ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 10| Issue: 12| December 2024|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2024: 8.402 || ISI Value: 1.188

# UNDERSTANDING THE ROLE OF TERATOGENS AS GARBHOPAGATHAKARA BHAVAS IN CAUSING THE FETAL ANOMALIES

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**ABSTRACT**
*Around the globe, birth defects are the primary reason why many infants don't make it through their first year, and those who do survive often face enduring physical and mental challenges throughout their lives. Ayurveda explains 4 garbha sambhava samagris (factors essential for conception); Ritu, Kshetra, Ambu, and Beeja. The Ksetra and Ambu play important roles throughout the gestation period. Congenital anomalies can occur during the developmental stages of the embryo, from abnormal genetics passed on from the parents, or from vivid environmental factors. Teratogens are one of the major contributors causing fetal anomalies by affecting the prenatal environment which can be understood as Garbhopagathakara Bhavas (factors responsible for Damaging a fetus). A* human teratogen *is an agent that alters the growth or structure of the developing embryo or fetus, thereby causing birth defects. examples Alcohol, Tobacco (smoking), Thalidomide, Cocaine, Rubella, X-rays (ionizing radiation), Lead, Mercury, and Pesticides. Acharyas have mentioned Garbhini Paricharya and Garbhopagathakara Bhavas highlighting their importance during pregnancy. Teratogens are significant contributors to fetal anomalies, and their prevention is of paramount importance. By understanding the mechanisms by which teratogens operate and by implementing integrated effective prevention strategies, it is possible to reduce the incidence of birth defects and promote healthier pregnancies. Public awareness, guidance, and governmental regulations all play a vital role in safeguarding the developing fetus from the harmful effects of teratogenic exposures.*

**KEY WORDS-** *Garbhopagathakara Bhavas, Teratogens, fetal anomalies.*

## INTRODUCTION

Teratogenesis can impact the developing fetus in a spectrum of severity, influenced by timing and intensity. The World Health Organization (WHO) reports that around 240,000 newborns globally succumb to congenital disorders within the first 28 days of life annually. In India, the incidence of live birth defects ranges from 61 to 69.9 per 1,000 live births.[1] Teratogenic defects pose a significant public health challenge, given their potential to affect individuals and their families throughout their lives. Ayurveda, a comprehensive approach to health, underscores the importance of maintaining balance and harmony in all facets of life. The Acharyas, have provided a thorough and systematic guide outlining a month-wise regimen and a set of recommendations for the Antenatal Period. Pregnant women aspiring to have a child with optimal qualities are advised to abandon unfavorable dietary habits and lifestyle choices. Even seemingly minor unhealthy practices that may not have significant consequences for the mother can lead to substantial adverse effects on the developing fetus. The 'Garbhopaghatakara Bhavas' concept addresses factors that threaten or harm the growing embryo. To prevent complications arising from these factors, this analysis aims to explore the rationale behind the Teratogens and *Garbhopaghatakara Bhavas*.

## TERATOGENESIS

Teratogenesis refers to the process by which abnormal development occurs in a fetus, leading to congenital anomalies or birth defects. This phenomenon is a complex interplay of genetic and environmental factors during the critical stages of embryonic and fetal development.[2]

## TERATOGENS

Teratogens are substances or agents that can cause birth defects. These may include drugs, chemicals, infections, or physical factors. Common teratogens include certain medications, alcohol, tobacco, and infections such as rubella. The impact of teratogens varies depending on the timing, duration, and intensity of exposure.[3]

Broadly Classified into,

- Chemical agents (Alcohol, Retinoids, Tobacco smoke, Lead)
- Infectious agents (Rubella, CMV, HIV)
- Physical agents (Radiation, Hyperthermia)
- Nutritional factor (folic acid deficiency, vitamin A deficiency etc)
- Maternal condition (Diabetes, Phenylketonuria)

| **Teratogen Drugs include- 'TERATOWA'** |
|---|
| **T**halidomide |
| **E**pileptic drugs |
| **R**etinoid (Vit A) |
| **A**CE inhibitors, ARB's |
| **T**hird Element- Lead |
| **O**ral contraceptives, Hormones |
| **W**arfarin |
| **A**lcohol |

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## TERATOGENESIS IN AYURVEDA

Ayurveda recognizes that certain birth defects can be inherited through the sperm or egg (*Beeja*) [4], while others are caused by factors during pregnancy (*Garbha Vighatakara Bhava*). *Beeja*, *Atmakarma*, *aashaya*, *Kaala*, and *Maturahara-vihara* [5] play a very important role in pregnancy. Inheritable defects are related to imbalances in the genetic material (*Beeja Dosha*), and can lead to conditions like cleft lip, cleft palate, and congenital heart diseases. Non-inheritable defects, on the other hand, arise from metabolic disturbances during pregnancy and can cause conditions like neural tube defects. These metabolic disturbances can be triggered by various factors, including the mother's diet and lifestyle. Ayurveda recognizes that genetic factors and environmental factors play a role in the development of birth defects.

