

Bridging Ayurveda and Modern Science: A Critical Appraisal on the concept of Garbhasrāva (Early Pregnancy Loss)

Dr. Neha Dixit¹, Dr. Divya U.², Dr. Poonam Choudhary³

¹ PhD Scholar, Department of Prasuti Tantra evum Stree Roga, National Institute of Ayurveda, Jaipur, Rajasthan, India.

² PhD Scholar, Department of Prasuti Tantra evum Stree Roga, National Institute of Ayurveda, Jaipur, Rajasthan, India.

³ Assistant Professor, Department of Prasuti Tantra evum Stree Roga, National Institute of Ayurveda, Jaipur, Rajasthan, India.

Cite this paper as: Dr. Neha Dixit, Dr. Divya U., Dr. Poonam Choudhary (2024) Bridging Ayurveda and Modern Science: A Critical Appraisal on the concept of Garbhasrāva (Early Pregnancy Loss). *Frontiers in Health Informatics, Vol.13, No.8*, 8183-8193

ABSTRACT:

Background: Early pregnancy loss, described in Ayurveda as Garbhasrāva, continues to be a major reproductive health concern despite significant advances in maternal healthcare and obstetric interventions. Contemporary biomedical science attributes miscarriage to multifactorial causes including genetic, endocrine, immunological, anatomical, environmental, and psychological factors; however, many cases remain unexplained. Exploring the Ayurvedic Samprāpti alongside contemporary pathophysiological mechanisms may provide a more comprehensive understanding of pregnancy loss and support the development of preventive pre-conceptual and antenatal care strategies.

Aim: To critically appraise the Ayurvedic concept and Samprāpti of Garbhasrāva and correlate it with contemporary biomedical pathophysiological mechanisms of early pregnancy loss.

Materials and Methods: This conceptual review analyzed classical Ayurvedic texts and contemporary biomedical literature related to Garbhasrāva and early pregnancy loss. Comparative evaluation was performed to correlate Ayurvedic Samprāpti and etiological concepts with modern pathophysiological mechanisms.

Results: The review identified two major pathogenetic dimensions of Garbhasrāva: pre-conceptual (Viprakṛṣṭa Nidāna) and post-conceptual (Sannikṛṣṭa Nidāna) factors. Ayurvedic concepts such as bīja duṣṭi, kṣetra duṣṭi, Agni duṣṭi, and Apāna Vāta prakopa showed significant parallels with modern mechanisms including genetic abnormalities, hormonal imbalance, defective implantation, oxidative stress, and placental dysfunction associated with early pregnancy loss.

Conclusion: Garbhasrāva is a multifactorial condition arising from both pre-conceptual vulnerabilities and post-conceptual triggers, and an integrative Ayurvedic–biomedical approach may improve prevention and pregnancy outcomes...

Keywords: Garbhasrava, Early Pregnancy Loss, Sannikrasta, Viprakrsta, Nidana..

INTRODUCTION

Despite national maternal health initiatives in India—such as Janani Suraksha Yojana, Dakshata, Pradhan Mantri Surakshit Matritva Abhiyan, Pradhan Mantri Matru Vandana Yojana, and LaQshya—miscarriage remains a significant public health concern. Globally, miscarriage affects nearly 10–25% of clinically recognized pregnancies¹. In India, Patki et al. reported a high prevalence of spontaneous miscarriage (32%) in 2016², along with a greater burden of recurrent pregnancy loss compared to Western populations. Furthermore, Periyasamy Kuppusamy et al. observed a declining trend in live births from 2015–2021³. NFHS data also revealed a 1.3% decline in live births between 2015–16 and 2019–21, with the proportion falling to 88.9%, lower than that in several other low- and middle-income countries³. These findings highlight the persistent burden of pregnancy loss in India despite advances in medical technology and maternal healthcare programs.

From a biomedical perspective, miscarriage remains a complex and heterogeneous clinical entity, with no identifiable cause in a considerable proportion of cases. Although chromosomal abnormalities account for nearly

half of first-trimester pregnancy losses, a wide range of embryonic and parental factors—including genetic, endocrine-metabolic, immunological, anatomical, infectious, thrombotic, and environmental influences—may contribute to its occurrence, often through multifactorial and obscure manner⁴.

The persistent burden of *Garbhasrāva* (early pregnancy loss) despite advances in modern obstetrics highlights the need for a broader conceptual understanding of early pregnancy loss. Classical Ayurvedic texts describe multiple *Nidānas* (etiological factors), including *Āhāraja* (dietary), *Vihāraja* (lifestyle), *Vyādhiya* (disease-related), and *Mānasika bhāvas* (psychological factors), which contribute to the development of *Garbhasrāva*.

In this context, this review aims at elucidating the Ayurvedic *Samprāpti* alongside current pathophysiological theories may provide a more holistic and integrative framework for understanding pregnancy loss, with emphasis on prevention and health promotion during the pre-conceptual and conceptional phases.

AIM & OBJECTIVES

To critically review and analyze the *Samprāpti* (Pathogenesis) of *Garbhasrāva* with respect to its etiological factors in the pre-conceptional and post-conceptional phases, and to correlate the Ayurvedic pathophysiological concepts with contemporary biomedical perspectives.

