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REVIEW ARTICLE

The *Panchabhoutik* Composition of the Embryo: Ayurvedic Insights into Early Fetal Development

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ABSTRACT

Embryology is the study of the development of an embryo from the fertilization of the ovum to the fetal stage or up to the time it is born as an infant. Embryology is also called developmental anatomy. Human development is a continuous process that includes fertilization, cell division, implantation in the uterine wall, and differentiation of cells into various tissues and organs. The early stage of human development, from fertilization to the end of the 8 weeks during which major organs and structures begin to form, is called the embryo. Ayurveda also states that after the union of Sukra and Shonita, along with the *Prakruti*, the *Vikar Garbha* has been formed, and the development change from the *Garbha to Sharir* is influenced by *Panch Mahabhoota*. Each *Panch Mahabhoota* plays an essential role in the various developmental aspects of *Garbha.* This article explores the role of *Garbha Panchabhoutiktva* as described in Ayurvedic classics and analyzes its relevance in understanding the processes of early human fetal development.

1. INTRODUCTION

Embryology is the branch of science that deals with the study of the formation and development of an organism, and development is a broad term that involves the transformation of a single cell into a complex multicellular organism.[1]

Human development is a continuous process that starts from the fertilization of gametes, i.e., ovum and sperm, and this includes initial stages of cell division, the formation of a blastocyst, implantation in the uterine wall, and subsequent differentiation of cells into various tissues and organs.[2]

Growth is a mere increase in the number and size of cells.[3]

Development is a process where someone or something grows or changes and becomes more advanced. The early stage of human development from fertilization to the end of the 8th week, during which major organs and structures begin to form, is called the embryo. From the 9th week to birth, the embryo undergoes significant growth and maturation of structures, called a fetus.[4]

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The fusion of male and female gametes is called fertilization. The fused ovum and spermatozoon form the zygote.[5]

2. AIMS AND OBJECTIVES

2.1. Aim

To critically explore and elucidate the concept of *Garbha Panchabhoutiktva* as described in Ayurvedic classics and to analyze its relevance in understanding the processes of early human fetal development.

2.2. Objectives

1. To review Ayurvedic literature regarding the concept of *Panchamahabhuta* in the formation and development of *Garbha* (embryo)
2. To explain the role of each *Panchamahabhuta (Prithvi, Jala, Teja, Vayu, and Akasha*) in early embryogenesis according to Ayurvedic principles
3. To analyze how *Panchabhoutik* principles influence the structural, functional, and physiological development of the embryo in its initial stages
4. To highlight the relevance and applicability of *Panchabhoutiktva* in understanding healthy fetal growth and developmental abnormalities from an Ayurvedic perspective
5. To propose a conceptual framework integrating Ayurvedic

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Panchabhoutik theory with early-stage human developmental biology.

3. OVERVIEW OF 1ST WEEK OF DEVELOPMENT

Human embryonic development starts from the stage of fertilization. During the 1st week of embryonic development, a series of events occur[6]

1. Fertilization – The process begins with the fertilization of the ovum by a sperm cell, forming the zygote. This typically occurs in the ampulla of the fallopian tube
2. Cleavage – The zygote undergoes rapid mitotic divisions known as cleavage without increasing in size, resulting in a cluster of smaller cells called blastomeres
3. Morula formation – By day 3–4 post-fertilization, the cells compact into a solid ball known as a morula
4. Blastocyst formation – Around 5–6 days, the morula develops into a blastocyst consisting of an inner cell mass (embryoblast) and an outer cell layer (trophoblast)
5. Implantation – By the end of the 1st week, the blastocyst reaches the uterus and begins the process of implantation into the endometrial lining, which will provide it with the necessary nutrients for further development.

