



Review Article

STRESS AND FEMALE INFERTILITY: AN INTEGRATIVE REVIEW OF AYURVEDIC CONCEPTS AND MODERN BIOMEDICAL INSIGHTS

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ABSTRACT

Ayurveda, through concepts such as *Manasika Bhava* (mental states) and the principle "*Saumanasya Garbhajananaanaam* (mental tranquillity, a prime factor for conception), has long acknowledged the mind's impact on fertility and pregnancy outcomes. It also conceptualizes infertility (*Vandhyatva*) as resulting from disturbances in *Dosha, Agni, Dhātu, Ojas*, and *Garbha Sambhava Samagri*. **Aim:** To elucidate the pathophysiological mechanisms of stress-induced female infertility by integrating Ayurvedic concepts with modern psycho-neuro-endocrine and oxidative stress perspectives. **Methods:** A narrative review of classical Ayurvedic texts (*Brihatrayi* and *Laghutrayi*) and contemporary biomedical literature was conducted. Ayurvedic constructs, including *Tridosha, Manasika Bhava, Garbha Sambhava Samagri*, and *Samprapti*, were correlated with modern mechanisms involving hypothalamic-pituitary-adrenal - hypothalamic-pituitary-Gonadal axis dysregulation and oxidative stress. **Results:** Chronic psychological stress activates the Hypothalamic-pituitary-adrenal axis, suppressing gonadotropin secretion and ovarian function while increasing oxidative stress, leading to impaired oocyte quality, anovulation, and defective implantation. Ayurveda explains these changes through *Vata-Pitta* vitiation, *Agnimandya*, *Ama* formation, *Srotodushti*, *Artava Kshaya*, and *Ojas* depletion, resulting in derangement of *Ritu, Kshetra, Ambu*, and *Beeja*. Mind-body interventions, including *Panchakarma, Rasayana, Yoga*, and *Pranayama*, have the potential to restore neuroendocrine balance. **Conclusion:** Stress-induced female infertility represents a complex interaction of psychological, neuroendocrine, metabolic, and reproductive dysfunctions. The convergence of Ayurvedic psychosomatic theory with modern psycho-neuro-endocrine science provides a coherent model explaining how emotional stress compromises fertility. Integrating stress-reduction strategies, lifestyle regulation, and mind-body therapies with conventional fertility management.

INTRODUCTION

Stress is defined as a state of mental or emotional stress resulting from adverse circumstances. Despite modern advancements that have simplified many aspects of life, the incidence of stress continues to rise steadily in today's world. Fast and disturbed lifestyles, changing food habits, and changing family structure, along with increasing competition in the work field, are the basic causes of stress.

Infertility is defined as the inability to conceive after one year of regular unprotected intercourse and affects a significant proportion of women worldwide. In recent times, female infertility has become a growing concern, affecting 3.9% to 16.8% of couples in India. [1] Female infertility is a multifactorial condition caused by anatomical, hormonal, metabolic, and psychological factors.

Psychological stress has emerged as a significant contributor to female infertility by affecting neuroendocrine regulation, ovulatory function, and reproductive outcomes. It may lead to hormonal imbalance, anovulation, poor egg quality, and a longer time for conception, and affecting pregnancy outcome. It also negatively impacts the outcome of fertility

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treatments like IVF, IUI, etc. Despite significant advances in medical science, the systematic assessment and management of psychological stress remain a relatively ignored topic in the overall treatment of female infertility.

Ayurveda has emphasized the importance of mental and spiritual well-being alongside physical health. Health is the condition with dynamic equilibrium of *Dosha*, *Agni*, *Dhatu*, *Mala*, along with well-being of *Atma* (soul), *Indriya*, *Indriyarth*, and *Mana*^[2]. Both *Sharira* (physical) and *Manasika* (mental) entities are interdependent and hence all the diseases are psychosomatic.

Though Ayurveda describes the *Ritu* (fertile period), *Kshetra* (topography), *Ambu* (nourishing fluid), and *Beeja* (gametes) as the prerequisites for conception, *Saumanasya* (mental well-being) is considered the principal factor for conception.^[3] For healthy conception, Ayurveda emphasizes that the woman should be in a psychologically calm and positive state, characterized by mental clarity, emotional contentment, and enthusiasm. This suggests that optimal reproductive outcomes are supported when the female is in a low-stress emotional state, with positive affect and psychological well-being, which favor balanced neuroendocrine function and a supportive hormonal environment for conception.

Ayurveda describes a multidimensional therapeutic framework to support female fertility, encompassing systemic regulation, detoxification, rejuvenation, and mind-body interventions. These approaches include *Shamana Chikitsa*, *Panchkarma* procedures, *Rasayana*, and *Vajikarana* to restore physiological homeostasis through metabolic and hormonal regulation. The mind-body interventions, viz. Yoga, pranayama, etc., aim at the modulation of neuro-endocrine and autonomic balance.

Integrating these perspectives may offer a more comprehensive and holistic framework for the management of stress-related infertility. This narrative examines the pathophysiological mechanisms underlying stress-induced female infertility from an Ayurvedic perspective and critically evaluates their relevance in the context of contemporary psycho-neuro-endocrine insights.