OBJECTIVES:

To evaluate the Ayurvedic concept of *Garbhasrāva* in relation to early pregnancy loss and its etiological determinants.

To identify *Sannikṛṣṭa Nidāna* (direct/contributing causes) and *Viprakṛṣṭa Nidāna* (indirect/remote causes) responsible for *Garbhasrāva* and to propose distinct *Samprāpti* pathways corresponding to each category of *Nidāna*.

To formulate an Ayurvedic-based preventive and management protocol aimed at reducing the risk of early pregnancy loss.

To correlate Ayurvedic *Samprāpti* of *Garbhasrāva* with contemporary biomedical mechanisms.

MATERIALS & METHODS:

This conceptual review was conducted through a comprehensive textual and comparative analytical approach. Primary Ayurvedic classical texts were systematically reviewed to extract descriptions of *Garbhasrāva* and its *Samprāpti* (Pathogenesis), with emphasis on etiological factors, *doṣic* involvement, and disease progression. Relevant secondary sources, including authoritative commentaries and interpretations, were also examined to enhance conceptual clarity.

In parallel, contemporary biomedical literature was retrieved from indexed databases such as PubMed and Scopus, focusing on current evidence related to genetic, environmental, hormonal, immunological, and psychological factors implicated in miscarriage. The collected Ayurvedic and modern data were then systematically compared and critically analyzed to identify conceptual parallels and divergences. Based on this integrative evaluation, correlations were established between Ayurvedic disease classifications and modern pathophysiological mechanisms to develop a coherent interpretative framework for *Garbhasrāva*.

