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Review Article

ROLE OF *PANCAMAHABHOOTA* IN *GARBHAVASTHA* IN THE PURVIEW OF PHYSIOLOGY AND PATHOLOGY

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ABSTRACT

Being close to nature has helped Ayurveda to develop the time-tested principles. The unique concept of commonness between the cosmos and the human body is the strength of Ayurveda. The presence of the five elements such as *prithvi, jala, teja, vayu*, and *akasha* in all the *dravya* can be deduced from the verse, "*sarvam dravyam pancabhoutikam*." (All the dravya are composed of the five elements) The body is said to be *anitya* (temporary) as it undergoes some apoptotic changes each moment. To replenish the lost bodily element, the human is dependent on the diet. *Ahara* being *pancabhautika*, replenishes the body to maintain *dhatusamyata.* A living body has had intrauterine as "*garbha*" and extrauterine life in the form of "*shaddhatuja purusha*." *Pancamahabhoota* play a significant role in *garbha avastha* in designing the anatomy and physiology of the body. Anatomical or physiological abnormalities seen during or post-labor are also attributed to the *pancamahabhoota*. This works throw light on the role of the five elements in maintaining the normalcy or causing any abnormality in a *garbha* which may eventually form the base of Ayurveda genetics.

Keywords: *Siddhanta*, Mutation, Gene, Anamoly, *Sahaja.*

INTRODUCTION

Origin of any of the fields of medicine requires strong fundamentals and their development is seen through constant research. Rationality and validation are necessary to accept any of the explored concepts. "*Siddhanta*" is the conclusion established by investigators after testing in several ways and on proving it with logical reasoning [1]. Ayurveda believes in the principles of five elements popularly known as *pancmahabhoota siddhanta*. *Pruthvi, jala, teja, vayu,* and *akasha* are considered as *pancamahabhoota* [2]. All the *dravya* present in the universe which is believed to be made of these five elements [3].

As the man used to live amidst nature, he had immense knowledge about various drugs of plant and animal origin through constant usage and keen observation. Hunger and thirst were quenched through these natural sources. During the process, by intellectual skills, he perceived certain phenomenon called "*lokapurusha samyata*" [4], also known as "*pinda-brahmanda nyaya*" [5]. It states that "whatever is present in the nature in gross form is present in the human body in the subtle form [6]." The amalgamation of *pancamahabhoota* theory with *pinda-brahmanda nyaya* became the initial step in developing various Ayurveda principles. *Garbhavastha* being the prime stage in a man's life is analyzed here concerning *pancamahabhoota*.

THEORY OF MICROCOSM AND MACROCOSM – *PINDA-BRAHMANDANYAYA* [7]

The human body is an essence of the universe. *Pinda* refers to "microcosm" while *brahmanda* refers to "macrocosm." Individual creature (*purusha*) is a replica of the vast universe (*loka*) in subtle form. This is termed as "*lokapurusha samyata*" or "*pinda brahmanda nyaya"* as shown in Fig. 1. The doctrine of *Pancamahabhoota* too follows this maxim. Various internal structures of the body constitute the five elements of the universe. All the substances are made of these five elements in varied proportions [8]. The following table substantiates the above theory. This is substantiated in Table 1 and Table 2.

PHYSIOLOGICAL CONSIDERATIONS *PANCAMAHABHOOTA*

The food being *pancabhautika* in nature is responsible for nourishing the respective element in the body [10]. During the growth of the fetus, each of the *mahabhoota* has its function. Gradual changes in the body of the fetus brought from the time of conception to the parturition are attributed to the action of *pancamahabhoota*. The nourishment of the fetus is dependent on the mother through *upasneha* (perfusion) and *upasweda* (thermal regulation) [11]. The diet of the mother directly impacts the development of *garbha*.

Prithvi mahabhoota

Parthiva dravya have properties such as *guru, khara, kathina, manda, vishada, sthoola, sthira, Sandra,* and specific property of *gandha* [12]. Intake of *parthiva dravya* has certain effects on the body such as *bala* (strength), *upacaya* (development), *sanghata* (compactness), *gaurava* (heaviness), and *sthairya* (firmness) [13]. During the formation of *garbha*, it gives *samhanana (dridhata* – firmness to the body) effect [14].