***Garbhopagatakara Bhavas* (Teratogens)**

In ancient Ayurvedic texts, the concept of Garbhopaghatakara Bhava [6] outlines specific factors that can harm or hinder a healthy pregnancy. To better understand these guidelines established by Ayurvedic Acharyas, we can categorize *Garbhopaghatakara Bhavas* into three main categories: *Aaharaja Bhava, Viharaja Bhava, and Manasika Bhava*.

| **AHARAJA BHAVAS** | |
|---|---|
| **Charaka** [7] | *Ushna, Teekshna, Guru Padartha Sevana, Madakara Aahara Sevana, Madya Sevana, Mamsa Sevana* |
| **Sushruta** [8] | *Shushka, Paryushita, Kuthita, Klinna Anna* |
| **Ashtangasangraha** [9] | *Ati Ushna, Guru, Teekshna, Rooksha anna* |
| **Astanga hrudaya** [10] | *Ati Ushna, Teekshna, Guru, Vishtambhi Bhojana* |
| **Bhavamishra**[11] | *Devakhatodaka, Mamsa Bhojana* |
| **Kashyapa**[12] | *Sheetala Jala, Lashuna Prayoga* |
| **Harita**[13] | *Dvidala Anna Sevana, Vidahi Vastu, Amla Padartha, Mrittika, Soorana Kanda, Rasona, Palandu, Ushna Ksheera* |
| **Yogaratnakara**[14] | *Kshara Sevana, Dooshita Vishama Anna Sevana* |

***Teekshna Ushna Padartha***- sevana during pregnancy is associated with potential risks such as miscarriage (*Garbha Srava*), depletion of the fetus (*Garbha Shushka*), premature delivery (*Akala Prasava*), and foetal death (*Garbha Marana*). The disturbance of *Vatadi Doshas* is believed to result in the constriction of blood vessels, disrupting the proper supply of nutrients to the fetus and causing conditions like *Garbha Shosha* or *Akala Prasava*. These foods, characterized by their intense properties, contain chemicals and nitrates that may negatively interact with red blood cells (RBCs), diminishing their oxygen-carrying capacity and consequently reducing utero-placental blood flow.

***Shushka, Ruksha, Paryushita Anna Sevana***- can result in adverse outcomes such as *Garbha Shushka, Akala Prasava,* and *Garbha Marana*. When a pregnant woman consumes these types of food after the fetus attains *sara* (essential nutrients), inadequate flow of *Rasa* (nutrient essence) to the fetus occurs. This insufficient nutrient supply impedes proper fetal growth, leading to *Garbha Shosha*. Additionally, inadequate calorie intake exacerbates the impact of malnutrition during pregnancy and is associated with lower birth weight in infants, ultimately impairing fetal growth.[15]

***Vidahi Anna Sevana***- can result in adverse effects such as *Garbha Shosha* and *Akala Prasava*. For instance, beverages containing caffeine, like tea, coffee, and chocolates, act as stimulants and are advised to be avoided during pregnancy. Caffeine, known for crossing the placenta and entering the fetal circulation, can have detrimental effects. [16] Additionally, the tannin in tea can interfere with iron absorption.

***Madya Nityata***- leads to symptoms such as the foetus being thirsty (*Trishnalu*), having short memory (*Alpa Smriti*), and displaying fickle-mindedness *(Anavasthita Chitta*). Consumption of alcohol during pregnancy poses a risk of abnormal fetal development and can result in Foetal Alcohol Syndrome (FAS). The toxic effects of alcohol are particularly pronounced in the first trimester, leading to fetal abnormalities.[17] It is crucial to avoid alcohol during pregnancy to safeguard the well-being of the developing fetus.

| ***Rasa* as *Garbhopagatakara Bhava*** | |
|---|---|
| ***Madhura Nitya*** | *Prameha, Ati Stoola* |
| ***Amla Nitya*** | *Rakta Pitta, Tvak Roga, Akshi Roga* |
| ***Lavana Nitya*** | *Sheeghra Vali palita Khalitya* |
| ***Katu Nitya*** | *Shosha, Alpa Shukra, Anapatya* |
| ***Tikta Nitya*** | *Shosha, Balaheenatva, Daurbalya* |
| ***Kashaya Nitya*** | *Shyama Varna, Anaha, Udavarta* |

***Madhura Nitya-*** There is a direct relationship between the level of maternal glucose & macrosomia (>4kgs). The carbohydrate surplus available to the fetus leads to increased insulin secretion & fetal hyperinsulinemia (diabetes).

