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**RESEARCH ARTICLE**

**TERATOGENESIS IN AYURVEDA: UNDERSTANDING THE CONCEPT AND ITS IMPLICATIONS- A REVIEW**

**Manisha and M.B.Gaur**

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**Abstract**

Ayurveda is a life science which achieves health through a holistic approach. Concept of Ayurveda is to restore balance between body, mind and spirit with prevention and personalized treatments. Concepts about physiology, pathology and treatments were ascribed during the period of Vedas. Ayurveda explains Sharira (body) which is made up of Indriya (sense), Satva (mind), Atma (soul) and Panchamahabhutas (five elements). The process of growth, differentiation and development of cell leads to formation of organ, system and as a whole – body. The process of life starts from conception. This marks the beginning of a new human life. Conception is a complex biological process which depends upon variety of factors. A healthy birth refers to delivery of a newborn without any physical developmental and congenital abnormality. On the other hand when there is physical, cognitive, developmental abnormalities are called teratogenic defects and the process by which abnormal development of the embryo or fetus occurs, resulting in birth defects is teratogenesis. In this article we put some light on teratogenesis explained by Acharyas in Ayurveda and their principles. Ayurveda offers valuable guidance for maintaining a healthy pregnancy and promotes the healthy development of fetus.

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**Introduction:-**

Teratogenesis affects developing fetus from mild to severe range depending upon the timing and severity. According to WHO report an estimated 2, 40000 newborns die worldwide within 28 days of birth every year due to congenital disorders. In India, live birth defects varies from 61 to 69.9/1000 live births.<sup>1</sup> Teratogenic defect is an important public health concern as these conditions can have lifelong impacts on affected individuals and their families. Ayurveda, a holistic approach to health and wellness, emphasizing the importance of maintaining balance and harmony in all aspects of life. First understanding of Garbha must be important in better understanding of teratogenesis. Different Acharyas ascribed Garbha.

**Acharya Charaka-**

Sperm and ovum fertilization occurs in uterus which is joined by Jiva (soul) leads to the formation of embryo. It grows with time and being nourished by Rasa (essence of food) and being managed with proper regimen.<sup>2</sup>

**Acharya Sushruta-**

Sukra (semen) and Artava (ovum) are composed of Pancabhutas (five elements); these two combine together and form a small mass which is called Garbha.<sup>3</sup>

**Acharya Vagabhata-**

The mass, formed by the union of Sukra (semen) and Artava (ovum) gets divided by Vata which leads to the production of Garbha.<sup>4</sup>

Aim of conception is to get better progeny. Ayurveda has explained about healthy pregnancy and fetus. Sometimes there are malformations present at or before birth which are identified during birth or later. The ancient Acharyas identified the genetic basis of these abnormalities.

**Abnormalities in Garbha-**

**Acharya Charaka-**

Vayu is responsible for cell division and provide structure to organs.<sup>5</sup> If Vayu gets vitiated, the organs which is affected by Vayu become abnormal in shape.<sup>6</sup> Bija (Sperm-ovum) abnormality is responsible for anomalies in the fetus. It depends upon the Bija part affected. Because of the defects in sperm and ovum, actions associated with the Atma, Garbhashaya (uterus), time and Ahara-Vihara (food and daily regimen of mother) results in the impairment of shape, color and sensory as well as motor organs of the fetus. As a tree standing in the river gets afflicted by the forceful downward movement of wood, stone pieces and water during the rainy season, so as the fetus in the uterus of mother gets afflicted with vitiated Dosha.

The mass formed by union of Sukra and Artava gets divided by Vata leading to the production of Garbha. If abnormal (Sukra- Artava and functions of Vata) there will be production of Garbha of universal features.<sup>7</sup>

Garbha obtains abnormalities due to Nastikya (Infidelity) of parents, Asubha actions (sinful act) of past life by parents and also Garbha. Prakopa of Vata (Aggravation of Vata) during pregnancy are three causes of teratologic abnormality.<sup>8</sup>

Bhela enumerated that Bijadosha of parents, use of Apathya Ahara (bad dietary habits), suppression of Vegas (natural urges) and Yoni Dosha (as causative factor for abnormality in uterus). The woman not having proper diet in pregnancy leads to abnormality in fetus. The mother who is suffering from Udavarta (upward motion of Vata) consuming injurious diet gives birth to weak and blind child.

Acharya Charaka has explained Garbhavikriti (birth abnormalities) on chromosomal level. Abnormality in entire Bija which is responsible for formation of different organs (chromosome) leads to absence or abnormality of organs. Abnormality in reproductive part of Bija and part of Bija (sex chromosome) which is responsible for formation of female body parts leads to a condition called Varta.

**Modern Aspect-**

This condition leads to absence of female characters and associated symptoms. We can correlate this condition with Turner's syndrome (45, XO) which is a genetic disorder in which a female is partially or completely missing X chromosome. Females affected do not develop menstrual periods or breasts.