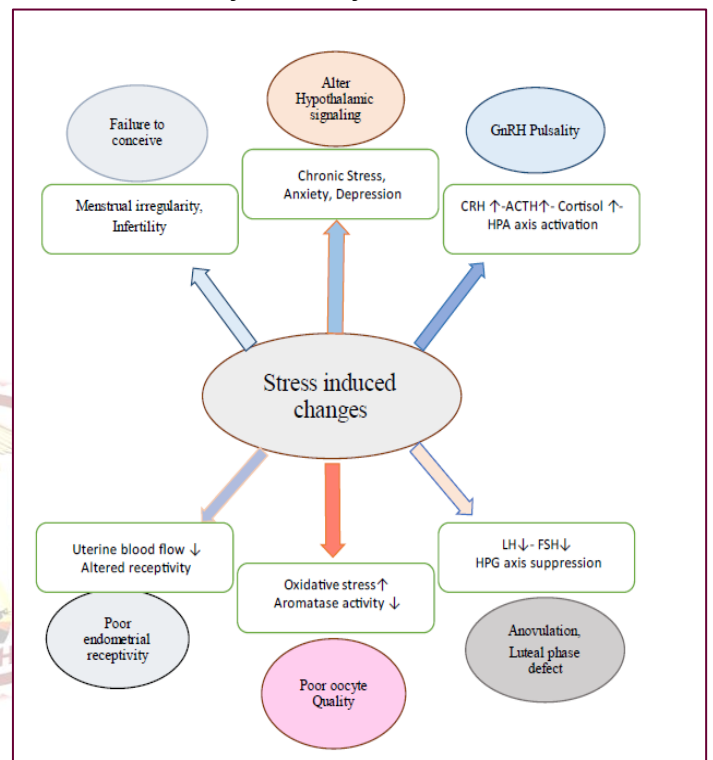
MATERIAL AND METHOD

This study was designed as an integrative narrative review to explore the relationship between Ayurvedic psychological concepts and modern psycho-neuro-endocrine mechanisms in relation to reproductive health. Classical Ayurvedic texts and contemporary biomedical literature were reviewed. Ayurvedic concepts such as *Tridosha*, *Manasika Bhava*, *Garbha Sambhava Samagri*, and *Samprapti* of

Vandhyatva were analyzed and correlated with modern mechanisms including the hypothalamic-pituitary-adrenal axis, hypothalamic-pituitary-gonadal axis, and oxidative stress pathways.

Relevant data were collected from classical texts, peer-reviewed journals, and standard physiology and reproductive medicine sources. A qualitative comparative approach was adopted to map Ayurvedic principles with modern scientific explanations. The study mainly focused on understanding how chronic psychological stress influences hormonal regulation, ovulation, and reproductive function.

Female Infertility -The Psycho-neuroendocrine

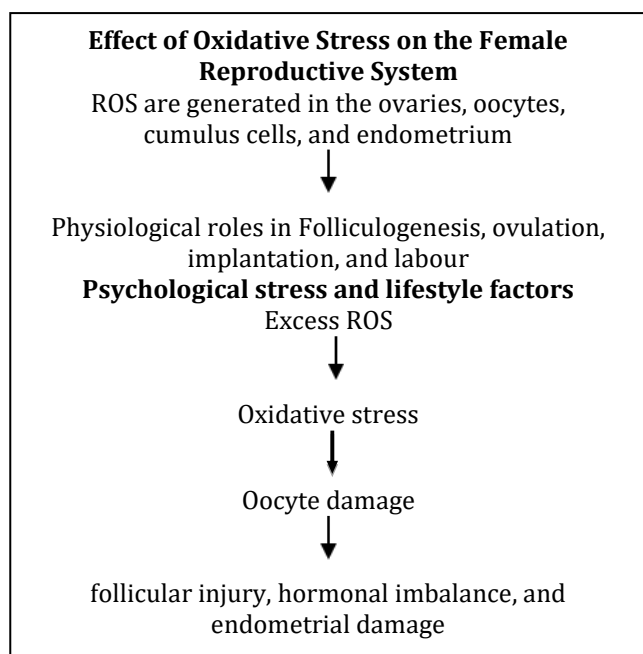


Perspective

Female infertility is recognized as a complex, multifactorial condition shaped by the interrelated functioning of psychological factors, neural pathways, and endocrine mechanisms. The psycho-neuro-endocrine (PNE) perspective offers an integrated model to elucidate how emotional stress and psychological disturbances can negatively influence female reproductive physiology. Psychological stress activates the hypothalamic-pituitary-adrenal (HPA) axis through increased secretion of corticotropin-releasing hormone (CRH) from the hypothalamus. Persistent CRH release during chronic stress inhibits the hypothalamic-pituitary-ovarian (HPO) axis at multiple levels. CRH directly suppresses gonadotropin-releasing hormone (GnRH) secretion and indirectly inhibits it through stress-induced β -endorphins, resulting in reduced pulsatile luteinizing hormone (LH) release and impaired ovulation. CRH receptors

are expressed in the ovaries, uterus, and placenta; elevated CRH reduces ovarian steroidogenesis and disrupts endometrial decidualization and implantation, leading to infertility and pregnancy loss. Increased adrenocorticotrophic hormone (ACTH) further suppresses the LH surge by decreasing pituitary responsiveness to GnRH. Elevated glucocorticoids act via receptors across the HPO axis, causing follicular atresia, reduced estrogen synthesis, altered uterine estrogen-progesterone receptor expression, and impaired endometrial receptivity and luteal function.^[4,5,6,7,8,9]

Effect of Oxidative Stress on the Female Reproductive System



The female reproductive system, comprising the ovaries, fallopian tubes, uterus, and cervix, is highly sensitive to oxidative stress (OS). Granulosa cells, oocytes, cumulus cells, and endometrial cells generate reactive oxygen species (ROS), with oocytes being particularly vulnerable. ROS, including superoxide anion, hydrogen peroxide, and hydroxyl radicals, are natural by-products of mitochondrial ATP production and play roles in follicle development, ovulation, steroidogenesis, corpus luteum regression, and implantation.

