastricus and omohyoideus muscles: a critical difference in histogenesis Yukio Katori 1, Ji Hyun Kim, Jose Francisco Rodríguez-Vázquez, Tetsuaki Kawase, Gen Murakami, Baik Hwan Cho
24. Caraka Samhita, Sharir sthana, 4/11, Edited By Prof. Ravi Dutt Tripathi And Acharya Vidyadhar Shukla, Chaukhamba Sanskrit Pratishthan, Delhi. Reprint, 2007
25. Caraka Samhita of Agnivesa, revised by caraka and supplemented by Dridhabala with Ayurved Dipika Commentary by Chakrapanidutta, Sharir sthan 8/32
26. Caraka Samhita, Sharir sthana, 4/15, Edited By Prof. Ravi Dutt Tripathi And Acharya Vidyadhar Shukla, Chaukhamba Sanskrit Pratishthan, Delhi. Reprint, 2007
27. Caraka Samhita, Sharir sthana, 4/19, Edited By Prof. Ravi Dutt Tripathi And Acharya Vidyadhar Shukla, Chaukhamba Sanskrit Pratishthan, Delhi. Reprint, 2007
28. Sushruta Samhita of Sushruta with Ayurved Tatva Sandipika Hindi commentary by Kaviraja Ambika Dutta Shastri, Sharir sthana 3/18
29. Shri. Brahmashankara Mishra and Shri Rupalalji Vaishya, Bhavamishra. Bhavprakasha, Varanasi edited with Vidyotini, Chaukhamba Sanskrit Series, 2006, Bhava Prakasa of Bhavamisra, Purvakhanda, 3/291
30. Tripathi R.D, AstangaSamgraha, Chowkhamba Sanskrit Pratisthan, Delhi, Astanga Sangraha, Sarira Sthana 2/7
31. Tripathi R.D, AstangaSamgraha, Chowkhamba Sanskrit Pratisthan, Delhi, Astanga Sangraha, Sutra Sthana 22/4 93 commentary
32. Astang Sangraha of Vruddha Vaghbata with the, sasilekha Sanskrit commentary by Indu, prolong in Sanskrit and English by Jyotir Mitra, Edited by Dr. Shivprasad Sharma, Chaukhamba Sanskrit Series, Varanasi, 22/4 93 commentary
33. Astanga Hridaya of Vaghbata with the, commentaries sarvanga sundara of Arundatta and, Ayurved rasayana of hemadri, Sharir sthana 1, Arundatta Commentary, Astanga Hridaya Sarira Sthana 1/54-
34. Shri Satyapal Bhisagacharya, Vidyotini Commentary on Kashyap samhita of pt. Hemraj Sharma, sharir sthan, garbhavkranti sharir, Kasyapa Samhita, Sarira Sthana 2/4
35. Mahatama Nath Dutta, Harit samhita English edition, H.C. das press Calcutta, 1906, Harita samhita, Sastha sthana 1/20
36. Mahatama Nath Dutta, Harit samhita English edition, H.C. das press Calcutta, 1906, Harita samhita, Tritiya sthana 49/4,
37. Textbook of embryology, Suresh d Gangane, Shahbana M. Borate, chapter 5, page no 51
38. Caraka Samhita, Sharir sthana, 4/20, Edited By Prof. Ravi Dutt Tripathi And Acharya Vidyadhar Shukla, Chaukhamba Sanskrit Pratishthan, Delhi. Reprint, 2007
39. Sushruta Samhita of Sushruta with Ayurved Tatva, Sandipika Hindi commentary by Kaviraja Ambika, Dutta Shastri, Sharir sthana 3/18 Dalhana Commentary

40. Tripathi R.D, AstangaSamgraha, Chowkhamba Sanskrit Pratisthan, Delhi, Astanga Sangraha, Sarira Sthana 2/13
41. Astanga Hridaya of Vagbhata with the, commentaries sarvanga sundara of Arundatta and, Ayurved rasayana of hemadri, Sharir sthana 1, Arundatta Commentary, Astanga Hridaya Sarira Sthana 1/57
42. Shri Satyapal Bhisagacharya, Vidyotini Commentary on Kashyap samhita of pt. Hemraj Sharma, sharir sthan, garbhavkranti sharir, Kasyapa Samhita, Sarira Sthana 2/5
43. Shri. Brahmashankara Mishra and Shri Rupalalji Vaishya, Bhavamishra. Bhavprakasha, Varanasi edited with Vidyotini, Chaukhamba Sanskrit Series, 2006, Bhava Prakasa of Bhavamisra, Purvakhanda, 3/293
44. Mahatama Nath Dutta, Harit samhita English edition, H.C. das press Calcutta, 1906, Harita samhita, Sastha sthana 1/21
45. UNDERSTANDING OF DAUHRDA PERIOD OF PREGNANCY BY MODERN EMBRYOLOGICAL PARAMETERS 1*Dr. Suman Kumari and 2DrAnjana Saxena *Junior Resident, Deptt. of Prasuti Tantra and Stri Roga, Govt. Ayurvedic P.G. College and Hospital, Varanasi.2Assistant Professor, Deptt. of Prasuti Tantra and Stri Roga, Govt. Ayurvedic P.G. College and Hospital.