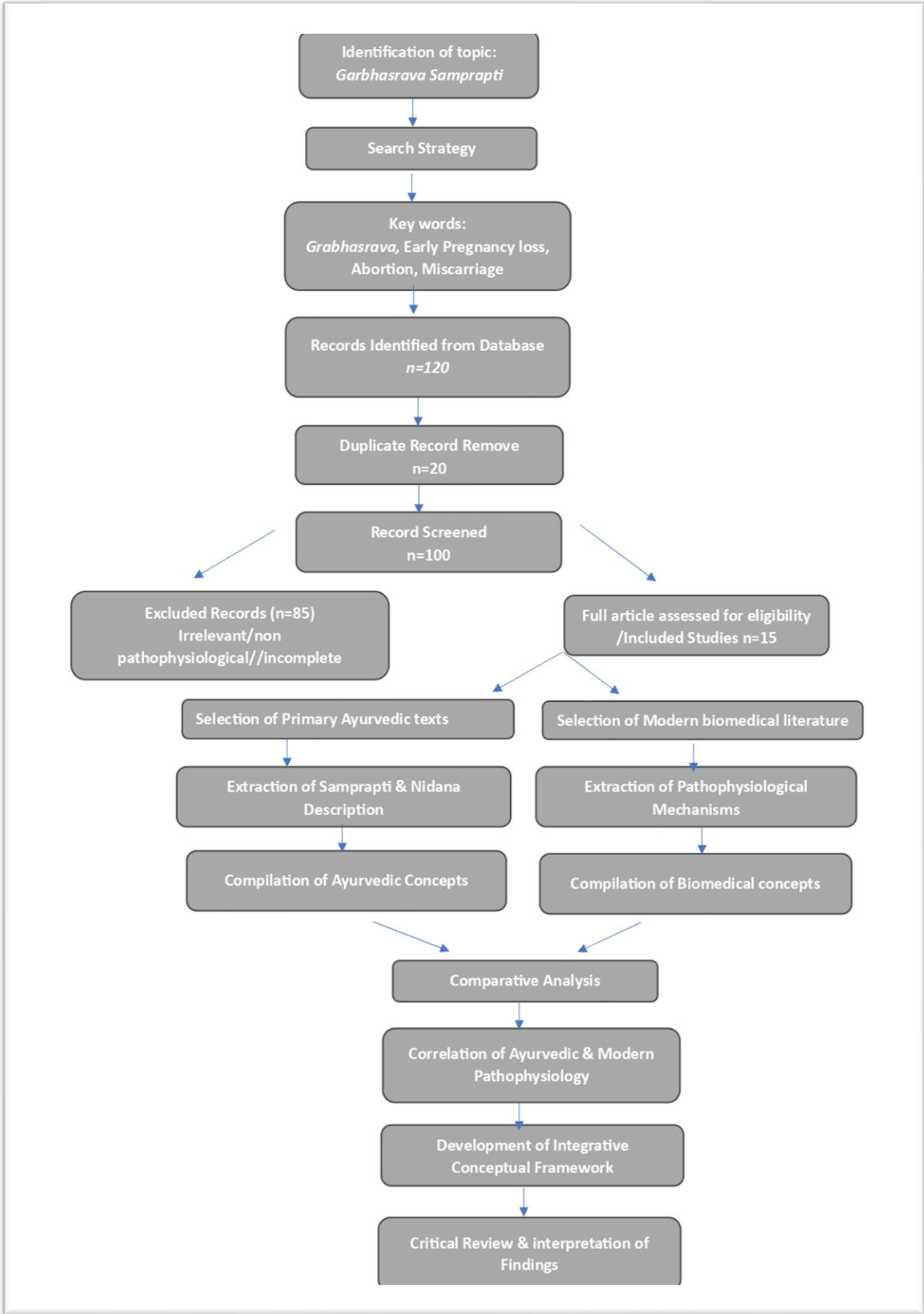


Figure 1: Diagrammatic representation of the study design

RESULTS

CLASSIFICATION OF ETIOLOGY BASED ON *SANNIKRṢṬA* AND *VIPRAKRṢṬA NIDĀNA*

Ayurveda classifies disease causation according to the temporal proximity of etiological factors to disease manifestation. In the context of *Garbhasrāva* (early pregnancy loss), these factors are broadly categorized into *Sannikrṣṭa Nidāna*, which are proximal causes acting after conception and directly precipitating pregnancy loss, and *Viprakrṣṭa Nidāna*, which are distal or remote causes operating prior to conception and creating a predisposition to adverse reproductive outcomes. This classification provides a comprehensive framework for understanding both immediate and pre-existing contributors to pregnancy loss and emphasizes the importance of preventive measures across the reproductive life span. Acharya Susruta has elaborated six types of *Vyādhi* (diseases)—*Ādibala Pravṛtta Vyādhi*, *Janmabala Kṛta Vyādhi*, *Doṣabala Pravṛtta Vyādhi*, *Saṅghātabala Pravṛtta Vyādhi*, *Kālabala Pravṛtta Vyādhi*, *Daivabala Pravṛtta Vyādhi*, and *Svabhāvabala Pravṛtta Vyādhi*) through which *Garbhasrāva* manifests via diverse pathogenetic pathways.

Table 1: Classification of etiology based on *Sannikrṣṭa* and *Viprakrṣṭa Nidāna*:

<i>Sannikrṣṭa</i>	<i>Viprakrṣṭa</i>
<p>Janma bala Krita vyadi: मातुर्यचारात् द्विविधा: रसकृताः, दौहदापचारकृताश्च Impact Maternal nutrition and hamper Fetoplacental growth and metabolic patterns</p>	<p>Ādibala pravṛtta vyadhi:- शुक्रशोणितदोषान्वयाः Aneuploidies, congenital anomalies, Inherited thrombophilia, Apert syndrome, Pfeiffer syndrome, Crouzon syndrome, Osteogenesis imperfect etc</p>
<p>Doshabala pravṛtta vyadhi: मिथ्याहाराचारकृताश्च द्विविधा:- शारीरा, मानसाश्च Implaintaion defect, Hypertension, Diabetes mellitus, , Thyroid dysfunction, fetal alcohol syndrome, Stress</p>	<p>Doshabala pravṛtta vyadhi: मिथ्याहाराचारकृताश्च द्विविधा:- शारीरा, मानसाश्च PCOD, PID, Uterine fibroid, Endometriosis, Adynomyosis, Hypertension, Dibetes mellitus, Malnutrition, Hemoglobinopathies, SLE depression, anxiety, stress etc.</p>
<p>Sanghata bala pravṛtta vyadhi: आगन्तवो Trauma, Excessive intercourse especially in conditions like placenta previa</p>	<p>Sanghata bala pravṛtta vyadhi: आगन्तवो Previous surgery, Repeated D&E</p>
<p>Kala bala pravṛtta vyadhi: Enviourmental pollution Air pollution (PM10 exposure during entire pregnancy associated with increased risk of S.A.), Aging of paternal and maternal gametes</p>	<p>Kala bala pravṛtta vyadhi: Endocrine distrupting chemicals present in the polluted air causing hormonal imbalance</p>
<p>Swabhaava bala pravṛtta vyadhi: Maternal (<i>Atibala & ativriddha</i>) and Paternal age factor</p>	<p>Daivabala pravṛtta vyadhi: <i>Jataharini</i> Unexplained causes</p>

Ādibala Pravṛtta Vyādhi: The disease which are caused due to the morbidity of sperm and ovum are called *Ādibala Pravṛtta Vyādhi*. The hereditary disease falls under this category and are inherited from parents. Sperm DNA integrity plays a vital role in embryogenesis and fetal wellbeing and sperm DNA damage may lead to pre- and post-implantation losses⁶. There are several genetic causes of pregnancy loss including chromosomal abnormalities, gene mutation, and structural rearrangements of chromosomes. Chromosomal abnormalities, such as aneuploidy (abnormal number of chromosomes), are the most common genetic cause of miscarriage.

Janmabala Kṛta Vyādhi: The disease which occur in the child due to improper dietetics and lifestyle practices followed by mother during the conception and developmental stages of fetus are called *Janmabala Kṛta Vyādhi*. Faulty diet leads to the *Agni duṣṭi*, which further creates *doṣha- duṣṭi*. *Agni* as a vital entity of human body which not only help in digestion of ingested food but also responsible for various metabolic activities. The transformation of food into nutritional energy takes places through *Agni* which further govern normal physiological functioning of body. When the *Agni* is imbalanced the digestive power gets diminished which gives rise immature *Rasa Dhātu* which play an important role as ‘*Ambu*’ in the nourishment of uterine endometrium and growth & development of fetus. The fetus is wholly dependent on mother; therefore, her diet and other activities may affect the growing fetus during pregnancy. Both maternal under nutrition and over nutrition may impair placental syntheses of NO and polyamines, and therefore placental development and utero-placental blood flows⁷. At the time of conception, maternal nutritional status is an important determinant of embryonic and fetal growth. Placental and fetal growth is most vulnerable to maternal nutrition status during the pre-implantation period and the period of rapid placental development. Congenital uterine malformations are also birth defects and can fall under this category. Congenital uterine anomalies directly disrupt the implantation field or “*Kṣetra*” which is one of the factor necessary for conception and affect fertility of an embryo implantation, resulting in pregnancy loss. *Sūcīmukhī Yonivyāpad* described in Ayurveda may be interpreted under *anmabala Pravṛtta Vyādhi*, as it resembles congenital Müllerian dysgenesis-associated uterine or genital tract malformations caused by developmental defects during embryogenesis.