Cumulus and endometrial cells release ROS to regulate fertilization and endometrial receptivity, while antioxidants like catalase, glutathione, and estrogen protect against apoptosis. Excess ROS from stress, lifestyle factors, or substances causes DNA damage, mitochondrial dysfunction, and proinflammatory cytokine release, impairing oocyte quality, follicle function, hormone balance, and implantation. Stress-related hormonal changes can negatively impact ovarian steroidogenesis,

endometrial receptivity, and uterine blood flow, thereby reducing the likelihood of successful implantation. Additionally, stress is associated with immune dysregulation and low-grade inflammation, which may further compromise reproductive outcomes. Maintaining ROS-antioxidant balance is essential for optimal female reproductive health and early embryonic development.^[10]

Oocyte Quality

The viability of an oocyte largely depends on its quality, which may decline due to oxidative damage affecting DNA, lipids, and proteins. ROS-induced DNA damage, such as strand breaks and nucleotide alterations, can lead to chromosomal abnormalities and difficulties in conception. Oxidative stress also decreases membrane fluidity and permeability, reducing the oocyte's ability to be fertilized. Furthermore, protein oxidation may hinder oocyte maturation and overall fertility.

ROS-driven DNA damage can halt embryonic development by inducing chromosomal anomalies. Reduced ATP production and impaired embryo growth are frequently associated with OS. Moreover, OS can alter gene expression, making cells more prone to apoptosis and contributing to abnormal development.^[12]

Implantation

Implantation, essential for establishing pregnancy, is also adversely affected by OS. Elevated ROS levels can interfere with trophoblast invasion, disrupt gene expression, and promote endometrial inflammation. These changes reduce the ability of the endometrium to support and nourish the embryo, while abnormal gene regulation increases the risk of apoptosis and implantation failure.

Factors Affecting Female Fertility Associated with OS

Age

Fertility naturally declines with age, making maternal age a key factor in infertility. By around 44 years of age, women typically experience lower Estrogen levels and reduced defence against oxidative stress in the endometrium, both of which hinder reproductive potential.

Body Weight

Obesity: Excess weight is a major risk to female fertility, as it disrupts hormonal balance and menstrual function. Obesity is closely linked to conditions like polycystic ovary syndrome (PCOS), the leading cause of female infertility. The mechanisms include changes in adipokine secretion, insulin resistance, and chronic inflammation, all of which impair ovulation.

Underweight: Undernourished Women may also face fertility problems. Poor nutrition can damage vascular function by reducing endothelium-dependent vasodilation, contributing to oxidative stress and impaired reproductive health.

Lifestyle Factors

Habits such as cigarette smoking, alcohol intake, and recreational drug use further increase oxidative stress, which has been associated with several reproductive disorders.

PCOS

Polycystic ovary syndrome affects about 18% of women of reproductive age and is marked by elevated androgen levels, disrupted follicle development, irregular or absent periods, and polycystic ovaries. Around 90% of women with PCOS struggle with anovulatory infertility. Insulin resistance is a common feature of PCOS, driving excess ovarian androgen production and further disturbing menstrual cycles and ovulation.

Endometriosis

Endometriosis is a chronic, estrogen-dependent disorder affecting 6–10% of reproductive-aged women. It involves the growth of endometrial tissue outside the uterus, commonly on the ovaries and pelvic structures. This ectopic tissue induces oxidative stress and inflammation, impairing oocyte and embryo quality, altering peritoneal fluid, and reducing fertility. Recent studies have shown that chronic stress can lead to female reproductive dysfunction, including menstrual irregularities, amenorrhea, anovulation, and/or infertility.^[12,13]

Concept of Mana, Mansik Bhava, and Stress

Ayurveda conceptualizes human health within the mind-body continuum in which mental and physiological processes are intrinsically interconnected. *Mana*, the sixth *Indriya* (sense organ), acts as a bridge between the physical body and consciousness, continuously influencing physiological as well as psychological processes. This integrative view establishes the foundation of the mind-body continuum. The mind-body continuum is governed by the interaction of *Tridosha* (*Vata*, *Pitta*, and *Kapha*) and *Triguna* (*Satva*, *Raja*, and *Tama*). *Tridosha* not only act as regulators of physiological processes but also as integrative functional systems that significantly influence cognitive and psychological processes, emotional regulation, and behavioral expression. Each *Dosha* contributes distinct neuropsychological characteristics:

- *Vata Dosha* is associated with cognitive processing, sensory perception, and neural activity; when dysregulated, it manifests as heightened despair, fear responses, anxiety, grief, confusion, and loss of mental steadiness.^[14]
 - *Pitta Dosha* influences intellect, emotional reactivity, and executive functions such as judgment and decision-making; imbalance may result in irritability, anger, and heightened emotional intensity and loss of mental peace.^[15]
 - *Kapha Dosha* supports emotional resilience, stability, and affective endurance; however, excess *Kapha* is linked to mental sluggishness, apathy, and reduced motivational drive.^[16]
- Manas Guna* are fundamental psychological attributes that shape mental functioning and behavior:
- *Satva* is pure and illuminating; it promotes compassion and non-cruelty, a liking for sharing, forbearance, truthfulness, righteousness, and belief in the existence of God, knowledge, intelligence, sharp intellect, good memory, firmness, and freedom from excessive attachment.
 - *Raja* is born of desire and attachment, causing mental agitation; it represents predominance of sorrow, a wandering or restless nature, lack of steadiness, egoism, untruthfulness, lack of compassion, hypocrisy, pride, excessive exhilaration, desire, and anger.
 - *Tama* arises from ignorance and causes delusion of the mind; it corresponds to cognitive inertia and reduced awareness, despondency, disbelief in God, inclination towards unrighteous conduct, obstruction of intellect, ignorance, dullness of understanding, inclination towards inaction, and excessive sleep.^[17]

A person endowed with *Satva guna* predominance endures all situations by self-control and inner strength. A Rajasic person endures difficulties only when supported or restrained by others, whereas a Tamasic person is unable to endure at all.