46. Textbook of embryology , suresh d gangane, shahbana m . borate , chapter 8 , page no
47. Caraka Samhita, Sharir sthana, 4/21, Edited By Prof.Ravi Dutt Tripathi And Acharya Vidyadhar Shukla, Chaukhamba Sanskrit Pratishthan, Delhi. Reprint,2007
48. Sushruta Samhita of Sushruta with Ayurved Tatva Sandipika Hindi commentary by Kaviraja Ambika Dutta Shastri, Sharir sthana 3/28
49. Shri. Brahmashankara Mishra and Shri Rupalalji Vaishya, Bhavamishra. Bhavprakasha, Varanasi edited with Vidyotini, Chaukhamba Sanskrit Series, 2006, Bhava Prakasa of Bhavamisra, Purvakhanda, 3/305
50. Tripathi R.D, AstangaSamgraha, Chowkhamba Sanskrit Pratisthan, Delhi, Astanga Sangraha, Sarira Sthana 2/13
51. Astanga Hridaya of Vagbhata with the, commentaries sarvanga sundara of Arundatta and, Ayurved rasayana of hemadri, Sharir sthana 1, Arundatta Commentary, Astanga Hridaya Sarira Sthana 1/57
52. Shri Satyapal Bhisagacharya, Vidyotini Commentary on Kashyap samhita of pt. Hemraj Sharma, sharir sthan, garbhavkranti sharir, Kasyapa Samhita, Sarira Sthana 2/6
53. Mahatama Nath Dutta, Harit samhita English edition, H.C. das press Calcutta, 1906, Harita samhita, Sastha sthana 1/21
54. Saddler's langman's medical embryology, chapter 11, 12th edition .
55. Caraka Samhita, Sharir sthana, 4/22, Edited By Prof.Ravi Dutt Tripathi And Acharya Vidyadhar Shukla, Chaukhamba Sanskrit Pratishthan, Delhi. Reprint,2007
56. Sushruta Samhita of Sushruta with Ayurved Tatva Sandipika Hindi commentary by Kaviraja Ambika Dutta Shastri, Sharir sthana 3/30
57. Shri. Brahmashankara Mishra and Shri Rupalalji Vaishya, Bhavamishra. Bhavprakasha, Varanasi edited with Vidyotini, Chaukhamba Sanskrit Series, 2006, Bhava Prakasa of Bhavamisra, Purvakhanda, 3/305
58. Tripathi R.D, AstangaSamgraha, Chowkhamba Sanskrit Pratisthan, Delhi, Astanga Sangraha, Sarira Sthana 2/13

59. Astanga Hridaya of Vagbhata with the, commentaries sarvanga sundara of Arundatta and, Ayurved rasayana of hemadri, Sharir sthana 1, Arundatta Commentary, Astanga Hridaya Sarira Sthana 1/57,
60. Shri Satyapal Bhisagacharya, Vidyotini Commentary on Kashyap samhita of pt. Hemraj Sharma, sharir sthan, garbhavkranti sharir, Kasyapa Samhita, Sarira Sthana 2/7
61. Mahatama Nath Dutta, Harit samhita English edition, H.C. das press Calcutta, 1906, Harita samhita, Sastha sthana 1/21
62. An Approach To Fetal Growth in Ayurveda With Its Applied Aspects Dr. Boro Mitali,2Dr. Sarma Tikendrajit,Dr. Khakhly Kaushalya,Dr. Deka Dharendra nath ;International Journal of Ayurvedic & Herbal Medicine 8(6) Nov.-Dec. 2018 (3392-3404)
63. Caraka Samhita, Sharir sthana,4/23, Edited By Prof.Ravi Dutt Tripathi And Acharya Vidyadhar Shukla, Chaukhamba Sanskrit Pratishthan, Delhi. Reprint,2007
64. Sushruta Samhita of Sushruta with Ayurved Tatva Sandipika Hindi commentary by Kaviraja Ambika Dutta Shastri, Sharir sthana 3/30S
65. Tripathi R.D, AstangaSamgraha, Chowkhamba Sanskrit Pratisthan, Delhi, Astanga Sangraha, Sarira Sthana 2/13
