

**CONCEPT OF EMBRYOLOGY IN AYURVEDA WITH SPECIAL
REFERENCE TO GARBHA SHARIR: A REVIEW ARTICLE****Dr. Mayuri Pramodrao Yawalkar*¹ and Dr. Vinod M. Choudhary²**

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ABSTRACT

Embryology is branch of biology that studies prenatal development of gametes, fertilization and development of embryos and fetuses. Garbha shareera is a term coined for embryology in Ayurveda. We can find some specific chapters in treatises like Sushruta Samhita focusing on fundamentals of embryology and materials related to embryology scattered at different contexts. Compiling extracts and related references would give a good gist of embryological basics explained in Ayurveda Science is the result of curiosity of human being through which human being has studied, analyzed and come to the results of various natural processes occurring in body. Today practically and scientifically the existence of everything has been proved. Ayurveda, being a part of this science also needs a deep study and research for

proving all the facts established by Acharyas in ancient time. In Ayurvedic treatise, the matter related to the concept of Garbha Sharir is systematically described in "Sharir Sthana". Ayurvedic texts have systematic description of various facts mentioned in Ayurveda and in Modern science are quite similar in many point of views.

KEYWORD: Ayurveda, Garbha Sharir, Bija, Garbhavakranti, Garbhadhana.

INTRODUCTION

Occurrence of human body in proper shape, size and weight is a wonder of nature. The embryology has been always a subject of curiosity. How an organism develops from a single cell is quite intriguing. Embryology is the key that helps to unlock such secrets as heredity,

the determination of sex and organic evolution. It conceives a comprehensive and rational explanation of the intricate arrangement of human anatomy. As mentioned in Ayurveda, Swastha Sharir is needed for reaching the Purusharatha Chatushtaya i.e. Dharma, Artha, Kaam and Moksha. Maintenance and protection of Swastha Sharir is the main aim of Ayurvedic science. In Ayurvedic treatise, the matter related to the concept of Garbha Sharir is systematically described. Specific Sthana of the Samhitas where the whole development, embryology and genetics of the organs is described is known as “Sharir Sthana”. Historical Aspect Vedas have the concept that mature age of woman including physical and psychological both are an essential factor for a good progeny.

The proper time of insemination, the gradual and sequential stages of embryonic development have been minutely observed and well described in ancient literature. In Vedic literature, the importance of heredity and environment has been also not left untouched as they could recognize the intimate interaction between the developing embryo and the immediate environment which its body, organ and tissues experience. In Samhitas, the matter related to concept of Garbha Sharir is systematically described. It has well recognized the paternal units taking parts in development of Garbha more precisely. The terms employed for these embryonic components and their stages of developments appear to be more appropriate and scientific, if viewed in the light of present advances.

Modern aspect

The literal meaning of term “Embryo” in modern science signifies the developing ovum during the early months of gestation and the branch of science popularly known as embryology. In its widest sense means the growth from one cell stage to adult one, but the term frequently is restricted to mean the period of growth and development before birth.

Tridosha – embryology

Tridosha links to Ayurvedic embryology.

According to Ayurveda, Garbha i.e. embryo is said to be formed in womb of mother in below mentioned process.

First of all shukra i.e. sperm and shonita i.e. ovum get united in garbhashaya i.e. womb, uterine tube to be precise. This is fertilization. When sperm and ovum get united, product will be called as shukra-shonita i.e. zygote.

This zygote gets impregnated with atma i.e. life element

8 types of prakriti

16 types of vikriti.

Entire composition of atma, prakriti and vikriti embedded in zygote is called garbha. This embryo gets implanted in uterine cavity. Here, being nurtured by maternal nutrients through fetal circulation happening through placenta and umbilical cord, embryo attains growth and development over a period of 9 months until it is matured enough to be delivered at term of pregnancy.