Therefore, *Raja* and *Tama* are considered *Manasika Dosha*, while *Satva* is a *Manasik Guna* as it maintains mental balance.

| Dosha | Balanced Mental Traits | Vitiated Mental Traits |
|--------------|---------------------------------------|----------------------------------|
| <i>Vata</i> | Creativity, alertness, and enthusiasm | Anxiety, fear, insomnia |
| <i>Pitta</i> | Intelligence, courage, clarity | Anger, aggression, jealousy |
| <i>Kapha</i> | Calmness, stability, compassion | Depression, lethargy, attachment |

Pradnyaparadha is the dysfunction of higher cognitive processes, including impaired judgment, self-regulatory control, and memory, leading to maladaptive behaviours and lifestyle choices. Within the Ayurvedic etiological framework, it represents a key pathway by which cognitive and behavioral dysregulation precipitates physiological imbalance and contributes to the development of somatic disease.

The location of *Mana* is considered as *Hridaya* and *Shir Talvanatargata* (between the head 7 Palate). While it exhibits the qualities of *Satva*, *Raja*, and *Tama*, its function is modulated by the *Dosha*.

- *Prana Vayu* resides in *Moordha* (head but its regulatory influence extends to the *Ura* (thorax), where it supports the functioning of *Mana* (mind) and *Hridaya* (heart).
- *Sadhak Pitta*, located in the *Hridaya*, governs cognitive-emotional processes and is responsible for the realization of mental goals and aspirations.
- *Avalambak Kapha*, situated in the thoracic region, provides structural and functional support to the heart, maintaining stability and protection.
- *Tarpak kapha* Located in the head, located in the head, nourishes and maintains the sensory organs, using its intrinsic energy and the nutritive components of the body to sustain their proper function.

Along with the aforementioned *Dosha*, *Rasa* and *Rakta Dhatu*, *Oja* resides in *Hridaya* (Heart).^[18] The *Pranavaha* and *Rasavaha Srotasa* also have their moolasthan (origin) in the heart.

Chintya denotes mental knowledge perceived without sensory input and represents the thinking domain of the mind. Balanced mental engagement maintains normal mental function, while *Ayoga* (under-thinking), *Atiyoga* (over-thinking), or *Mithyayoga* (negative /fear-based thinking) leads to mental and intellectual dysfunction.^[19] Excessive or persistent thinking (*Chinta*) disrupts neurological homeostasis, leading to *Vata* imbalance, which leads to aggravation of *Vata Dosha*, culminating in mental fatigue and stress.

Psycho-physiologically, excessive or chronic mental activity (overthinking) is considered a key factor that disrupts the normal function of the

Rasavaha Srotas, potentially leading to systemic and cardiovascular disturbances.

Bhaya (fear), *Shoka* (grief), *Krodha* (anger), *Lobha* (greed), *Moha* (delusion), *Mana* (pride), *Dweshha* (jealousy), *Mithya Darshana* (false perception) are *Mithya Yoga* (erroneous utilization) of *Mana* and are recognized as causes of mental and psychosomatic disorders.^[20]

Shoka (Grief) resulting from the loss of a loved one or major misfortune induces physical and psychological weakness. *Bhaya* (fear) of harm from external threats similarly compromises strength and resilience. *Krodha* Intense anger and hatred generate a hyperarousal physiological state, producing sensations of internal heat and agitation. *Shoka* and *Bhaya* result in the vitiation of *Vata Dosha*, while *Krodha* predominantly vitiates *Pitta* and *Vata Dosha*.^[21]

Chinta, *Bhaya* and *Shoka* are recognized as significant contributors to the depletion of *Dosha*, *Dhatu*, *Oja*, and *Mala*. leading to systemic weakening and compromised homeostasis. *Krodha*, *Shoka*, and *Bhaya* disrupt the normal function of the *Swedavaha Srotasa*, impairing thermoregulation and fluid balance ^[22]. The chronic engagement in these states can lead to psychosomatic illness, weakness, cognitive-emotional dysregulation, and aggravate the *Dosha*. These vitiated *Dosha* settles in the site of *Mana*, i.e., heart, and block the channels of *Manovaha* and *Rasavaha Srotasa*.

Prolonged psychological and emotional stress, such as chronic grief, anxiety, anger, fear, or rumination, adversely affects the quality and replenishment of *Rasa Dhatu*. When sustained mental stress is combined with factors such as undernutrition, inadequate fluid or caloric intake, constitutional weakness, or cachexia, it can result in depletion of *Rasa Dhatu*. Clinically, this depletion presents as generalized fatigue, emaciation, and reduced vitality. Persistent emotional dysregulation, such as envy, excessive desire, fear, anger, and prolonged grief, combined with excessive sexual activity or inadequate nutrition, leads to depletion of *Ojas*, resulting in reduced vitality, impaired immune function, decreased stress resilience, and disrupted homeostasis. These psychological disturbances, along with mental agitation, can impair digestive function, causing even nutritionally adequate food to be improperly metabolized and resulting in

Ama formation. Stress, emotional dysregulation, and sleep disturbance disrupt digestive efficiency, leading to functional indigestion (*Ajeerna*) despite appropriate dietary intake.^[23]

Mental factors such as *Bhaya* (fear), *Shoka* (grief), *Krodha* (anger), and *Kama* (excessive desire) act as primary etiological stressors that vitiate the mind, disturb *Dosha*, and weaken *Agni* and *Ojas*, thereby contributing to the development of physical disease. Conversely, chronic somatic illness can destabilize psychological function, underscoring the bidirectional nature of mind-body interactions.

Ayurveda thus offers a nuanced psychosomatic framework in which mental health is intrinsically linked to dynamic *Dosha* equilibrium: *Vata Dosha* governs cognitive activity and creativity, *Pitta* regulates intellect and emotional intensity, while *Kapha* sustains emotional stability and memory.

Ayurveda Perspective of Female Fertility

Ayurveda conceptualizes conception (*Garbha Sambhava*) as a multifactorial biological process requiring the synchronized functioning of specific physiological, anatomical, nutritional, and genetic determinants rather than the mechanical union of sperm and ovum. Conception is understood to result from the coordinated interaction of four critical determinants, i.e., *Garbha Sambhava Samagri: Ritu, Kshetra, Ambu, and Beeja*. Disruption or dysfunction in any of these factors may compromise the process of fertilization, implantation, or early embryonic development, thereby contributing to infertility.