Doṣabala Pravṛtta Vyādhi: *Doṣabala Pravṛtta Vyādhi*'s are those manifests due to disturbed *Śārīrika and Mānasa Doṣas*. For the genesis of *Doṣabala Pravṛtta Vyādhi*'s causative factors are incompatible dietetic and erratic activities. The *Vata-pitta* and *kapha* can lead to disease in disequilibrium state. Improper diet and lifestyle are the main cause of *Doṣa-duṣṭi*, not only during pregnancy but also in preconception period dietetic & lifestyle of mother & father affect the chances of conception and also pregnancy outcome.

Obesogenic environment (high caloric diet and sedentary lifestyle) can compromise father's sperm quality (increase sperm oxidative DNA damage, increase sperm epigenetic modification, reduce fertilization capacity) which may have substantial negative impacts on embryo and fetal development⁸.

Maternal improper diet and lifestyle before pregnancy can cause many systemic and gynecological disorders like PCOD⁹, PID¹⁰, Uterine fibroid¹¹, Endometriosis¹², Adenomyosis¹³, Hypertension, Diabetes mellitus etc. which play a major role in pregnancy continuation. A nutrients rich maternal diet before and during pregnancy is associated with improved fetal health, more appropriated birth weight and increased rates of maternal and infant survival¹⁴.

Bhaya, Krodha, Śoka, etc., Mānasika Bhāvas (Mental state) are mentioned as responsible for *Garbhasrāva* in Ayurvedic scriptures. *Bhaya* (Fear) is a condition triggered by a horrible act. It develops as a result of being in an unwanted circumstance. *Bhaya* is a human emotion that causes a person's *mana* to become restless, rendering them unable to do tasks. Increase in *Bhaya* causes an increase in *Vatadosha*, which is the primary *Doṣa in Garbhasrāva*. In fear the punishment center of the limbic system is activated. It turns on the autonomic response of fight-or-flight response. Stimulation of a thin zone of periventricular nuclei of thalamus, located immediately adjacent to the third ventricle usually leads to fear. Tremors in the body parts, dryness of mouth sweating, giddiness are the symptoms of *Bhaya*. A sudden exposure to *Bhaya* may lead to many physical and mental diseases¹⁵. In *Cintā or Śoka*, there is increase in *Sūkṣmaguṇa of Vāta due to Atiyoga of Cintā*, which causes increase in mental vibrations. The physiological concomitants which characterize anxiety are increase blood pressure, tachycardia, increased respiration, tremors & sweating and all these are not good for healthy pregnancy outcome. *Krodha* (Anger), originating from *Rajogūṇa*, affects both *Vāta and Pitta Doṣa*. Anger is responsible for surge of catecholamine's levels in body¹⁵ which is not good in pregnancy. High catecholamine levels indicative of predisposition to elevated sympathetic activation that contributes to increased risk of spontaneous preterm delivery¹⁶. *Śoka* (grief) is considered a psychological state predominantly associated with the aggravation of *Rajo*

Doṣa. Initially, it provokes *Vāta Doṣa*, followed by subsequent aggravation of *Pitta Doṣa*. Prolonged exposure to *Śoka* exerts significant psychological and physiological stress, leading to conditions such as emaciation (*Karśya*) and impairment of *Agni (Agnivikṛti)*¹⁵, which ultimately contributes to *Rasa Duṣṭi* and adversely affects overall health and reproductive well-being.

Saṅghāta Bala Pravṛtta Vyādhis: *Saṅghāta Bala Pravṛtta Vyādhis* are those diseases which manifest due to trauma or injury. Previous reproductive surgeries and repetitive D&E can lead to the “*Kṣetra*” *duṣṭi* and further increases the chances of miscarriages.

Saṅghāta Bala Pravṛtta Vyādhi, classified under *Āgantava* causes (externally acquired factors), represent external or mechanical factors that precipitate *Garbhasrāva* through direct physical insult to the gravid uterus or through prior structural compromise of the reproductive tract. When operating as *Sannikṛṣṭa Nidāna*, such factors include abdominal trauma and excessive sexual activity, particularly in vulnerable obstetric conditions such as placenta previa or cervical incompetence, where mechanical stress leads to sudden aggravation of *Apāna*. As *Viprakṛṣṭa Nidāna*, *Saṅghāta Bala Pravṛtta Vyādhi* encompass iatrogenic and surgical interventions occurring before conception, such as previous uterine surgeries and repeated dilatation and evacuation procedures, which impair endometrial integrity and uterine receptivity (*Kṣetra Duṣṭi*).