8 types of prakriti

Avyakta – microcosm

Mahat – cosmic intelligence

Ahankara – feeling of egoism or individuality

Shabda – sound

Sparsha – touch

Rupa – vision

Rasa – taste

Gandha – smell

Sound, touch, vision, taste and smell are called pancha tanmatras. 16 types of vikriti are –
Pancha maha bhutas + pancha jgnana indriyas + pancha karma indriyas + manas

Pancha maha bhutas i.e. five elements of nature

Prithvi – earth

Ap / jala – water

Teja – fire

Vayu – wind / air

Akasha – space / ether

Pancha jgnana indriyas and manas – 5 sense organs and mind

Chakshur indriya – sense organ of vision, eyes

Shrotra indriya – sense organ of sound, ears

Ghrana indriya – sense organ of smell, nose

Rasana indriya – sense organ of taste, tongue

Sparshana indriya – sense organ of touch, skin

Manas – mind

Pancha karma indriya – 5 motor organs, organs of function

Vak indriya – vocal apparatus

Pani indriya – hands

Pada – feet

Payu indriya – anus

Upastha indriya – sexual organ, penis

Garbha thus formed is processed and developed by five basic elements of nature at various stages of development. The development of an organism is characterized by a progressive alteration of form and proportions, both externally and internally.

Definition of garbha

Acharya Charaka says that the Samyoga of Shukra, Shonita and Jeeva (Atma) inside the Kukshi is named as Garbha. Garbha is generated due to intermingling of Panchamahabhutas in each other's. Acharya Sushruta states that a combined state of "Shukra" and "Shonita" in the Garbhashaya, intermixed with the "Prakritis" (Mula-Prakriti along with its eight categories) and "Vikaras" (her sixteen modifications) and ridden in by the Atma is called "Garbha". Vriddha Vagbhata corroborating the views of Charaka explains that due to effect of Raga (desires) etc. and impelled by deeds of previous life the Mana propels Jeeva to come to the Kukshi (uterus) and formation of Garbha occurs. The term "Garbhavakranti" in Ayurveda, though analogically stands parallel to the embryology but is more comprehensive. In real sense it deals with the process of fertilization and development of the foetus starting from their parental units, their union (fertilization), implantation, successive growth and finally the full term delivery. It comprises of two words, i.e., the "Garbha" and "Avakranti", which literally gives an idea about descent of a dormant embodied life principle.

Garbha sambhav samagri (factors essential for formation of garbha)

Four factors i.e., "Ritu" (menstrual period) "Kshetra" (uterus) "Ambu" (Ahara Rasa) "Bija" (Shukra and Shonita) are the essential raw ingredients for the production of Garbha, provided Bija (Shukra and Shonita) should be pure. It means Ritu, Kshetra, Ambu and Bija contribute in the formation of Garbha but afterwards different organs develop in the Garbha with the help of different Bhavas. Characteristics of Shukra and Shonita for good progeny should be as described below. Shukra: The male factor which is taking part in the formation of Garbha

is called as Shukra. It is composed of Vayu, Agni, Jala, Prithvi Mahabhuta. This Shukra is formed by the food substances having all the six Rasa. Shukra Guna: Shukra is Shukla (white) in Varna, Sphatika (crystal) like appearance, Madhura (sweet) in taste, Madhu in Gandha, Snighda, Picchila, Sandra, Guru in consistency and overall appearance like Taila and Kshoudra. Shukra possessing these characters, only called as Shuddha Shukra and capable to produce Garbha.

Pramana: Quantity Shukra of the Shukra

Dhatu is Ardha ($\frac{1}{2}$) Anjali in human body

Artava/Shonita/Raja: From Rasa (Dhatu), the Rakta named as Raja is formed. Artava is Agneya, has characteristics of Rakta, forms Garbha and is also essential for life. The Artava becomes Vyakta in a female body from the age of twelve years and persists up-to fifty.

Thus it is physiologically absent before twelve years and after fifty years. Rakta reaching Yoni (uterus) and coming out for three days in every month is called Artava. The blood collected for whole month by both the Dhamanis assuming slight black colour and specific colour or odour is brought downwards to Yoni-mukha (vaginal orifice) for excretion.