1. Ritu (The optimal fertile window)

Ritu denotes the appropriate temporal window during which conception is biologically feasible, i.e. optimal fertile window. In females, this corresponds to the post-menstrual fertile phase (*Ritu Kala*), when ovulation occurs, and the endometrium is receptive to implantation.

2. Kshetra (Structural Integrity & Reproductive micro-environment)

Kshetra refers to a structurally and functionally healthy maternal reproductive system, particularly the uterus and associated structures, functioning as the biological “field” for conception and gestation.

3. Ambu (Nutritional and Metabolic Support)

Ambu signifies the nutritional and biochemical milieu necessary for fertilization, implantation, and provides adequate nutritional and metabolic support necessary for cellular growth and development during embryogenesis. It is primarily derived from the *Rasa dhatu* of Mother, which supplies energy, substrates, and regulatory molecules to reproductive tissues and the early embryo. provide adequate nutritional and

metabolic support necessary for cellular growth and development

4. Beeja (Gamete Quality and Genetic Integrity)

Beeja refers to the gametes, i.e., *Shukra* (sperm) and *Artava* (ovum), and encompasses their structural, functional, and subtle genetic attributes signifying the qualitative integrity of the parental gametes. Ayurveda acknowledges hereditary and congenital disorders as consequences of defective *Beeja*, recognizing the role of parental health, nutrition, age, and lifestyle in determining gamete quality. *Artava* is described as an *Upadhatu* (secondary tissue) derived from *Rasa Dhatu* (the nutritive plasma). Consequently, the quality and functional integrity of *Artava* are directly influenced by the health and adequacy of *Rasa Dhatu*.

The successful conception and early embryogenesis result from the integrated contribution of multiple parental and environmental determinants, including maternal factors (*Matruja Bhava*), paternal factors (*Pitruja Bhava*), individual constitutional attributes (*Atmaja Bhava*), habitual and environmental adaptability (*Satmyaja Bhava*), nutritional influences (*Rasaja Bhava*), and psychological factors (*Satvaja Bhava*).^[24] The coordinated interaction of these genetic, epigenetic, nutritional, environmental, and psycho-behavioral influences is considered essential for normal conception and early embryonic development.

The region below the umbilicus corresponds to the primary anatomical domain of *Vata Dosha*, encompassing the large intestine, urinary bladder, and reproductive organs. In females, the pelvic cavity, which contains the uterus, cervix, vagina, and supporting ligaments, is recognized as the principal site of *Apana Vayu*. It is critical for maintaining reproductive function, regulating menstruation, facilitating conception, and supporting gestation and parturition. *Vyana Vayu* enables the propulsion of *Shukrawithin Yoni*, facilitating its inward movement and transport into the uterine cavity.

Infertility is described as the inability to conceive despite regular and appropriate cohabitation during the fertile period. *Vandhyatva* is classified as one of the 80 *Nanatmaja Vyaadhi* caused by *Vata Dosha*. *Vandhya* is described as one of the characteristics of *Artavavaha Srotas Viddha Lakshana*, i.e., a pathological state of the female reproductive tract due to damage or injury. Classical texts underscore the clinical significance of *Vandhyatva* (female infertility) by allocating a dedicated chapter to its etiology, pathogenesis, and management, reflecting its recognized importance in gynecological practice.

Vitiation of *Vata* can disrupt reproductive processes at multiple stages, from gamete formation to implantation. Violation of *Apana Vayu* can cause

Vandhyatva (infertility), *Nashtarhava* (amenorrhoea), *Garbhapata* (miscarriage), *Garbhasrava* (abortion), or *Mudhagarbha* (obstructed labor). During parturition, it is termed *Prasuti Maruta*, as it governs the processes and dynamics of labour. Therefore, managing and balancing *Vata Dosha* is a key factor in the treatment of infertility.

Yonivyapada refers to a broad category of gynaecological disorders affecting the female reproductive system, identified by 20 distinct conditions. *Mithya Aahara Vihara* (faulty diet and lifestyle), *Aartava dushti* (ovulatory and menstrual pathology), *Beejadasha* (genetic defects in *Aartava*), and *Daiva* (unknown etiology) are the principal etiological factors of *Yonivyapada*.^[25] These factors act individually or synergistically to disturb the homeostasis of the *Tridosha*. The resultant *Dosha* imbalance, depending upon the predominance and combination of the involved *Dosha*, manifests as twenty distinct clinical conditions, each characterized by specific pathophysiological mechanisms and symptomatology.

The different *Yonivyapada* affect *Artava* (menstrual and ovulatory functions), *Kshetra*, and *Beeja* (gamete quality). Vitiating of *Dosha* in *Yonivyapada*, viz. *Shandhi*, *Arajaska*, etc. contributes to subfertility or infertility (*Vandhya Shandhi*, *Arajaska*). Multiple clinical case studies have provided substantial evidence supporting the role of *Yonivyapada* as a contributing etiological factor in the development of infertility.^[26,27]

Ayurveda recognizes mental well-being as a central determinant of successful conception, emphasizing the influence of psychological stability on reproductive function.