These pre-existing structural alterations compromise implantation and placental attachment in subsequent pregnancies, predisposing to early pregnancy loss. Thus, *Saṅghāta Bala Pravṛtta Vyādhi* illustrate how both acute post-conception trauma and chronic pre-conceptional uterine injury converge on a common pathogenetic pathway characterized by *Vāta prakopa*, uterine instability, and failure of *Garbha sthāpana* and *dhāraṇa*.

Kālabala Pravṛtta Vyādhi: The diseases which are produced by *Kāla (season)* are called *Kālabala Pravṛtta Vyādhi*: All the environmental factors which can adversely affect the pregnancy outcome comes under this category. Environmental chemicals (ECs) including endocrine-disrupting compounds (EDCs) can alter female reproductive development and fertility. During early embryonic development, potential targets of EDCs include cell cleavage and differentiation, cell lineage determination, methylation, implantation, maintenance of pregnancy and organogenesis¹⁷. EDCs have a deleterious effect on sperm quality and also associated with cryptorchidism, hypospadias, and testis cancer, the so-called testicular dysgenesis syndrome¹⁸. The developing fetus is particularly susceptible to environmental pollutants. Studies suggest that exposure to air pollutants such as particulate matter (PM), carbon monoxide (CO) and cooking smoke may be associated with higher risk for stillbirth and spontaneous abortion. PM₁₀ exposure during an entire pregnancy was associated with increased risk of spontaneous abortion, and exposure to PM_{2.5} and PM₁₀ in the third trimester might increase the risk of stillbirth¹⁹.

Svabhāvaj Vyādhi: The diseases such as hunger, old age and such others are known as *Svabhāvaj Vyādhi*: Miscarriage occur due to advanced maternal age and teenage age pregnancy are called as *Svabhāvaj Vyādhi* which occur due to *Dhātukṣaya Avasthā*.

Daivabala Pravṛtta Vyādhi (diseases attributed to divine or unexplained causes) include conditions such as *Jātahāriṇī*, which in the context of *Garbhasrāva* (early pregnancy loss) correspond to cases with no identifiable etiology even after thorough evaluation. These represent unexplained causes of pregnancy loss as understood in both Ayurvedic and contemporary medical perspectives.