Shuddha Artava: Artava should be unctuous, bright red in colour like Padma (red lotus) / Gunjaphala (abrus seed) / Laksha Rasa (lac juice) / Indragopa (cochineal) / Shasha Asrik (like rabbit's blood), and free from pain or burning. This menstrual blood does not impart permanent stain on the cloth. The quantity is not very scanty or very excess.

Artava Pramana: It is four Anjali (approximately four ounces).

Panchbhautikta of garbha

The fusion of Shukra and Shonita (sperm and ovum) in the Kukshi (womb) mixed with Prakritis and its sixteen modifications known as Vikaras and Aatma give rise to Garbha (an embryo). Acharya Sushruta has clearly stated the role of „Panchamahabhutas“ and the selfconsciousness in the Garbha.

1. Vayu Bhuta divides this mass into Dosha, Dhatu, Mala, Anga and Pratyanga etc.
2. Tejas Bhuta gives rise to the metabolism of the tissue.
3. Aap Bhuta keeps it in liquid state.
4. Prithvi Bhuta is embodied in the shape of its species.
5. Akasha Bhuta contributes to its growth and development.

A fully developed Garbha with all its parts, such as the hands, feet, tongue, nose, ear, buttocks etc. and the sense organs is called “Shariram”. This is how the fetus develops.

On putting lime light on monthly development and organogenesis in Ayurveda, different Acharyas have different views.

Garbhavakranti comprises of two words, i.e., the “Garbha” and “Avakranti”, which literally gives an idea about descent of a dormant embodied life principle. Charaka says that when between a man of unvitiated Shukra (semen) and a woman of unvitiated Yoni (vagina), Shonita (ovum) and Garbhashaya (uterus), mating takes place during the night time, and when, moreover, the spirit descends, by the agency of the mind into that union of the Shonita fertilized by Shukra formed inside the Garbhashaya (womb), as a result Garbha is formed. Due to constant use of congenial diet by the pregnant woman this Garbha grows normally and gets delivered at appropriate time with all Indriyas (sensory and motor organs), complete body parts, Bala (energy), Varna (complexion), Satva (endurance) and Samhanana (compactness) along with Matrija (maternal), Pitrija (paternal), Atmaja, Satmyaja and Rasaja Bhavas (physical and psychological components) having constant association of Mana.

Sushruta opines that the Teja or heat generated at the time of coitus activates Vayu, then the Shukra excreted due to the action of both Vayu and Teja reaches Yoni gets mixed up with Artava, thus formed Garbha (zygote) with the union of Agni (Artava) and Soma (Shukra) stays in Garbhashaya (uterus). The additional differentiating factors put forth by Vagbhata are mainly “Panchakleshas” (i.e. Avidhya, Asmita, Raga, Dvesha and Abhinivesha), and “Swakarmas” (deeds of previous life). It can be briefly stated that the Garbha comes into existence inside the Garbhashaya soon after union of Shukra and Shonita governed by “Panchakleshas” and previous deeds of life and subsequently influenced by “Jeevatma” along with the Mana. The entire process of Garbhavakranti is controlled by Satva and Vayu. First Vayu deposits Shukra in Yoni, then Shukra passes through the Trayavarta of Yoni, there it gets absorbed by Vata and Vata facilitates its union with Artava, thereby Shukra Shonita Sammurchana takes place. After this, Satva acts as an instrument and paves the way for descent of Atma into the Shukra Shonita Sammurchita mass. So that in formation of Garbha the role of Mana has been recognised first, and subsequently the “Atma” gets entered to co-opt the attributes of Mana. The time while imprinting upon the attributes of “Manas”, the “Atma” first creates the “Akasha” and then subsequently other “Bhutas” are created in their sequence of evolution.