Manaso Abhitap (Psychological distress) is recognized as one of the factors of delayed conception in Ayurveda. Maternal and paternal mental states at the time of conception can influence gamete quality and early embryonic development. Stress, anxiety, fear, jealousy, or other negative emotions during conception may lead to depletion of *Shukra* and *Oja*, thus compromising reproductive health or affecting early foetal development. Maternal emotional stress can lead to haemorrhage during pregnancy and pose a risk to fetal viability. (*Dosha* vitiating caused by persistent engagement in aggravating practices leads to alterations in *Artava* (ovum quality) and functional disturbances in the *Garbhashaya* (uterine milieu). Conception under conditions of *Dosha* vitiating results in foetal abnormalities proportional to the severity of imbalance, ranging from mild localized developmental defects to the development of a non-viable or infertile embryo (*Vandhya*) in cases of extensive involvement,

underscoring the critical influence of maternal systemic and reproductive health on embryogenesis.^[28]

Sahas in Ayurveda denotes excessive physical, mental, or occupational exertion beyond an individual's capacity, resulting in aggravation of *Vata Dosha*. Aggravation of *Vata Dosha* due to emotional stress is one of the contributing factors for *Garbhasrava* (miscarriage within the first four months) and *Garbhapata* (after five to six months). In Ayurvedic nosology, anxiety disorders resemble *Chittodvega* or *Manovaha Srotas Dushti*, characterized by worry (*Chinta*), fear (*Bhaya*), instability (*Anavasthitatva*), palpitations, and insomnia. *Vata* aggravation, particularly *Prana Vayu*, along with dominance of *Raja* and *Tama Dosha*, is central to this condition.^[29] *Prana Vayu* is closely linked to mental health as it supports the function of the mind and heart.

Sahas, along with excessive emotional stress, can lead to widespread physiological dysfunction. It may cause muscle weakness, joint instability, impaired blood quality or circulation, loss of adipose tissue, reduced bone marrow activity, impaired *Shukra*, and depletion of *Oja*.^[30] *Ojas* depletion manifests as fatigue and poor resilience, while impaired *Agni* leads to ama accumulation and systemic dysfunction.

Over time, these disturbances contribute to generalized tissue wasting, impaired reproductive function, and diminished overall health.

Thus, the *Samprapti* (pathogenesis) of stress-induced female infertility in Ayurveda can be understood as a multifactorial process predominantly driven by *Vata Dosha* vitiating, particularly *Apana Vayu* and *Prana Vayu*, along with *Pitta* and *Kapha Dosha*.

According to Ayurvedic principles, improper lifestyle practices (*Nidana Sevana*) and adverse psychological factors (*Bhaya*, *Krodha*, *Shoka* and *Chinta*) lead to vitiating of the *Dosha* and *Agni*. Hypofunction of digestive fire (*Mandagni*) is recognized as the primary etiological factor in the formation of *Ama* (metabolically immature or toxic by-products).

The accumulated *Ama* produces systemic pathological effects by obstructing the physiological channels (*Srotas*), resulting in occlusive pathology (*Avaranatmaka Dushti*). Driven by aggravated *Vata Dosha*, *Ama* disseminates through the circulatory pathways, particularly the *Rasavaha Srotas*. Persistent digestive dysfunction and inappropriate lifestyle factors subsequently vitiate the primary body tissues (*Dhatu*s), especially *Rasa* and *Rakta Dhatu*.

Impairment of tissue-specific metabolic activity (*Dhatvagni Mandya*) leads to a depletion-type pathology (*Kshayatmaka Dushti*) of *Artava*, which is

considered an *Upadhatu* of *Rasa* or *Rakta Dhatu*. This results in both qualitative and quantitative diminution of *Artava*, constituting *Upadhatvatmaka Dushti* and manifesting clinically as menstrual irregularities and anovulation.

In terms of *Garbha Sambhava Samagri*, derangement of *Rtu* (appropriate ovulatory period) occurs due to disturbed *Apana Vayu* and altered cyclic physiology, leading to irregular or absent ovulation. *Kshetra* (uterus and reproductive tract) is adversely affected by *Ama*-induced *Srotorodha* and *Rasa-Rakta Dushti*, resulting in compromised endometrial receptivity and an unfavorable uterine milieu.

Ambu (nutritive fluid and hormonal environment) becomes deficient and qualitatively impaired as a consequence of *Rasa Dhatu Dushti* and *Poshanatmaka Dushti*, leading to inadequate nourishment of ovarian follicles and endometrial tissues. *Bija* (ovum) is directly affected by *Dhatvagni Mandya*, *Artava Kshaya*, and aggravated *Vata-Pitta Doshas*, resulting in poor ovum quality, follicular arrest, or anovulation.

Additionally, the derangement of *Ojas*, the essence of all *Dhatu* responsible for vitality, immunity, and reproductive competence, occurs secondary to chronic *Agni* dysfunction, *Dhatu Kshaya*, and persistent psychological stress. Depletion or qualitative impairment of *Ojas* (*Ojokshaya* or *Ojovypada*) leads to reduced tissue resilience, impaired endocrine regulation, and diminished reproductive potential. The

compromised state of *Ojas* further weakens *Bija* quality and disrupts the functional integrity of *Kshetra*, thereby exacerbating infertility.

As described by Vishvamitra, the uterus is supplied by fine, hair-like vascular channels throughout the menstrual cycle to facilitate nourishment and reception of *Bija*. Any disturbance in *Rasa Dhatu*, particularly *Rasa Dushti* with impaired nutritive capacity (*Poshanatmaka Dushti*), compromises uterine and ovarian perfusion and further contributes to anovulatory pathology.

Furthermore, the association of vitiated *Apana Vayu* with *Kapha Dosha* results in *Avaranatmaka Dushti*, obstructing normal ovarian function and potentially progressing to ovarian dysfunction or failure. Collectively, the integrated derangement of *Rtu*, *Kshetra*, *Ambu*, *Bija*, and *Ojas* creates a hostile reproductive environment, culminating in *Artava Kshaya* and anovulation, and ultimately contributing to female infertility.

Etiological factors such as improper diet and lifestyle, and psychological stress lead to disturbances in *Agni*, *Dhatu* metabolism, and *Srotas* function, especially affecting *Rasa*, *Artava*, and *Artavavaha Srotas*. These alterations impair the *Garbha Sambhava Samagri*, resulting in compromised fertilization, implantation, or early embryonic development. (Fig. 1.)