Jala mahabhoota

Jaliya dravya are *drava, sheeta, guru, snigdha, manda, mridu,* and *pichchila* in nature and are specific to *rasa* [15]. Because of these properties, they act on the body to achieve *upakleda* (moistening), *snehana* (unction), *bandhana* (binding), *vishyandana* (liquifying), *mardava* (softening), and *pralhada* (exhilaration) [16]. During *garbhotpatti*, its action is *kledana* (providing liquid medium for growth) [17].

Teja mahabhoota

Taijasiya/agneya dravya have properties such as *ruksha, teekshna, ushna, vishada, sukshma,* and *laghu.* Among the *vishesha guna*, they are specific to *roopa* [18]. Thus, they are responsible for producing *daha* (burning sensation), *paka* (metabolism), *prabha* (lustre), *prakasha* (lustre), and *varna* (complexion) in the body [19]. During the formation of *garbha*, it does the *pacana* (helps in maturation) [20].

Vayu mahabhoota

Vayaviya dravya have general properties such as *ruksha, vishada, laghu, sheeta, khara,* and *sukshma* [21]. They are specific to *sparsha guna*. *Raukshya* (roughness), *Glani* (fatigue), *Vicara* (movement), *Vaishadya* (non-sliminess), and *Laghava* (lightness) are the effects on the body by the intake of *vayaviya dravya* [22]. During *garbotpatti*, it acts by *vibhajana* (*vibhaga* – division) [23].

Akasha mahabhoota

Akashiya dravya are *mridu, sukshma, vishada, laghu,* and *shlakshna* in nature. Furthermore, they are specific to *shabda guna* [24]. *Mardava*

(softening), *soushirya* (porosity), and *laghava* (lightness) are their effects on the body [25]. During the formation of *garbha*, it acts by *vivardhana* (*kshetravardhana* – increasing the space) [26]. Probable role of *mahabhoota* in embryogenesis is shown in Table 3 [28].

MAHABHOOTA AND *MANAS*

Mahabhoota also have effect on the *manasika guna*, namely, *sattva, rajas,* and *tamas*. *Akasha mahabhoota* is predominant in *sattva*, *vayu* is rich in *raja guna*, *agni* has predominance of *sattva* and *raja*, *jala* is predominant in *sattva* and *tama* qualities, and *prithvi* has *tamobahulyata* [49]. Role of *mahabhoota* in the development of fetus are depicted in Table 3 and Table 4.

ABNORMAL FETAL GROWTH

An embryo is derived from male and female gametes. As mentioned earlier, all the tissues of the body are derived from the *pancamahabuta*, thus a healthy gametes can help in the formation of healthy embryo any alteration in it can cause the abnormality. The primary cause for chromosomal abnormality can be attributed to improper distribution of these *mahabhoota* and that can lead to various developmental anomalies.

Any change in the normal functioning of the five elements leads to *vikriti* [50]. Altered functioning can be either hyper (*vriddhi)* or hypo (*kshaya)* in nature [51]. These ultimately lead to various structural abnormalities in the body resulting in altered physiology. Table 5 depicts the probable gestational abnormalities in the purview of *pancamahabhoota*.

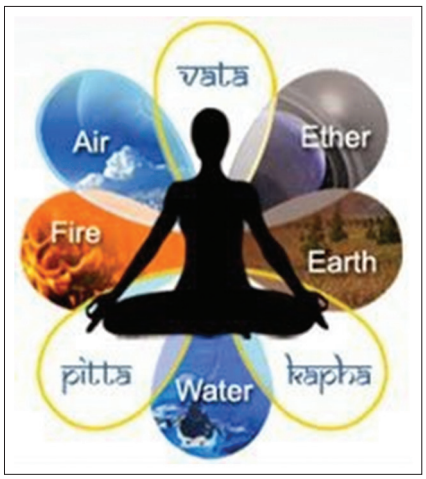

Fig. 1: *Lokapurusha Samyata*

Table 1: Similarity between universe and human body [9]