Other factors responsible for these anomalies are-

**Kala Dosha (Time Factor)-**

Time factor implies conception age, ovulation time, seasonal variations.

Acc. to Acharya after age of 16 for female and 25 for male is recommended to attempt for conception. In modern science, suitable age recommended for labor is 18-23 years. Premature births and trisomy syndromes are found to have a significant relation with maternal age. A frequency of these births increase with increasing maternal age. In modern research studies, the age of mother affects the fetus. Incidence of Down syndrome increases with maternal age. The prevalence of Down syndrome ranges from 1 in 319 to 1 in 1000 live births, and it rises with mother age. It is also known that a significant percentage of foetus with Down syndrome are conceived, but 50% to 75% of them are lost before they reach term. Other autosomal trisomy are far more frequent than the 21 yet have much lower postnatal survival rates than Down syndrome.<sup>9</sup>

**Ritu Kala (Menstrual Period) –**

During menstruation, partners should not be involved in sexual activity especially in first three days because conception in this period leads to defective progeny.<sup>10</sup>

Menstrual Day	Effect on arbha
First day	Intra-uterine death, death immediately after delivery.
Two day	Death with in some days of delivery.
Third day	Deformity in fetal body parts, short lived.
Fourth day	Healthy, normal

**Ahara-Vihara (Diet and regimen) –**

The fetus totally depends upon mother for nutrition, growth and development. The fetus receives nutrients from the mother's bloodstream, so mother's diet play an important role in fetal nutrition such as folic acid, iron, and calcium are important for fetal development. In Ayurveda, dietetics is prescribed for gestational period which is rich in given nutrients.

**Role of Diet and effects in pregnancy-**

According to Charaka, a mother who consumes a sour diet causes her child to experience bleeding abnormalities.<sup>11</sup> Citric, malic, oxalic, and lactic acids are predominant in sour foods. Citrus acids have been known to lower blood calcium levels and decrease blood coagulability when taken internally. For instance, in haemophilia, blood does not clot normally because there are insufficient blood clotting proteins present.

According to multiple research studies, those who had a poor diet while their mothers were carrying fetus that generated more of the miR-483-3p molecule than who received better nutrition. Wilms tumor, colorectal, breast, and liver cancer are all caused by miR-483-3p overexpression.<sup>12</sup>

**Dauhrida-**

According to Charaka, the Manah (mind) establishes connection with Vedana at the same time that the Indriyas (sense organs) of the Garbha become perceptible. The term "Vedana" in this context refers to both happy and sad emotions. Due to this, the Garbha begins to express its Spandana and its aspirations based on the experience acquired through prior lives, and this circumstance is known as Dauhridavasta.

The RasavahiniNadi connects the MatriHridaya with Hridaya of the fetus, which is a MatrujaAvayava. The mother receives the fetus's desires through these conduits between them. Needs of the pregnant woman mirrors the wishes of the foetus. Such aspirations shouldn't be disregarded. The foetus may become malformed if such urges are not utilised appropriately.<sup>13</sup>

Pregnancy-related physiological and hormonal changes may influence how they develop. According to anecdotal evidence, a greater need for energy or other nutrients may cause physiological changes in taste and smell sensitivity, which may lead to the ingestion of particular foods and affect the diet's nutritional composition. The physiological changes that occur during pregnancy may cause cravings for sweets in order to satisfy the body's increased energy needs. Women with moderate gestational diabetes mellitus had physiological changes that were related to insulin resistance and glucose intolerance, which resulted in the development of sweet cravings and a greater predilection for sweet meals.

Consuming too much foods high in calories can result in excessive weight gain during pregnancy, which is a known risk factor for future obesity in both the mother and the child.<sup>14</sup>

**Role of Psychological factors-**

Male newborn are developmentally sensitive to their mother's psychological condition during pregnancy. Delay in foetal development is one of the outcomes of maternal prenatal depression. When a mother is depressed, her body generates a lot of cortisol, less dopamine and serotonin, more frontal brain activity, and less vagal tone. The metabolic profile of infants exhibits all these changes.<sup>16</sup>

**Discussion:-**

Teratogenesis, a subject covered in Ayurveda, is the research of birth abnormalities and the elements that influence their growth. Teratogenesis can be impacted by a number of variables, such as mother health, way of life, diet, and environmental exposures during pregnancy. According to AyurvedicAcharaya, it is essential to keep your Dosha (constitution) and AharaVihara balanced. If one have history of genetic disorders, they must go for Shodhna therapies and conservative treatments mentioned by Acharyas. Charaka has given a successful pregnancy regimen to avoid birth abnormalities and encourage healthy pregnancy. Ayurveda places a strong emphasis on the value of adequate prenatal care, which includes routine check-ups, a nutritious diet, suitable lifestyle changes, and the use of natural medicines and treatments. In order to reduce the possibility of teratogenic effects, Ayurvedic concepts can be incorporated to work toward a better and safer pregnancy experience.

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