Thus, the key components in the pathogenesis of stress-induced female infertility can be understood as

Table 1: Key components in the pathogenesis of stress-induced female infertility

| | |
|-----------------------|---|
| <i>Dosha</i> | <i>Vata (Apana, Prana) ± Pitta/Kapha</i> |
| <i>Dushya</i> | <i>Rasa, Artava, Shukra, Ojas</i> |
| <i>Agni</i> | <i>Jatharagni and Dhatvagni Mandya</i> |
| <i>Srotas</i> | <i>Artavavaha, Manovaha</i> |
| <i>Adhishthana</i> | <i>Garbhashaya, Aartva Vahini Dhamani, Yoni</i> |
| <i>Udbhava Sthana</i> | <i>Pakvashaya</i> |
| <i>Vyakti Sthana</i> | <i>Garbhashaya, Yoni</i> |
| <i>Roga Marga</i> | <i>Abhyantara</i> |

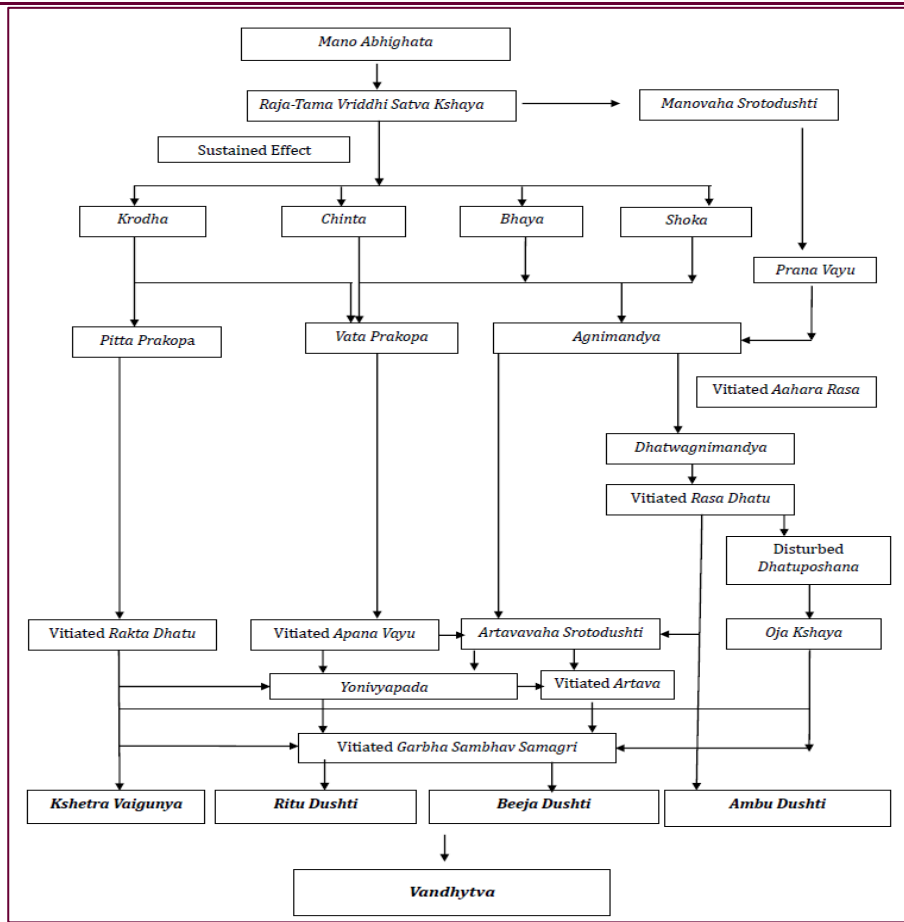


Fig. 1: Samprapti

DISCUSSION

The mind-body continuum describes the fundamental, inseparable connection where mental states (thoughts, emotions) directly influence physical health, and physical conditions (stress, illness) impact mental well-being, forming a continuous feedback loop seen in phenomena like the placebo effect, stress responses, and practices like meditation that leverage this link for healing.

Pathophysiological disturbances in the reproductive system in females can arise from genetic factors (gametes), uterine conditions, temporal influences, and maternal diet and lifestyle. These disruptions can affect tissue integrity, organ function, and sensory-motor development. The dysregulated maternal physiological and metabolic processes can adversely affect foetal development within the uterus.

Ayurveda emphasizes *Vidhipurvak Sannidhya* - the purification of both body and mind-as a key preparatory step for conception. The four components in *Garbha Sambhav Samagri* are not independent; rather, they function as an integrated biological system. Optimal *Ritu* cannot compensate for poor *Beeja* quality, nor can adequate *Ambu* overcome an unhealthy *Kshetra*. In biomedical terms, this concept encompasses the availability of a healthy ovum and sperm, a receptive endometrium, appropriate hormonal regulation, and optimal maternal physiological conditions (Table 1). Together, these factors ensure successful fertilization, implantation, and progression of early pregnancy.

Table 2: Ayurvedic Components of *Garbha Sambhava Samagri* and Their Modern Biomedical Correlates

| S.No. | <i>Garbha Sambhav Samagri</i> | Modern Equivalence | Conditions Associated with Disturbance |
|-------|-------------------------------|---|--|
| 1. | <i>Ritu</i> | <ul style="list-style-type: none"> Ovulatory timing and follicular maturation Estrogen-progesterone balance Endometrial receptivity and cervical mucus changes Circadian and neuroendocrine synchrony | <ul style="list-style-type: none"> Anovulation Irregular/ delayed ovulation Inadequate fertile period |
| 2. | <i>Kshetra</i> | <ul style="list-style-type: none"> Anatomical normalcy of the uterus, cervix, | <ul style="list-style-type: none"> Endometrial inflammation - |