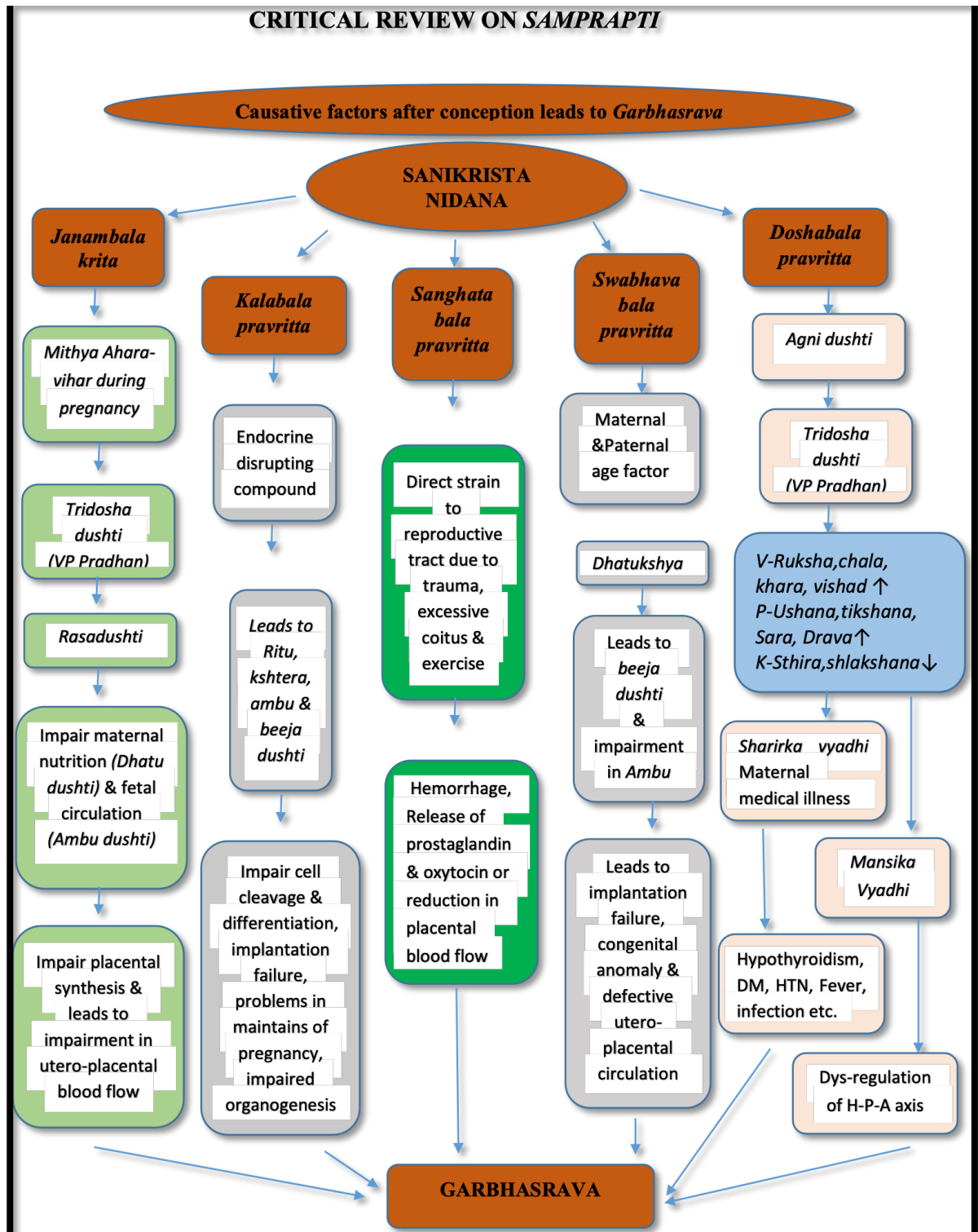


Figure 2: Critical Review on *Samprāpti* according to causative factors after conception leads to *Garbhasrāva*

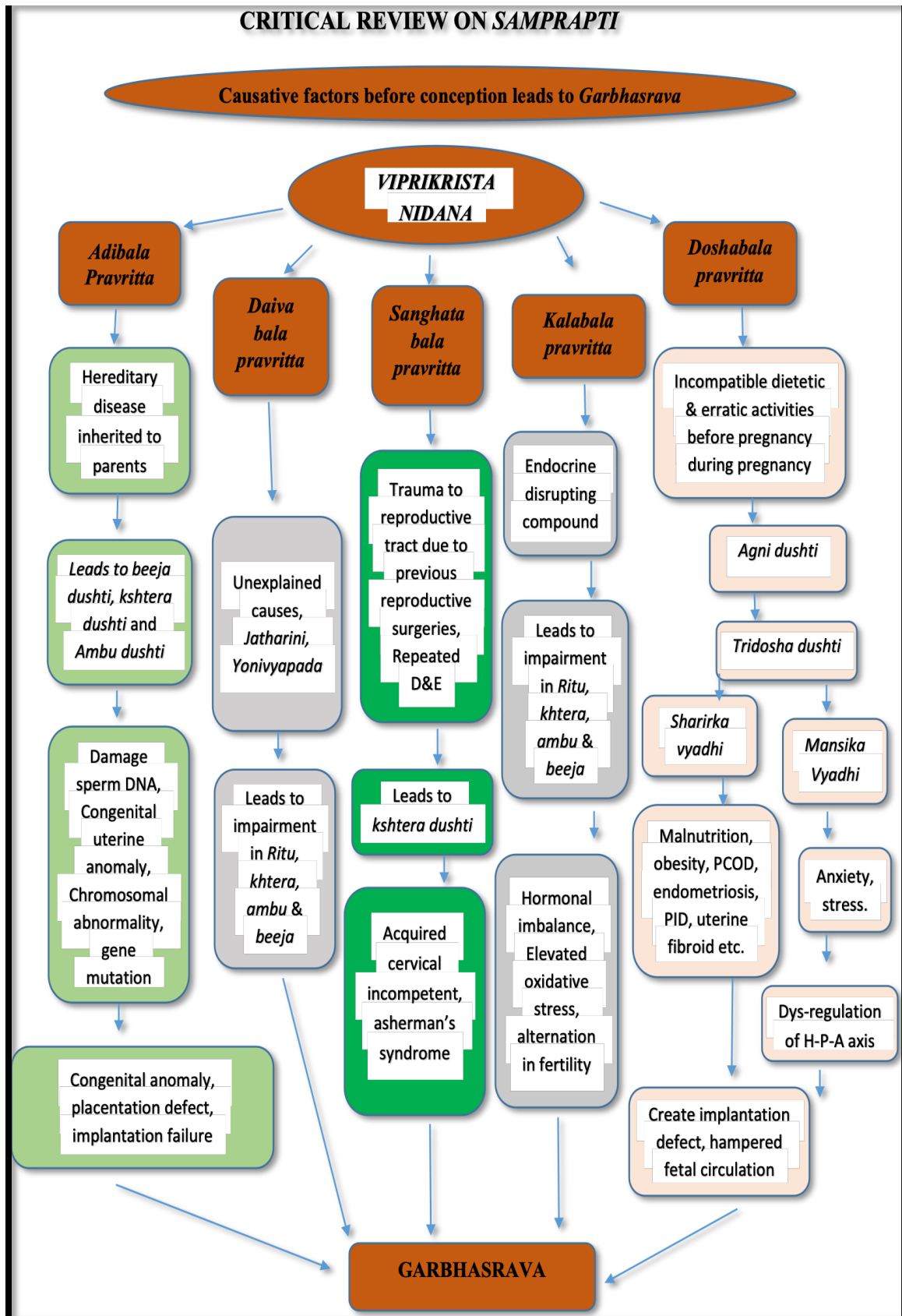


Figure 3: Critical Review on *Samprāpti* according to causative factors before conception leads to *Garbhasrāva*

DISCUSSION:

Early pregnancy loss is traditionally perceived as an event precipitated by factors acting after conception; however, growing evidence from both Ayurveda and contemporary biomedical science suggests that its origins often lie much earlier, during the pre-conceptual period. The present discussion emphasizes that early pregnancy loss is not merely an outcome of gestational factors but rather the final manifestation of cumulative disturbances operating before and after conception

Ayurveda clearly recognizes the role of pre-conceptual determinants through the concept of *Viprakṛṣṭa Nidāna*. Factors such as *bīja duṣṭi* (defects in *śukra* and *śoṇita*), *kṣetra duṣṭi* (uterine or reproductive tract abnormalities), and long-standing *doṣa* imbalance create a biologically unfavorable internal environment even before fertilization occurs. These pre-existing abnormalities compromise embryonic viability, implantation, and placental development, thereby predisposing the pregnancy to early loss. This aligns with modern evidence showing that chromosomal abnormalities, impaired gamete quality, metabolic disorders, uterine anomalies, and environmental exposures before conception significantly increase the risk of miscarriage.