66. Shri Satyapal Bhisagacharya, Vidyotini Commentary on Kashyap samhita of pt. Hemraj Sharma, sharir sthan, garbhavkranti sharir, Kasyapa Samhita, Sarira Sthana 2/8
67. Astanga Hridaya of Vagbhata with the, commentaries sarvanga sundara of Arundatta and, Ayurved rasayana of hemadri, Sharir sthana 1, Arundatta Commentary, Astanga Hridaya Sarira Sthana 1/57
68. Shri. Brahmashankara Mishra and Shri Rupalalji Vaishya, Bhavamishra. Bhavprakasha, Varanasi edited with Vidyotini, Chaukhamba Sanskrit Series, 2006, Bhava Prakasa of Bhavamisra, Purvakhanda, 3/305
69. Mahatama Nath Dutta, Harit samhita English edition, H.C. das press Calcutta, 1906, Harita samhita, Sastha sthana 1/21
70. Textbook of Embryology , suresh d gangane, shahbana M . Borate , chapter 6 , page no 55
71. Caraka Samhita, Sharir sthana,4/24, Edited By Prof.Ravi Dutt Tripathi And Acharya Vidyadhar Shukla, Chaukhamba Sanskrit Pratishthan, Delhi. Reprint,2007
72. Susruta Samhita, Sarira Sthana 3/28,Susruta Samhita, Dalhana Commentary, Sarira Sthana 3/30, Bhava Prakasa of Bhavamisra, Purvakhanda 3/306-307
73. Tripathi R.D, AstangaSamgraha, Chowkhamba Sanskrit Pratisthan, Delhi, Astanga Sangraha, Sarira Sthana 2/14
74. Astanga Hridaya of Vagbhata with the, commentaries sarvanga sundara of Arundatta and, Ayurved rasayana of hemadri, Sharir sthana 1, Arundatta Commentary, Astanga Hridaya Sarira Sthana 1/62-63
75. Shri Satyapal Bhisagacharya, Vidyotini Commentary on Kashyap samhita of pt. Hemraj Sharma, sharir sthan, garbhavkranti sharir, Kasyapa Samhita, Sarira Sthana 2/9
76. Mahatama Nath Dutta, Harit samhita English edition, H.C. das press Calcutta, 1906, Harita samhita, Sastha sthana 1/22
77. Caraka Samhita, Sharir sthana,4/25, Edited By Prof.Ravi Dutt Tripathi And Acharya Vidyadhar Shukla, Chaukhamba Sanskrit Pratishthan, Delhi. Reprint,2007
78. Sushruta Samhita of Sushruta with Ayurved Tatva Sandipika Hindi commentary by Kaviraja Ambika Dutta Shastri, Sharir sthana 3/30

79. Shri. Brahmashankara Mishra and Shri Rupalalji Vaishya, Bhavamishra. Bhavprakasha, Varanasi edited with Vidyotini, Chaukhambha Sanskrit Series, 2006, Bhava Prakasa of Bhavamisra, Purvakhanda, 3/308
80. Kaviraj Atridev Gupta, Astang hrdaya , Vidyotini hindi Commentary,edition 2018 Chaukhamba prakashan 2018, Ash.San.Sar 2/15,
81. Astanga Hridaya of Vaghbata with the, commentaries sarvanga sundara of Arundatta and, Ayurved rasayana of hemadri, Sharir sthana 1, Arundatta Commentary, Astanga Hridaya Sarira Sthana 3/37-68 Page-235-239,
82. Shri Satyapal Bhisagacharya, Vidyotini Commentary on Kashyap samhita of pt. Hemraj Sharma, sharir sthan, garbhavkranti sharir, Kasyapa Samhita, Sarira Sthana 2/11
83. Mahatama Nath Dutta, Harit samhita English edition, H.C. das press Calcutta, 1906, Harita samhita, Sastha sthana 1/22
84. Textbook of embryology, Suresh d Gangane, Shahbana M. Borate, chapter 11, page no 107