Factor in universe	Similarity in the body
Prithvi	*Asthi* (Bony structures)
Aap/Jala	*Rakta* (blood), *Mutra* (urine)
Teja/Agni	*Jatharagni* (digestive fire)
Vayu	Process of respiration
Akasha	Space within the major tracts like GIT

Table 2: Predominance of *mahabhoota* in *Shareerika Bhava*

Shareerika Bhava	*Mahabhoota* predominance [27]
Rasa	*Jala*
Rakta	*Teja, jala*
Mamsa	*Prithvi*
Meda	*Jala, prithvi*
Asthi	*Prithvi, vayu*
Majja	*Jala*
Shukra	*Jala*
Mutra	*Jala*
Purisha	*Prithvi*
Artava	*Agni*
Sveda	*Jala*
Stanya	*Jala*

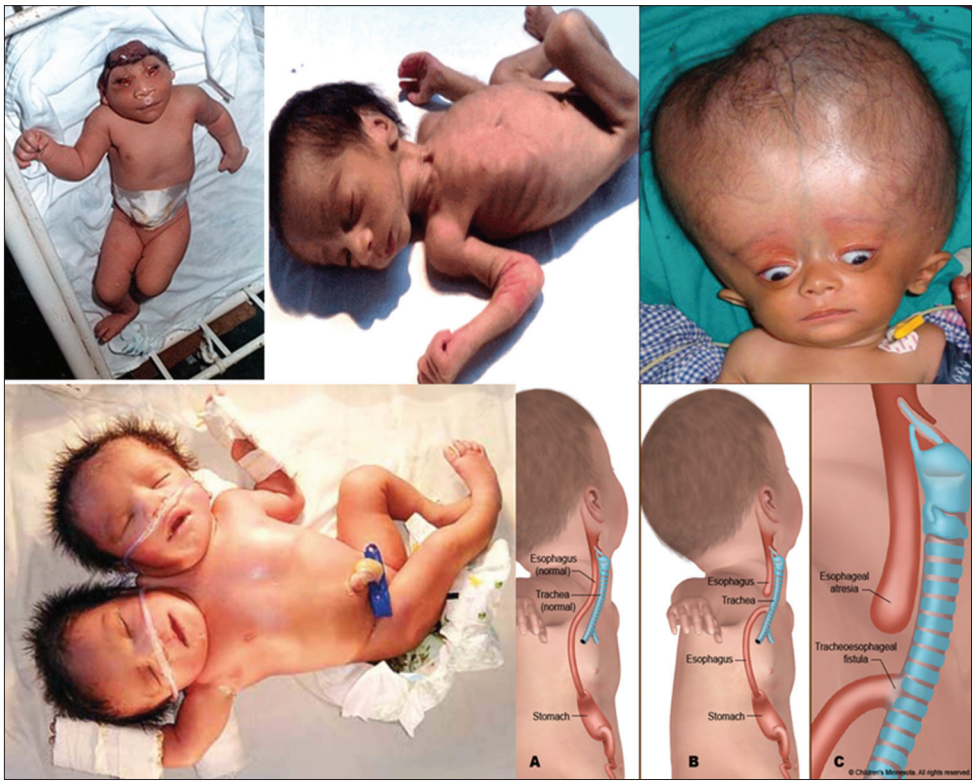

Fig. 2: Genetic disorders

Table 3: Probable role of *Mahabhoota* in the stages of embryogenesis

Mahabhoota	Stages of embryogenesis
Vayu	1) Karyokinesis 2) Descent of zygote into the uterine cavity. 3) Differentiation of trophoblast into cytotrophoblast and syncytiotrophoblast. 4) Differentiation of embryologist into hypoblast and epiblast (formation of bilaminar disc). 5) Formation of trilaminar disc 6) Formation of yolk sac, amnion 7) Differentiation of sclerotome and myotome, pericardial bar leading to formation of musculoskeletal and cardiovascular system.
Teja	1) Proteolytic action of trophoblast for embedding 2) Disappearance of zona pellucida assisted by trypsin like enzymes.
Jala	1) Nourishment and protection of inner cell mass or embryoblast by trophoblast. 2) Action of decidual cells which contain glycogen and lipid facilitates the fertilized ovum to get embedded in the wall of the uterus 3) Uteroplacental circulation – in this process, the nutrition comes from uterus to the placenta. 4) Fetoplacental circulation – in this process, the nutrition goes from placenta to the fetus through umbilical cord. 5) Different subsequent formation of fluid in the serous cavity as well as in joints. For example, synovial fluid
Prithvi	1) Maintains the grouping and compactness of cells under division. 2) Gives shape to all structures formed during the time of growth and development. 3) Forms bones and skeleton which gives the shape of the fetus. 4) Structural increase of all tissue and organ.
Akasha	1) Blastocele formation. 2) Amniotic cavity formation. 3) Yolk sac formation, vitellointestinal duct, allantois, and extraembryonic coelom. 4) Trophoblastic lacunae which will later form intervillous space. 5) Formation of foregut, midgut, and hindgut.

Table 4: *Masanumasika garbha vriddhi*

Month	Development