3.1. Overview of 2nd week of development[7]

1. Formation of Bilaminar Germ Disc – Embryoblast cells undergo differentiation to form two layers, which are the hypoblast and epiblast. Then the germ disc is called a bilaminar germ disc
2. Formation of amniotic cavity – A cavity filled with amniotic fluid
3. Formation of primary yolk sac
4. Formation of connecting stalk – which later becomes the umbilical cord with development of blood vessels
5. Formation of chorion and amnion
6. Formation of chorionic cavity – It plays crucial roles in supporting embryonic development and establishing maternal-fetal circulation for nutrient and waste exchange
7. Formation of chorionic villi – These are essential functional elements of the placenta, which are tiny, finger-like processes called villi.

3.2. Overview of 3rd week of development [10]

1. Changes in the shape of the embryonic disc – The disc undergoes morphological alteration, establishing three distinct axes and also three germ layers, converting a circular disc into an oval in shape.
2. Changes in the ectodermal layer of the disc.

3.3. Overview of 4–8 weeks of development[8]

This period is also called the embryonic period, as the embryonic disc forms the specific shape of the embryo, and the primordia of organs are formed from the germ layers; hence, this period is also called the period of organogenesis.

The changes during the embryonic period can be studied under the following headings:

1. Folding of embryo – There is a progressive increase in the size of the embryonic disc due to rapid growth of cells. This results in the formation of a head, tail, and two lateral folds
2. Formation of derivatives of various germ layers.

Ayurvedic aspect of *Garbha* formation and development[9]

According to Sushruta Samhita – *Garbha* is formed when there is a union of *Sukra-Shonita-Aatma-Prakuti-Vikar.*

After the union of all these structures, the following events occur due to the influence of *Panchmahabhuta* (Table 1).

4. DISCUSSION

Human development is governed by the sequential activation and influence of the *Panchmahabhuta*, providing a profound morphological framework that closely covers the embryological milestones of the first 8 weeks of gestation.

When analyzed chronologically, the ancient description of *Garbha* development aligns with modern embryological timelines in the following manner.

1. Cellular division and cleavage (*Vayu Mahabhuta* – 1st week): Acharya Sushruta notes that *Vayu Mahabhuta* initiates the subdivision of the single-cell zygote into a multicellular structure. In modern embryology, the 1st week is characterized by rapid mitotic division, cleavage, morula formation, and blastocyst development. The anatomical attribution of *Vayu Mahabhuta* is responsible for cellular cleavage and distribution
2. Cellular differentiation and implantation (*Teja Mahabhuta* – End of 1st to 2nd week): Dalhana explains that *Teja Mahabhuta* initiates form (*rupa*) and structural positioning. This corresponds to the formation of the two-layered blastocyst (epiblast and hypoblast) and successful implantation into the uterine endometrium, processes achieved because of the influence of *Teja Mahabhuta*
3. Fluid dynamics and nutritional interface (*Jala Mahabhuta* – 2nd week): The influence of *Jala* initiates moisture and counters the actions of *Vayu* and *Teja*. This corresponds with 2nd-week developmental events, including the formation of the amniotic cavity, connecting stalk, amnion, chorion, and chorionic villi. These fluid-filled structures are vital for maintaining homeostasis and establishing the early nutrient-exchange interface in the embryo and are governed by *the Jala Mahabhuta*
4. Structural consolidation and morphogenesis (*Prithvi Mahabhuta* – 3rd week): *Dalhana* attributes *kathinatva* (firmness, solidity) and definitive shape to the embryo because of the influence of *Prithvi Mahabhuta,* which gives structural solidarity to the moist embryonic components. In modern terms, the 3rd week marks critical shape changes in the embryonic disc, notably transitioning from a circular to an oval configuration and laying down the primary tissue architecture
5. Spatial expansion and organogenesis (*Akasha Mahabhuta* – weeks 4–8): Governed by *Akasha* Mahabhuta, this stage permits growth and multidirectional expansion – superior, inferior, and oblique–ultimately transforming the *Garbha* into a distinct *Sharir* (body). This period corresponds directly to embryonic folding (forming the three primary germ layers into a tubular body plan) and active organogenesis. Once organ primordia are established by the end of the 8th week, the embryo formally transitions into a fetus.