Garbha vriddhikara bhava

1. Shatbhava Sampat: Excellence of Matrija, Pitrija, Satvaja, Satmyaja, Rasaja, Atmaja Bhava.
2. Ahara, Vihara of Mother: Dietary regimen prescribed for Garbhini.
3. Upasneha and Upasweda: By diffusion and heat conduction.
4. Kala Parinama: By time factor.
5. Svabhava: The development of Garbha mainly depends upon the inflation done by Vayu and nourishment supplied by Rasa is the opinion Sushruta and Bhavamishra. Behind the umbilicus there is definitely the location of Jyotisthana” (the place of light or fire). The Vayu by its blowing action excites or stimulates this fire, which in turn performs development of body.

Garbhashaya-antar garbha-stithi

The Garbha stays in Garbhashaya with all its body parts fully flexed, and facing towards the back of the mother. Charaka has mentioned the position of head as upwards. Sushruta mentioned position of head in downwards direction in Garbhashaya. Vriddha Vagbhata has added the Garbha lies inside the Garbhashaya facing the mother's back, keeping both its hands on the forehead, with its body contracted, and if it is male it's situation is more on right lateral side of the Kukshi; if female then on left lateral side and if a Napumsak then it remains centrally situated. Garbha Paratantrata Garbha is totally dependent on mother for nutrition so it is said that Garbha is in Paratantra stage.

Pachana kriya in garbha (digestive functions)

After the Pachana Kriya, formed Rasa from the mother enters into Garbha through Garbha Nabhinadi. This Rasa gets metabolised by Garbha Kayagni present in Pakvashaya and utilized for Garbha Dhatu Pushti. Major Pachana Kriya is not necessary in Garbha as Rasa is available in Prasada Rupa.

Mala kriya in garbha (excretory functions)

Sthulamala formation or excretory function does not take place in Garbha due to two reasons.

- ☐ Absence of Pakvashyagata Vayu.
- ☐ Receiving of Prasada-Rupa Rasa: Rodanam in Garbha (Cry): Garbha does not cry inside the Garbhashaya, the reasons being.
- ☐ Covering of Mukha with the Jarayu (foetal membranes)
- ☐ Obstruction of Vayu Marga Garbha

Prakriti

The Prakriti is defined as the aspect which is stable from birth to death and which is formed at the time of conception due to self-aggressiveness of Shukra and Shonita. This Prakriti consist of Vikarahita Doshas at the preliminary stage. This Prakriti is influenced by 4 factors when the Garbha is in the womb of mother.

These factors are

1. Shukra Shonita Prakriti,
2. Kala Garbhashaya Prakriti
3. Maturahara Vihara Prakriti
4. Doshas – sperm – ovum

As already said, predominance of doshas in sperm and ovum would determine dosha predominance in zygote, embryo and fetus. This would go on to determine basic constitution of an individual which would never change for life.

Shukra i.e. semen consisting of sperms in general and sperms in particular are said to be soumya i.e. cool and watery in nature. This tissue belongs to kapha group of tissues. Following discipline of residence-resident relationship, kapha resides in semen / sperms by nature. Semen is residence and kapha is resident.

Artava i.e. ovum / menstrual blood is said to be agneya i.e. fiery in nature. It is a form of blood and all synonyms of blood are given to artava. Since pitta resides in blood, pitta also resides in menstrual blood sharing residence-resident relationship. Artava is a sub-tissue of rasa dhatu i.e. lymph tissue. It is formed in form of byproduct of rasa while rasa is in process of transformation into blood tissue. Since it is formed parallel to formation of blood, at same time and since it shares same features of blood tissue, artava is blood like and will have more of pitta features.

Vata, chiefly apana vata, enables expulsion of artava. If artava is taken as menstrual blood, apana vata helps in menstruation. If artava is taken as ovum, apana vata helps in ovulation. Similarly, apana vata helps in normal ejaculation.

Fetus – elements – dosha: While garbha i.e. fetus is developing in mother's womb, five elements of nature basically participate in various aspects of formation, maturation and

development of fetus. Air element helps in division and fragmentation of fertilized ovum i.e. cell division.