| | | | |
|----|--------------|---|---|
| | | fallopian tubes, and ovaries <ul style="list-style-type: none"> • Endometrial thickness, vascularity, and immune tolerance • Absence of infection, inflammation, fibrosis, or structural abnormalities • Proper uterine contractility and microcirculation | Endometriosis <ul style="list-style-type: none"> • Poor Endometrial receptivity • Implantation Failure |
| 3. | <i>Ambu</i> | <ul style="list-style-type: none"> • Adequate macro- and micronutrient availability • Efficient maternal digestion, absorption, and cellular metabolism • Optimal uterine perfusion and hydration • Balanced endocrine and paracrine signaling | <ul style="list-style-type: none"> • Impaired Nutrient & oxygen Delivery • Poor follicular nutrition • Reduced Ovarian Reserve • Thin Endometrium lining • Early Pregnancy loss due to poor nutrition • General reproductive debility |
| 4. | <i>Beeja</i> | <ul style="list-style-type: none"> • Gamete morphology, motility, and viability • Chromosomal integrity and epigenetic stability • Mitochondrial function and oxidative balance • Hormonal regulation of gametogenesis | <ul style="list-style-type: none"> • Qualitative Ovum defects (Immature ovum, Mitochondrial Dysfunction, chromosomal abnormalities) • Impaired Fertilization (zona pellucida issues, activation defects) • Recurrent conception failure |

Ayurveda views conception as the culmination of optimal bodily tissues, balanced physiological forces, psychological readiness, and appropriate timing, unlike reductionist reproductive models. This integrative approach underscores the influence of stress and mental disturbances on reproductive success, making it particularly relevant to contemporary infertility research.

Contemporary biomedical research emphasizes the role of chronic stress in dysregulating the hypothalamic-pituitary-adrenal (HPA) axis, which in turn interferes with the hypothalamic-pituitary-gonadal (HPG) axis, leading to hormonal imbalance, ovulatory disturbances, and impaired endometrial receptivity. These alterations collectively contribute to reduced fertility and unfavorable reproductive outcomes.

In females, ROS facilitate follicular rupture, corpus luteum formation, and endometrial remodelling during the periovulatory phase, partly by enhancing matrix metalloproteinase activity and promoting local prostaglandin release. However, excessive production of ROS results in oxidative stress. Furthermore, emerging evidence identifies oxidative stress as a crucial mediator linking psychological stress and reproductive dysfunction. Chronic stress induces harmful, long-term oxidative stress by elevating Reactive Oxygen Species (ROS) production while simultaneously overwhelming the body's antioxidant defenses. ROS production and resulting OS

may contribute to aging and several disease states affecting female reproduction. Endothelial dysfunction secondary to OS contributes to the development of obstetric complications such as early and recurrent pregnancy loss, preeclampsia, IUGR, and preterm labor. Reactive oxygen and nitrogen species can negatively affect embryo implantation and may influence the development of reproductive disorders such as endometriosis and preeclampsia.

Review of multiple studies suggests that *Yoga* (including *Asanas*, *Pranayama*, meditation) reduces anxiety, depression, and stress, which can help normalize physiological status and potentially improve assisted reproduction outcomes.

Across studies, *Yoga* and related mind-body interventions are consistently associated with a reduction in perceived stress and fertility-related anxiety, improvements in psychological well-being, depression, and anxiety, and better emotional regulation among women undergoing infertility treatment.

Ayurveda provides a parallel and complementary explanation by recognizing the profound influence of *Manasika Bhava* on reproductive health. Classical texts emphasize *Saumanasya* (mental tranquility) as an essential prerequisite for successful conception, indicating that psychological stability is integral to healthy *Garbha* formation.

Chronic exposure to stressors such as *Bhaya* (fear), *Chinta* (worry), *Krodha* (anger), and *Shoka*

(sorrow) affects *Manasik Dosha*. *Raja-Tama* predominance due to chronic emotional stress initiates functional derangement of the *Manovaha Srotas*, which, in contemporary biomedical terms, may be correlated with sustained activation of the hypothalamic-pituitary-adrenal (HPA) axis, leading to increased secretion of corticotropin-releasing hormone and cortisol. Persistent hypercortisolaemia further amplifies stress perception, establishing a self-perpetuating psycho-neuro-endocrine loop, and concurrently suppresses the hypothalamic-pituitary-ovarian (HPO/HPG) axis by impairing pulsatile GnRH release and reducing downstream FSH and LH secretion. This neuroendocrine inhibition may be interpreted in Ayurveda as *Vata-Pitta* vitiation, which predisposes to *Agnimandya* and *Srotodushti*, resulting in impaired metabolic and micro-circulatory support to the reproductive tissues. Parallel elevation of oxidative stress adversely affects the follicular microenvironment and oocyte competence, thereby contributing to *Beejadushti* and poor oocyte quality. Progressive vitiation of *Artava* and *Rakta Dhatu* manifests clinically as ovulatory dysfunction and suboptimal endometrial receptivity, ultimately disturbing the integrity of *Garbha Sambhav Samagri*. The resultant failure of conception or implantation culminates in *Vandhyatva*, which, in turn, reinforces psychological distress and sustains the vicious cycle of stress-mediated reproductive dysfunction.

The convergence of Ayurvedic concepts of *Raja-Tama vrddhi*, *Manovaha srotodushti*, *Vata-Pitta prakopa*, *Agnimandya*, and progressive *Dhatu* vitiation with contemporary evidence of HPA-HPO axis dysregulation, oxidative stress, and impaired ovarian-endometrial function provides a coherent explanatory model for stress-induced reproductive failure. Disturbance of *Garbha Sambhav Samagri* emerges as the final common pathway, clinically manifesting as infertility.

CONCLUSION

In conclusion, the integrative framework presented in this review highlights emotional stress as a central and modifiable determinant in female infertility, operating through closely interconnected psycho-neuro-endocrine and metabolic pathways. Importantly, the bidirectional and self-perpetuating relationship between infertility and psychological distress underscores the necessity of addressing emotional and behavioural factors alongside biomedical treatment.

This integrative understanding supports the inclusion of structured stress-modulating interventions, lifestyle regulation, and mind-body practices within fertility care and offers a rational

foundation for future translational and clinical studies aimed at validating Ayurvedic constructs through measurable neuroendocrine and reproductive outcomes.

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