5. CONCLUSION

This study critically explored and elucidated the concept of *Garbha Panchabhoutiktva* as described in Ayurvedic classics, establishing its remarkable scientific parallels with early fetal development. Based on the objectives outlined, the following key insights have been concluded-

1. Ayurvedic literature review on *Garbha* formation: A systematic review of classical texts, including the *Sushruta Samhita* and its

commentary by Dalhana, confirms that the human body (*Garbha* to *Sharir*) is fundamentally constituted and governed by the *Panchmahabhuta* from the moment of conception (*Sukra-Shonita samyoga*).

2. Sequential roles of the *Panchmahabhuta*: Each element plays a distinct, chronologically coordinated role in early embryogenesis:
   - *Vayu Mahabhuta* governs cellular division and cleavage, especially in the 1st week of fetal development
   - *Teja Mahabhuta* governs the metabolic transformation and structural positioning, especially at the end of the 1st week and up to the 2nd week of fetal development
   - *Jala Mahabhuta* provides moisture and establishes the fluid matrix for the nutritional interface of the embryo, especially in the end of the 2nd week of fetal development
   - *Prithvi* Mahabhuta imparts structural solidity and definitive shape, especially up to the 3rd week of fetal development
   - *Akasha Mahabhuta* provides the spatial dimensions necessary for multidirectional growth and expansion, especially 4th to 8th week of fetal development
3. Correlation with early embryonic milestones: A direct analytical bridge exists between these elemental functions and modern embryological timelines – mapping sequentially from 1st-week cleavage, blastocyst formation, and implantation to 2nd-week amniotic and chorionic development, 3rd-week disc morphogenesis, and weeks 4 through 8 of embryonic folding and organogenesis
4. Clinical relevance and application: Understanding *Panchabhoutiktva* offers a profound qualitative model for evaluating healthy fetal growth. Imbalances or disruptions in these *Panchmahabhuta* functions at specific stages can serve as a framework for conceptualizing developmental anomalies, congenital defects, and growth restrictions from an Ayurvedic viewpoint
5. Integrated conceptual framework: Ultimately, this study successfully proposes a bridge between ancient Ayurvedic embryology and modern developmental biology. While modern science details the microscopic, genetic, and molecular mechanics of embryogenesis, the *Panchmahabhuta* paradigm provides a unified macro-physiological framework, validating the timeless wisdom of classical Indian medicine in explaining the grand continuum of human life.

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7. AUTHORS' CONTRIBUTIONS

All authors have read and approved the final version of the manuscript.

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9. ETHICAL STATEMENT

Ethical approval was not required for this study, as it was a review article with data obtained through a literature search.

10. CONFLICTS OF INTEREST

The authors declare no conflicts of interest in relation to the publication of this paper.

11. DATA AVAILABILITY STATEMENT

The data analyzed in this review were obtained from publicly available sources, including peer-reviewed articles, Ayurvedic literature.

12. DISCLAIMER/VIEW AND OPINIONS

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13. AI USE DECLARATION

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Table 1: Ayurvedic aspect of grabha formation and development

S. No.	Event occurred	Comments by Dalhana	Mahabhuta responsible for that
1.	Vibhajan	Because of *Vayu Mahabhuta*, there is division of *Dosha-dhatu* etc., in the *Garbha*	Vayu
2.	Pachati	Because of *Agni Mahabhuta*, *Rupa* and *Anatarsthan* of *Garbha* occur	Agni
3.	Kledayanti	Because of *Jala Mahabhuta,* there is softness and wetness in *Garbha*	Jala
4.	Sanhanti	Because of *Prithvi Mahabhuta,* there is a definite shape to the *Garbha*	Prithvi
5.	Vivardhyati	Because of *Aakash Mahabhuta,* there is increase and division of *Garbha* in upper-lower and oblique directions, and then other parts/organs are formed	Aakash