WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
Coden USA: WJPRAP Impact Factor 8.453
Volume 14, Issue 22, 615-636. Review Article ISSN 2277–7105

APPLIED PHYSIOLOGICAL PRINCIPLES OF VANDHYATVA IN AYURVEDA: AN INTEGRATIVE CRITICAL ANALYSIS

Dr. Pooja Prajapati[1]*, Dr. Abhishek Singh Rajawat[2], Dr. Ravindra Singh[3], Dr. Divya Siva[4]

[1]Assistant Professor, Department of Kriya Sharir, LN Ayurved College and Hospital, Bhopal, India.

[2]PG Scholar, Department of Kriya Sharir, LN Ayurved College and Hospital, Bhopal, India.

[3]PG Scholar, Department of Kriya Sharir, Dr. D. Y. Patil College of Ayurved and Research Centre, Pune, India.

[4]PG Scholar, Department of Swasthavritta Evam Yoga, Dr. D. Y. Patil College of Ayurved and Research Centre, Pune, India.

Article Received on 23 Oct. 2025,
Article Revised on 13 Nov. 2025,
Article Published on 16 Nov. 2025,

https://doi.org/10.5281/zenodo.17616457

***Corresponding Author**

Dr. Pooja Prajapati

Assistant Professor, Department of Kriya Sharir, LN Ayurved College and Hospital, Bhopal, India.

How to cite this Article: Dr. Pooja Prajapati*, Dr. Abhishek Singh Rajawat, Dr. Ravindra Singh, Dr. Divya Siva. (2025). Applied Physiological Principles of Vandhyatva In Ayurveda: An Integrative Critical Analysis. World Journal of Pharmaceutical Research, 14(22), 615–636.

ABSTRACT

Background: Infertility affects approximately 15% of couples globally, representing a significant reproductive health challenge. Ayurveda provides distinctive physiological perspectives on reproductive function through concepts of *Shukra dhatu*, *Artava*, *Tridosha*, and *Garbha sambhava sharir*. **Objective:** This review critically examines applied physiological foundations of Ayurvedic infertility management, correlates traditional frameworks with contemporary reproductive biology, and evaluates clinical evidence supporting therapeutic interventions. **Methods:** Comprehensive literature search was conducted across PubMed, Scopus, and Web of Science databases alongside classical Ayurvedic texts including *Charaka Samhita*, *Sushruta Samhita*, and *Ashtanga Hridaya* for publications from 1990-2025. **Results:** Ayurvedic reproductive physiology conceptualizes fertility through integrated systems involving *Dhatus*, *Doshas*, *Agni*, and *Srotas*. *Vajikarana* herbs including *Withania somnifera*, *Asparagus racemosus*, *Mucuna pruriens*, and *Tribulus terrestris* exhibit multifaceted effectson hypothalamic-pituitary-gonadal axis

regulation, steroidogenesis, and gametogenesis. Clinical studies demonstrate improvements in semen parameters, menstrual regularity, and pregnancy outcomes. **Conclusion:** Ayurvedic medicine offers comprehensive individualized frameworks for reproductive dysfunction management. Evidence-based integration with modern reproductive medicine presents promising opportunities for personalized approaches.

KEYWORDS: Ayurveda, Infertility, *Vandhyatva*, *Vajikarana*, *Shukra dhatu*, Reproductive physiology.

INTRODUCTION

Infertility, defined as inability to achieve pregnancy after twelve months of regular unprotected intercourse, represents a major global reproductive health concern affecting approximately 48 million couples worldwide.[1] Regional variations demonstrate elevated prevalence throughout South Asia, Sub-Saharan Africa, and Eastern Europe, with rates reaching 20-30% in certain populations.[2] Beyond biological implications, infertility imposes substantial psychological, social, and economic burdens, particularly in societies where parenthood forms fundamental components of personal identity.[3]

Contemporary reproductive medicine has achieved remarkable technological advancement through assisted reproductive technologies including in vitro fertilization (IVF) and intracytoplasmic sperm injection (ICSI). However, success rates remain variable, with live birth rates per cycle ranging between 20-35% depending on maternal age and underlying etiology.[4] Substantial financial costs, psychological stress, and potential health risks necessitate exploration of complementary therapeutic approaches that may enhance outcomes or serve as alternatives for specific populations.