Fire element processes zygote and causes dissolution. It can be correlated to dissolution of nucleus and nucleolus of developing cell during early part of cell division and dissolution of zona pellucid of multiplying cells so as to enable developing cells to come into direct contact with endometrium after implantation. Maturity of developing cells is also brought by action of fire element.

Water element helps in nourishing dividing cells. This can be correlated to endometrial fluid entering blastocyst to offer nutrition and nourishment. Earth element causes integrity and maintains compactness of cells undergoing division. Ether element provides space for different structures to develop. Same elements also form tridoshas which form constitution of body. Vata is formed by combination of air and space elements. Pitta is formed by combination of fire and water elements. Kapha is formed by combination of water and earth elements.

In second month of fetal development, it is said that embryo under influence of and being processed by sheeta (kapha), ushma (pitta) and vata and its bhutas i.e. elements, forms into a mass. If mass is compact, ball like clump or mass, embryo would be male child. If mass is in shape of a quadrangular stripped muscle, it is of female sex. If shape of embryo resembles that of a bubble, hemispherical in shape, it would be a eunuch. Thus, doshas not only form constitution of an individual, they also influence formation and development of fetus at all stages and also determine sex of fetus.

Doshas – organ formation

Role of doshas in forming organs in fetus

When we see development of some organs explained in Ayurvedic treatises, we can see involvement of doshas in formation of these organs during fetal development.

Examples

Kapha is seen to form tongue, testes, white portion of eye and heart. Samana type of vata along with heat of body is said to form liver and spleen. Vata is also seen to be involved in formation of visceral organs and gall bladder. All three doshas are involved in formation of

intestines, anus, rectum and urinary bladder. Vata and pitta are involved in formation of channels and muscles of body. Apertures of body are formed by vata.

Fetal anomalies and dosha

Doshas and fetal anomalies, multiple pregnancies, birth defects

When vitiated doshas influence fetus during various stages of development, many fetal anomalies are formed. Doshas may also cause different complications related to fetus during its development or during delivery.

Mudha Garbha – Disturbed apana vata is said to cause mal-presentation of fetus and makes delivery of fetus difficult. This condition is called mudha garbha.

Apraja – A condition in which vitiated pitta causes excessive bleeding leading to abortion of fetus is called asruja or apraja.

Putraghni – Putraghni is a condition wherein aggravated vata repeatedly destroys fetus. Thus, repeated abortions occur due to affliction of fetus by vitiated vata.

Importance of vata

Vata is most important factor in fetal development

As already stated, vata helps in division of zygote and in differentiation of different body portions. Master Harita tells that hands, legs, head etc body parts are formed by vyana vata, mouth and its aperture is formed by udana vata and anal opening is formed by apana vata.

According to Kashyapa, all activities like splitting and retention in fetus are carried out by vata. According to Bhela, agni i.e. pitta and vata enter body and form different major and minor body parts and also cause growth and activity. According to master Sushruta and Bhavamisra, development of fetus depends on inflation done by vata and nourishment supplied to fetus by rasa.

MULTIPLE PREGNANCIES

Multiple pregnancies caused by vata

Master Charaka tells that excessively increased vata in uterus, divides zygote into multiple pieces. Number of fetuses formed depends on number of zygote pieces caused by vata.

Harita opines that origin of all fetal parts depends upon specific combination of doshas and tissues.

Health of fetus depends on vata. Charaka further tells that vata dosha divides zygote in a way that one part of zygote is bigger than other, then child born from bigger portion will be healthier and child formed from smaller zygote portion will be weaker and unhealthier.

Teratogenic abnormalities

Doshas involved in causation of teratogenic abnormalities – Master Charaka tells – ‘Due to abnormalities of sperms and ovum, deeds of previous life, uterus, time factor, abnormality of menstrual cycles and abnormalities occurring during conception time and dietetics along with mother’s mode of life, vitiated doshas produce abnormalities of fetus. These abnormalities caused by vitiated doshas affect appearance, complexion and sensory system of fetus. Aggravated doshas situated in uterus disfigure fetus just like a tree fallen in river gets disfigured due to effect of being knocked by woods, stones and water currents’.