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***Lavana Nitya-*** Excessive consumption of salt leads to water accumulation, and causes Hypertension.

***Katu Nitya-*** Contains irritants, chemicals, and nitrates that work adversely with RBC and thereby reduce the oxygen-carrying role leading to reduced uteroplacental flow.

| ***Viharaja bhavas*** | |
|---|---|
| **Charaka** [1] | *Vyavaya, Vyayama, Daruna Cheshta, Uccha Bhashana, Utkata Vishama Kathina Asana, Vegadharana, Abhighata, Koopa Avalokana, Snehadi Kriya, Rakta Vastra Dharana, Yana* |
| **Sushruta** [2] | *Vyavaya, Vyayama, Atitarpana, Atikarshana, Divaswapna, Ratri Jagarana, Yana, Utkutukasana, Ekantata, Snehadi Kriya, Vegadharana, Sparshana of Malina vikruta heena gatra person, Durgandha, Durdarshana, Udvejaniya Katha, Uchai Bhasha, Travelling to Shoonyagara, Chaitya, Smashana alone* |
| **Ashtanga sangraha**[3] | *Vyavaya, Vyayama, Karshana, Abhighata, Yana, Ratri Jagarana, Divaswapna, Vegavidharana, Atapa Sevana, Utkataka, Vishama KAthina Asana, Koopa Prapata, Apriya Avalokana, Darunashcha Cheshta* |
| **Astanga hrudaya**[4] | *Vyavaya, Ayasa, Bhara, Guru Pravarana, Akala Jagara Swapna, Kathina Utkata Asana, Rakta Vastra, Uttana Shayana, Shodana Karma* |
| **Kashyapa** [6] | *Looking at declining moon, setting sun, Rahu Darshana, Grahana, Hasya, wearing tight garments, Looking at Ghruta filled pot* |
| **Harita** [7] | *Vyayama, Maithuna, Chankramana* |
| **Bhavamishra** [5] | *Vyayama, Apatarpana, Vyavaya, Atitarpana, Ratri Jagarana, Yana, Vegadharana, Utkatasana, Touching Malina, Vikrutakara, Heenangi, Apriya Katha, Bahirnishkramana, Uchai Bhasha, Taila abhyanga, Udvartana, Atyuccha shayanasana* |
| **Yogaratnakara** [8] | *Swedana, Vamana* |

***Uttana Shayana***- Choosing to rest in a lateral recumbent position is beneficial for promoting optimal uteroplacental blood flow. Prolonged periods of sleep in other positions may potentially decrease uteroplacental blood flow, resulting in fetal hypoxia. The risk of complications arises when the umbilical cord becomes entangled around the fetus's neck. Additionally, adopting a supine position can lead to issues such as low back pain, swelling of the feet, and pressure on the intestine and large veins, including the inferior vena cava. These factors can disrupt fetal circulation, impacting the mother's blood pressure. Elevated blood pressure may contribute to conditions like pre-eclampsia and fetal distress, ultimately increasing the risk of abortion or intrauterine fetal death. Therefore, the choice of resting position during pregnancy is crucial for maternal and fetal well-being.

***Vyavaya-*** While normal sexual activity and exercise are generally beneficial during pregnancy, excessive engagement in these activities or subjecting the body to undue physical strain can potentially trigger abortion, particularly in women with a predisposition to such risks. Engaging in sexual intercourse during pregnancy carries the potential threat of abortion or premature delivery. This is attributed to orgasms causing uterine contractions, specifically Braxton- Hick's contractions, which, though not causing cervical dilation, can elevate intrauterine pressure, leading to fetal distress and intrauterine death. [18] In the later stages of pregnancy, there is a possibility of early rupture of membranes during sexual activity, increasing the risk of infection due to the absence of a protective barrier. It's essential to exercise caution and moderation in these activities to safeguard both maternal and fetal well-being during pregnancy.

***Yana***- Causes *Akala Prasava* (premature delivery) or *Garbha Srava* (abortion). Travel as a whole should be abstained by the pregnant lady, but if inevitable should be strictly avoided in 1st and 3rd trimester. A long-distance journey on 2 or 4-wheelers or long flights is discouraged due to the risk of venous stasis and thromboembolism. Vehicle riding may precipitate abortion due to a sudden increase in intra-abdominal pressure. Travel in pressurized aircraft is safe for up to 36 weeks. It is contraindicated in cases with placenta previa, pre-eclampsia, severe anemia, and sickle cell disease.