Ayurveda, derived from Sanskrit terms meaning "science of life," represents among humanity's oldest documented medical traditions with textual evidence dating approximately fifteen hundred years before the common era.[5] Foundational classical texts *Charaka Samhita*, *Sushruta Samhita*, and *Ashtanga Hridaya* are compiled between eighth century BCE and fourth century CE, contain sophisticated discussions on anatomy, physiology, pathology, diagnostics, and therapeutics.[6] The Ayurvedic conceptual framework rests upon fundamental principles including *Panchamahabhuta* (five element theory), *Tridosha* (three bioenergetic principles), *Sapta Dhatu* (seven tissue systems), *Agni* (metabolic transformations), and *Srotas* (physiological channels).[7]

Classical Ayurvedic texts demonstrate remarkable attention toward reproductive anatomy and physiology. The *Sharira Sthana* sections contain extensive descriptions of reproductive organs, gametogenesis, fertilization, embryonic development, and factors influencing reproductive health.[8] The term "*Vandhyatva*" primarily denotes female infertility, though male factor infertility receives significant attention under *Shukra dosha* and *Klaibya*. *Sushruta Samhita* describes detailed examination procedures for assessing reproductive capacity, including microscopic semen evaluation remarkably paralleling modern semen analysis.[9]

Despite ancient origins, scientific investigation of Ayurvedic reproductive medicine principles remains limited. Existing research consists primarily of preliminary in vitro studies, animal experiments, and small-scale clinical trials with methodological limitations.[10] This review aims to elucidate fundamental physiological principles underlying reproduction in Ayurvedic medicine, critically analyse classical understanding of infertility etiology, examine pharmacological mechanisms of Ayurvedic interventions, evaluate clinical evidence for approaches toward male and female infertility, and explore possibilities for integrative approaches combining Ayurvedic and conventional medicine.

FUNDAMENTAL PHYSIOLOGICAL PRINCIPLES IN AYURVEDA

Concept of *Dhatus* and Reproductive Tissue Formation

Ayurvedic physiology conceptualizes human tissue formation through hierarchical transformation involving seven fundamental tissue systems (*Sapta Dhatus*): *Rasa* (plasma), *Rakta* (blood), *Mamsa* (muscle), *Meda* (adipose), *Asthi* (bone), *Majja* (marrow), and *Shukra* (reproductive tissue).[11] Each Dhatu undergoes sequential formation from previous through specific metabolic transformations mediated by *Dhatvagni* (tissue-specific metabolic capacity).

Shukra Dhatu, positioned as seventh and final tissue, represents most refined metabolic product. *Charaka Samhita* describes *Shukra* originating from *Majja Dhatu* through thirty days of successive transformations.[11] This temporal aspect correlates interestingly with seventy-four day spermatogenic cycle documented in modern andrological studies.[12] The concept of "*Ojas*," described as essence of all *Dhatus*, holds particular significance for reproductive physiology, representing immunity, vitality, and reproductive capability with direct relationships to neuroendocrine-immune interactions in reproductive health.[13]

Table 1 presents a comparative overview of Ayurvedic *Dhatus* and their correlations with modern physiological systems, highlighting the reproductive significance of each tissue system.

Table 1: Comparative Overview of Ayurvedic *Dhatus* and Modern Physiological Systems.

***Dhatu* (Tissue)**	**Primary Functions**	**Modern Correlation**	**Reproductive Significance**
Rasa	Nutrition, nourishment	Plasma, lymph, interstitial fluid	Provides nutritional substrate for all tissues including reproductive
Rakta	Oxygenation, vitality	Blood (RBCs, haemoglobin)	Oxygen delivery to reproductive organs, hormone transport
Mamsa	Structure, movement	Muscle tissue	Uterine contractility, ejaculatory function
Meda	Energy storage, lubrication	Adipose tissue	Steroid hormone synthesis, energy reserves
Asthi	Support, framework	Bone, cartilage	Pelvic structure supporting reproductive organs
Majja	Neural function, bone marrow	Nervous tissue, bone marrow	Neuroendocrine control of reproduction
Shukra	Reproduction, immunity	Reproductive tissues, gametes	Direct reproductive function, fertility

Tridosha Theory and Reproductive Function

The *Tridosha* framework (*Vata*, *Pitta*, *Kapha*) provides functional classification for understanding physiological processes. In reproductive physiology, each *Dosha* governs specific functions. *Vata*, characterized by movement and neural activity, regulates ovulation, sperm motility, muscular contractions during ejaculation and parturition, and hormonal transport. *Apana Vayu*, a *Vata* subdivision located in pelvic region, specifically governs menstruation, ovulation, and implantation.[14]

Pitta, characterized by transformation and metabolism, controls hormonal synthesis, follicular maturation, corpus luteum formation, and endometrial transformation. Enzymatic and hormonal functions attributed to *Pitta* demonstrate conceptual parallels with steroidogenesis and metabolic regulation.[15] *Kapha*, characterized by structure and lubrication, provides structural integrity to reproductive organs, maintains endometrial thickness, cervical mucus quality, and nourishment of developing gametes and embryos. Anabolic functions of *Kapha* correlate with growth factor activity and tissue proliferation.[7]