1st month	Appearance: • *Avyakta lakshana*: There is no clear differentiation [29] • *Khetabhuta – Shleshmasadrisha* (similar to *shleshma*) [30] • *Kalala – singhanaprakhya* (similar to phlegm) [31] • On the 10th day, *kalala* becomes *budbuda* (bubble) [32]
2nd month	*Garbha* attains *ghanatva* (solid state) due to the action of *mahabhoota* [33]
3rd month	• Differentiation of body parts begin by the appearance of five *pidaka* (circular structures) [34] • Sense organs start to develop [35]
4th month	• *Garbha* attains *sthirata* or stability [36] • *Cetana dhatu*, that is, factor of consciousness manifest [37] • Lanugo appears [38]
5th month	• The functioning of "*Manas*" begins [39] • There is *upacaya* (nourishment) of *mamsa* and *rakta dhatu* [40]
6th month	• *Buddhi* starts to function [41] • *Bala* and *varna*improve [42] • Body hairs, nails, bones, ligaments, blood vessels along with strength and complexion appears in this month [43]
7th month	• All the major and minor body parts become well differentiated [44] • Body gets *Tridosha* (*vata, pitta,* and *kapha*) [45]
8th month	• *Ojas* becomes unstable [46] • Acharya Harita's concept of function of *jatharagni* [47]
9th month	• Delivery can occur from the beginning of the 9th month up to 12th month [48]

Thus, both hypo and hyper functioning of the *mahabhoota* can lead to various malformations in the fetus as shown in Fig. 2. Although there is no proper cure for some of the above-mentioned abnormalities, definitely, it could be prevented with preconceptional care and pregnancy regimen.

PREVENTION OF DEVELOPMENTAL DISORDERS IN AYURVEDA

The embryo is formed from the union of male and female gametes. They are called as *beeja*, that is, *Shukra* in male and *Artava* in female. Preconceptional care in Ayurveda is a unique principle that is emphasized to get healthy progeny. It starts with the contraindication of *tulya gotra vadhu* (bride) and *vara* (groom) to get married [79]. Consanguineous marriage is the prime factor in causing chromosomal and hereditary disorders [80]. Once the *atulyagotrata* criteria are met, *Ayurveda* advises *shodhana* karma before conception [81], which helps in detoxing the body along with improving quality of the gametes. Once the conception takes place, the *garbhini paricharya* (pregnancy regimen) revolves around *vata shamana chikitsa* along with other *dosha* [82]. *Dosha* are considered as by-products of *pancamahabhoota* [83]. Thus, proper following this regimen also helps in correcting the imbalance of *pancamahabhoota* in the body.