Post-conceptual factors, described in Āyurveda as *Sannikṛṣṭa Nidāna*, act as immediate triggers that precipitate pregnancy loss in an already vulnerable system. Trauma, excessive physical exertion, improper diet, psychological stress, infections, and acute medical conditions disturb *Apāna Vāta* and destabilize *Garbha sthāpana* and *dhāraṇa*. However, these factors often exert a more profound effect when the foundation laid during the pre-conceptual period is weak. Thus, post-conceptual factors may act as precipitating events rather than independent causes.

The role of maternal nutrition and lifestyle before conception further illustrates this continuum. Disturbances in *Agni* and *rasa dhātu* during the pre-conceptual period impair endometrial receptivity and placental nourishment. Modern studies corroborate that maternal undernutrition, overnutrition, obesity, and metabolic disorders present before pregnancy adversely affect early embryonic development and placental function, increasing susceptibility to early pregnancy loss.

Psychological health also demonstrates the interdependence of pre- and post-conceptual factors. Chronic stress, anxiety, and emotional disturbances prior to conception alter neuroendocrine regulation and autonomic balance, which may persist into early pregnancy. Āyurveda acknowledges *bhaya*, *krodha*, and *śoka* as causative factors for *Garbhasrāva*, highlighting that mental disturbances do not suddenly arise after conception but often represent long-standing states that influence reproductive outcomes.

Environmental exposures and age-related factors further reinforce the importance of pre-conceptual health. Pollutants, endocrine-disrupting chemicals, and advanced maternal or paternal age affect gamete quality and embryonic competence even before fertilization, thereby increasing the likelihood of pregnancy loss despite optimal antenatal care.

In essence, early pregnancy loss should be understood as a continuum rather than an isolated gestational event. The Ayurvedic classification of etiological factors into *Viprakṛṣṭa* and *Sannikṛṣṭa Nidāna* provides a comprehensive framework that integrates pre-conceptual vulnerability with post-conceptual triggers. This perspective underscores the need to shift focus from pregnancy-centric care to a life-course and pre-conceptual approach, emphasizing *bīja śuddhi*, *kṣetra śuddhi*, balanced *doṣa* status, and mental well-being. Such an integrated strategy is essential for the effective prevention of early pregnancy loss and for improving reproductive outcomes.

CONCLUSION:

This critical appraisal of the literature highlights that early pregnancy loss (*Garbhasrāva*) is a multifactorial condition influenced not only by post-conceptual factors but also significantly by pre-conceptual determinants. The reviewed evidence supports the Ayurvedic concepts of *Viprakṛṣṭa Nidāna* (remote/pre-conceptual causes) and *Sannikṛṣṭa Nidāna* (proximate/post-conceptual triggers), providing a continuum-based understanding of reproductive failure. Factors such as *bīja duṣṭi* (gametic defects), *kṣetra duṣṭi* (impaired uterine receptivity), chronic *doṣa* imbalance, and *dhātu kṣaya* compromise the reproductive foundation and predispose to poor gestational outcomes. These concepts can be correlated with modern factors including genetic abnormalities, diminished ovarian reserve, poor endometrial receptivity, endocrine dysfunction, oxidative stress, immunological imbalance, and advanced maternal age, all of which are recognized contributors to recurrent pregnancy loss. Subsequent metabolic, psychological, and environmental stressors primarily function as precipitating triggers rather than root causes, comparable to the role of stress, lifestyle disorders, infections, and environmental toxins described in contemporary reproductive medicine. Therefore, the findings emphasize the importance of shifting from a pregnancy-centered approach to a comprehensive pre-conceptual and life-course

care model. Integrating Ayurvedic measures such as *bija-ksetra suddhi*, *Agni* optimization, and stress management with modern preconception counselling, nutritional optimization, genetic evaluation, and lifestyle modification may offer a holistic and preventive strategy for improving pregnancy viability and reducing miscarriage rates.