Abnormalities of semen and vata, as well as vitiated vata located in semen are also said to produce congenital anomalies. Sushruta further tells that due to vitiation of vata and non-fulfilment of desires of pregnant woman, fetus may become humpbacked, maim or crooked armed, lame and dumb and may have nasal voice.

In short, atheism of parents, bad deeds of previous life and aggravation of vata are three main causes for teratologic abnormalities. Commentator Indu opines that other doshas too can cause these problems.

Vata Dushta Shukra

Semen or sperms contaminated by vata will not be capable of impregnating and hence futile in reproduction. Semen contaminated excessively by pitta and kapha too makes conception difficult.

Mother’s diet – dosha vitiation

Effects of dosha-vitiating diet of mother on fetus –

When a pregnant woman consumes vata aggravating foods, vata vitiated by those foods makes fetus idiot, dumb and deaf, lame, humpbacked, dwarf, causes hoarseness of voice and less or more body parts.

When a pregnant woman consumes pitta vitiating foods, pitta causes baldness, premature graying of hair, absence of facial hair, tawny color of skin, nail and hairs and other pitta disorders.

When a pregnant woman consumes kapha vitiating foods, vitiated kapha causes leprosy, pigmentation disorders of skin.

Vitiated and accumulated doshas are responsible for abortions – Master Vagbhata tells that excessive accumulation of doshas, non-avoidance of contraindicated articles, diseases or influence of deeds done in previous life of either mother or fetus, abortion occurs.

Garbha Shosha / Vatabhipanna Garbha – It is a condition wherein vata causes dryness of fetus. Dried fetus does not fill properly in mother's womb and quivers very slowly. It can be compared to intra-uterine growth retardation of fetus.

Upavishtaka / Upashushka – Aggravated vata withholds pitta and kapha and compresses nutritional channels supplying fetus. Due to this there is insufficient nutrition of fetus and deficit development of fetus.

Nagodara – When a pregnant woman fasts, eats stale food, does not take adequate fat and uses vata vitiating foods and articles, her fetus gets desiccated and does not grow. It remains in uterus for a very long time and does not quiver. This is called nagodara.

Lina Garbha – It is a condition caused by fetus complicated and afflicted by vata. Here fetus gets adhered and remains in uterus for long duration.

Mruta Garbha – Among many reasons for intra-uterine death of fetus, excessive aggravation of vata and excessive accumulation of doshas have been named as important etiological factors.

Shukra pradoshaja vikara – Semen or sperms contaminated by doshas cause abortion, miscarriage and children who are always diseased, have less life span and awkward look. Many people will not have progeny in these conditions. Same are symptoms of contamination of semen carrying ducts and channels.

Shodhana before conception – Ayurveda treatment principles advise aspiring couple to undergo shodhana i.e. cleansing treatments in form of panchakarma before planning a child.

This forms blueprint of begetting a healthy child. According to Ayurveda, there is a possibility that sperm or ovum be contaminated by morbid doshas. If union of such contaminated sperm and ovum takes place there would occur many fetal anomalies.

CONCLUSION

Even though the Ayurvedic classics describe many aspects of Garbha like Garbha Vikas, Garbhadhana Vidhi, Garbha Vridhhikara Bhava, Garbha Poshan, Aanuvanshik Siddhant and Garbha Samskar etc. these references have not been carefully understood and explored in context of present era. Garbha Sharir helps us to understand the factors responsible for maldevelopment assists us in preventing, or treating such abnormalities. This knowledge helps us understand many complicated facts of adult anatomy. In this way the knowledge of embryology is essential for the study of Anatomy, Pathology, Surgery, Obstetrics and Pediatrics. There is thus need to explore and analyze these to have greater understanding of the subject. In this light, this study would be able to further the knowledge of Garbha Sharir and make it Yuganuroopa.

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