DISCUSSION AND CONCLUSION

The growing tendency of westernization among the youth has changed the classical habits of diet and regimen. The stress due to education, work, dependency, etc., adds on to the etiological factor for various lifestyle disorders. Along with the health of the individual, the quality

Table 5: Genetic defects due to abnormality of *Mahabhoota*

Maha bhuta	Function	Condition	Features
Prithvi	*Hypo*	Blighted ovum/anembryonic pregnancy	In sonography, there is the absence of fetal pole in a gestation sac with diameter of 3 cm or more [52]
		Molar pregnancy/hydatidiform mole	It is an abnormal condition of placenta where there are partly degenerative and partly proliferative changes in the young chorionic villi [53]
		Anencephaly and acrania	Anencephaly is characterized by the absence of cranial vault and telencephalic structures, with skull base and orbit coved only by angiomatous stroma. Acrania is the absence of cranium with protrusion of brain tissue [54]
		Symmetrical IUGR (Intrauterine growth restriction)	Fetal growth restriction is said to be present in those babies whose birth weight is below the 10th percentile of the average for gestational age. Cause can be attributed to genetic disease or infection. Here, the total number of cell is less and cell size is normal [55]
	Hyper	Macrosomia	Condition where the birth weight of the fetus is >4 kg (>90 percentile) [56]
		Large for gestational age	The term large for gestation has been widely used to categorize newborn, where birth weight is >90th percentile for gestational age [57]
Jala	*Hypo*	Oligohydramnios	Condition where the liquor amnii is deficient in amount to the extent of <200 ml at term [58]
	Hyper	Polyhydramnios	State where liquor amnii exceeds 2000 ml [59]
		Hydrocephaly	There is buildup of fluid in the ventricles deep within the brain. The excess fluid increases the size of the ventricles and puts pressure on the brain [60]
Teja	*Hypo*	Congenital blindness	Visual loss in children or infant can occur either at the stage of prenatal or postnatal stage [61] *Agni mahabhoota* is responsible for the *drishti* in the *garbha* [62], in the absence of *agni mahabhoota chakshuridriya* (eyes) cannot be functioned properly.
		Mental retardation	*Medha* of the *garbha* is due to *agni mahabhoota* [63], when *agni mahabhoota* is affected in the growing embryo, even the intelligence of the *garbha* is affected
	Hyper	Intrauterine growth restriction	Babies whose birth weight is below the 10th percentile of the average for gestational age [64]. This is due to faster metabolic rate
	Hypo	Conjoined twins	Formed due to improper division of the embryo [65]
Vayu		Cleft lip and cleft palate	Openings or splits in upper lip, roof of the mouth or both [66]
		Imperforate anus	Absence of the anal opening [67]. Types: A. High imperforate anus – where rectum ends above the puborectalis sling. B. low imperforate anus – where rectum has traversed the puborectalis sling [68]
		Imperforate hymen	Defect in opening of vagina. It is due to failure to disintegration of central cells of Mullerian eminence that projects in to urogenital sinus [69]
		Exomphalos	Congenital herniation of abdominal contents through the defect in the abdominal wall at the base of the umbilical cord [70]
	Hyper	Polydactylity	Condition where the fetus is born with extra toes/fingers [71]
		Multiple pregnancy	Where more than 1 fetus simultaneously develop in the uterus [72] Yugma garbha is due to division of garbha by vayu [73]
Akasha	*Hypo*	Esophageal atresia	Is a congenital medical condition that affects the alimentary canal. It causes the esophagus to end in a blind pouch rather than connecting to the stomach [74]
		Duodenal atresia	Duodenal lumen is obstructed. Vomiting is the prominent feature, the vomitus being copious and bile stained. The upper abdomen is distended and following the passage of meconium (usually white), no stools are passed [75]
		Stenosis of various organs	Abnormal narrowing of any pathway/lumen [76]
		Tracheoesophageal fistula	Congenital abnormality where there is a connection between the esophagus and trachea [77]
	Hyper	Patent ductus arteriosus	A heart defect caused by improper development of heart. There is an open vascular channel between heat and lungs [78]

of off-springs produced too is affected. Realizing these facts, the world is slowly focusing on the traditional systems of medicine like Ayurveda. The principles of Ayurveda revolve around the *pancamahabhoota* theory. Balance of the *pancamahabhoota* in the body promotes health while their imbalance causes various ailments. The same is true even in the case of intrauterine life. Genetics is the branch of biology concerned with the study of genes, genetic variation, and heredity in organisms. The base of Ayurveda genetics can be considered as the *pancamahabhoota*. Limitation of contemporary science in the prevention as well as the curative aspect of genetic disorders, Ayurveda can emerge as the front runner in such cases with long-term research projects.

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