REFERENCES

1. Nynas J, Narang P, Kolikonda MK, Lippmann S. Depression and Anxiety Following Early Pregnancy Loss: Recommendations for Primary Care Providers. *Prim Care Companion CNS Disord.* 2015 Jan 29;17(1):10.4088/PCC.14r01721. doi: 10.4088/PCC.14r01721. PMID: 26137360; PMCID: PMC4468887.
2. Patki A, Chauhan N. An Epidemiology Study to Determine the Prevalence and Risk Factors Associated with Recurrent Spontaneous Miscarriage in India. *J Obstet Gynaecol India.* 2016 Oct;66(5):310-5. doi: 10.1007/s13224-015-0682-0. Epub 2015 Mar 17. PMID: 27486274; PMCID: PMC4958068.
3. Kuppusamy P, Prusty RK, Chaaithanya IK, Gajbhiye RK, Sachdeva G. Pregnancy outcomes among Indian women: increased prevalence of miscarriage and stillbirth during 2015-2021. *BMC Pregnancy Childbirth.* 2023 Mar 8;23(1):150. doi: 10.1186/s12884-023-05470-3. PMID: 36890450; PMCID: PMC9992916.
4. DC Dutta. *Textbook of Obstetrics*, Jaypee Brothers Medical Publishers; New Delhi, 10th Edition, 2023, Chapter 16, Page No 154.
5. Ambikadutta Shastri (Editor). *Susruta Samhita of MaharsiSusruta*, Chaukhambha Sanskrit Sansthan, Varanasi; Reprint edition 2014, Sutra sthana, Chapter 24, Verse 6, Page No.130
6. Watanabe S. DNA damage in human sperm: The sperm chromosome assay. *Reprod Med Biol.* 2022 Apr 20;21(1):e12461. doi: 10.1002/rmb2.12461. PMID: 35475148; PMCID: PMC9020466.
7. Bazer F et al. Maternal nutrition and fetal development, *The journal of nutrition*, September 2004, 134(9): 2169-2172
8. Billah, M.M., Khatiwada, S., Morris, M.J. et al. Effects of paternal overnutrition and interventions on future generations. *Int J Obes* 46, 901–917 (2022). <https://doi.org/10.1038/s41366-021-01042-7>
9. Rudraksh PK Chavda, Bhavya P Patel, Kachhadiya Hemanshi, Patel Nirali, Dr. Ashok Choudhary, Dr. Divyakant Patel, *Pregnancy Complications and Outcomes in Women with Polycystic Ovary Syndrome: An Updated Review*, *Int. J. of Pharm. Sci.*, 2025, Vol 3, Issue 10, 1696-1709. <https://doi.org/10.5281/zenodo.17369994>
10. Marcinkowski K, Mehta V, Mercier R, *Pelvic inflammatory disease in pregnancy: a systematic review focusing on perinatal outcomes*, *American Journal of Obstetrics & Gynecology MFM*, 2022; 4
11. Hiba Ahmed Suhail. *Uterine fibroids and their effect on pregnancy: An updated review*; *International Journal of Clinical Obstetrics and Gynaecology* 2025; 9(2): 09-17.
12. Ji-Ze Hsu, Dah-Ching Ding, *Association between endometriosis and pregnancy complications: A nationwide retrospective analysis (2000–2021)*, *European Journal of Obstetrics & Gynecology and Reproductive Biology* 2025; Volume 314, 114704.
13. Hanxi Zheng, Meng Liu, Qiaolian Su, Hong Li, Fuxin Wang. *Impaired fertility and perinatal outcomes in adenomyosis: insights from a novel murine model and uterine gene profile alterations during implantations*, *American Journal of Obstetrics & Gynecology* 2025; 233, 180.e1-180.e18.
14. Lowensohn RI, Stadler DD, Naze C. *Current Concepts of Maternal Nutrition*. *Obstet Gynecol Surv.* 2016 Aug;71(7):413-26. doi: 10.1097/OGX.0000000000000329. PMID: 27436176; PMCID: PMC4949006.
15. Kumar H et al. *Understanding the relation between Mansik Bhabhavas and Vyadhi Utpatti* W.S.R. *Immunity*, *International Ayurvedic Medical Journal*, September 2020,4461-4465.
16. Claudia Holzman, Patricia Senagore, Yan Tian, Bertha Bullen, Eric DeVos, Cheryl Leece, Adroaldo Zanella, Gregory Fink, Mohammad H. Rahbar, Anjali Sapkal, *Maternal Catecholamine Levels in Midpregnancy and Risk of Preterm Delivery*, *American Journal of Epidemiology*, Volume 170, Issue 8, 15 October 2009, Pages 1014–1024, <https://doi.org/10.1093/aje/kwp218>

17. Owler PA, Bellingham M, Sinclair KD, Evans NP, Pocar P, Fischer B, Schaedlich K, Schmidt JS, Amezaga MR, Bhattacharya S, Rhind SM, O'Shaughnessy PJ. Impact of endocrine-disrupting compounds (EDCs) on female reproductive health. *Mol Cell Endocrinol.* 2012 May 22;355(2):231-9. doi: 10.1016/j.mce.2011.10.021. Epub 2011 Oct 28. PMID: 22061620
18. Sharma A, Mollier J, Brocklesby RWK, Caves C, Jayasena CN, Minhas S. Endocrine-disrupting chemicals and male reproductive health. *Reprod Med Biol.* 2020 Apr 14;19(3):243-253. doi: 10.1002/rmb2.12326. PMID: 32684823; PMCID: PMC7360961
19. Grippo A, Zhang J, Chu L, Guo Y, Qiao L, Zhang J, Myneni AA, Mu L. Air pollution exposure during pregnancy and spontaneous abortion and stillbirth. *Rev Environ Health.* 2018 Sep 25;33(3):247-264. doi: 10.1515/reveh-2017-0033. PMID: 29975668; PMCID: PMC7183911