***Vegadharana***- Maintaining the normal functioning of *Apana Vayu* is crucial for a healthy pregnancy. Disruption in this balance, known as Vegadharana, can result in the imbalance of *Vata Dosha*, leading to various *Vata*-related disorders such as *Garbha Srava*, *Garbha Shosha*, and *Akala Prasava*.

***Ratri jagarana and Diwaswapna***- Engaging in nighttime wakefulness (*Ratri Jagarana*) contributes to the vitiation of *Vata Dosha*, potentially causing issues like *Garbha Srava, Garbha Shosha,* and *Akala Prasava*. Prolonged daytime sleep (*Ati Divaswapna*) induces *Kapha Prakopa*, creating blockages in the *Rasavaha Nadi*, which, in turn, reduces nourishment to the fetus and results in Intrauterine Growth Restriction (IUGR).

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| Manasika bhavas | Effect on fetus |
|---|---|
| ***kalahasheela*** | *Apasmarini Santana* |
| ***Shoka Nitya*** | *Bheeru, Apachita, Alpayusha Santana* |
| ***Abhidhyayini*** | *Paropatapi, Irshalu Santana* |
| ***Stena*** | *Ayasa Bahula, AtiDrohini, Akarmasheela* |
| ***Amarshini*** | *Chanda, Aupadika, Asuyaka* |

**STRESS**- Negative emotional states or stress can trigger heightened activity or overstimulation of the autonomic nervous system, potentially resulting in abortion. Stress disrupts the usual functioning of the hypothalamic-pituitary axis through the excessive release of the stress hormone cortisol. Additionally, stress can compromise the immune system, reducing its effectiveness.

***Dauhridini***

There may arise a question as *Dauhridini* should not say no to what she asks for, but giving everything without a second will harm both the mother and fetus. The commentator says the mother should be provided with things that are not harmful in any way to the fetus. Ayurveda's concept of *Dauhrida* highlights the connection between the mother's mind (Manah) and the fetus's sense organs (*Indriya's*). This connection, established during pregnancy, allows the fetus to express its desires (*Spandana*) based on experiences from previous lives. The *Rasavahini Nadi*, a conduit connecting the mother's heart (*MatruHridaya*) to the fetus's heart (*Hridaya*), enables the mother to perceive the fetus's aspirations. These desires should be recognized and addressed appropriately, as neglecting them could potentially harm the fetus's development.[20]

Pregnancy-related physiological and hormonal changes can influence the mother's cravings and food preferences. For instance, a greater energy demand might lead to cravings for sweet foods, particularly in women with gestational diabetes mellitus. Consuming excessive calories during pregnancy can contribute to excessive weight gain in both the mother and the child, increasing the risk of future obesity.[21] Therefore, pregnant women must maintain a healthy diet and lifestyle, incorporating nutritious foods and mindfully addressing the fetus's desires, to promote optimal fetal development.

## DISCUSSION

Ayurveda delves into teratogenesis, studying factors affecting birth abnormalities like maternal health, lifestyle, diet, and environmental exposures during pregnancy. Ayurvedic guidance underscores balancing one's *Dosha* and maintaining a harmonious *AharaVihara*. Those with a genetic disorder history are recommended Shodhana therapies and conservative treatments per Acharyas. *Garbhini Paricharya* prioritizes check-ups, a nutritious diet, lifestyle adjustments, and natural therapies for optimal prenatal care. Ayurvedic principles aim to minimize teratogenic risks. Ancient Ayurvedic texts highlight Acharya's profound knowledge of embryogenesis, teratogens, and congenital malformations, particularly the significant influence of *Vata* and *Agni* on fetal development. Rising incidents of IUGR, habitual abortions, and LSCS may stem from *Garbhini's* neglect of *Garbhini Paricharya*. One should analyze and advise against such influences, deepening the understanding of teratogens such as *Garbhopaghatakara Bhavas* in fetal anomaly causation.

## CONCLUSION

Ensuring maternal well-being through a healthy lifestyle and avoiding *Garbhopaghatakara Bhava* is crucial for maternal and fetal health. Treating a *Garbhini* with the utmost care, educating mothers on *Garbhini Paricharya,* and steering clear of harmful influences during pregnancy are vital steps to cultivate a healthy generation and foster a prosperous society. Safeguarding the fetus from teratogens is essential for preventing congenital disabilities. Open communication with healthcare providers about medications, alcohol consumption, and environmental conditions is key to ensuring a safe pregnancy and reducing the risk of birth abnormalities. Increased public awareness, guidance, and regulatory measures are pivotal in shielding developing fetuses from teratogenic harm, contributing to healthier pregnancies and diminished birth defects.

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