Reproductive dysfunction in Ayurvedic pathophysiology typically involves imbalances of one or more Doshas. Polycystic ovarian syndrome is understood as involving Kapha and Vata vitiation affecting *Artava* (menstrual function) and *Medodhatvagni* (lipid metabolism), aligning with metabolic and hormonal disturbances characteristic of this condition.[16]

Agni: Metabolic Fire and Digestive Function

Agni represents transformative capacity operating at multiple physiological levels: *Jatharagni* (digestive metabolism), *Dhatvagni* (tissue-specific metabolism), and *Bhutagni* (elemental transformations). The concept demonstrates remarkable correlation with modern understanding of metabolic function, enzyme activity, and cellular energetics.[17] *Mandagni* (diminished metabolic capacity) leads to *Ama* formation (incompletely metabolized metabolites), correlated with inflammatory mediators, oxidative stress, and metabolic dysfunction.[18]

Research indicates chronic low-grade inflammation and oxidative stress significantly impact reproductive function through effects on oocyte quality, sperm DNA integrity, endometrial receptivity, and steroidogenesis.[19] The relationship between *Agni*, *Ama*, and reproductive health finds particular relevance in conditions such as endometriosis where inflammatory processes play central pathophysiological roles.[20]

Srotas: Channel Systems and Reproductive Circulation

Ayurvedic physiology describes numerous *Srotas* (channels) facilitating transport of nutrients, metabolites, and waste products. The reproductive system involves specific *Srotas*: *Artavavaha Srotas* (channels carrying menstrual blood) with roots in uterus, *Shukravaha Srotas* (channels carrying semen) with roots in testicles and ovaries, and *Stanyavaha Srotas* (lactation channels) with roots in mammary glands. *Srotorodha* (channel obstruction), *Srotoguna* (structural defects), or *Srotovimokhana* (abnormal opening) cause various reproductive pathologies.[21]

This concept correlates with tubal blockage, vascular insufficiency affecting ovarian reserve, varicocele, and anatomical abnormalities causing infertility. Modern vascular biology research confirming importance of adequate blood flow for folliculogenesis and endometrial development validates Ayurvedic emphasis on *Srotas* in reproductive health.[22]

AYURVEDIC UNDERSTANDING OF GAMETOGENESIS AND CONCEPTION

Shukra Dhatu: The Reproductive Tissue

Classical texts provide detailed descriptions of *Shukra* (reproductive tissue) formation, characteristics, and functions. *Charaka Samhita* states *Shukra* exists throughout body, manifesting during sexual arousal through nervous stimulation.[11] This description remarkably anticipates modern understanding of spermatogenesis occurring in seminiferous tubules and seminal emission involving complex neuroendocrine mechanisms.

The text describes eight essential qualities of normal *Shukra*: abundant quantity, viscous consistency, sweet taste, white colour, heavy nature, smooth texture, non-burning sensation, and sticky quality. Microscopic examination procedures described in *Sushruta Samhita* specify healthy semen should sink in water and spread uniformly, demonstrating awareness of specific gravity and liquefaction patterns assessed in modern semen analysis.[9]

Artava: Menstrual Physiology and Ovulation

Artava represents menstrual blood and ovarian function in classical literature. Texts describe Artava as formed through *Rasa Dhatu* transformation under *Pitta* influence, appearing monthly in healthy women during reproductive years.[23] Cyclical nature of menstruation, correlation with lunar cycles, and cessation during pregnancy and lactation are accurately documented.

Characteristics of normal Artava include red colour resembling lotus petals, neither too thick nor thin consistency, non-sticky quality, absence of burning sensation, and resembling rabbit blood. Duration of menstrual flow is specified as five days, with flow pattern heaviest on days two to three, correlating with typical menstrual patterns.[24] *Artava-kshaya* (diminished menstruation) and *Artava-vrddhi* (excessive menstruation) represent primary menstrual disorders affecting fertility, correlating with hypothalamic amenorrhea, premature ovarian insufficiency, menorrhagia, and hyperestrogenic conditions.[25]

Beeja and *Beejabhaga*: Gametes and Genetic Factors

Ayurvedic embryology employs sophisticated terminology distinguishing reproduction components. "*Beeja*" (literally "seed") refers to male and female gametes, while "*Beejabhaga*" represents genetic factors or hereditary determinants transmitted through gametes.[11] This distinction anticipates modern separation between gametes as cellular entities and genetic information encoded in deoxyribonucleic acid.

Classical texts describe *Beejabhaga* as responsible for transmitting specific phenotypic characteristics from parents to offspring, including physical features, constitutional type (Prakriti), disease predispositions, and mental attributes. The concept of *Beejabhaga-avayava* (components of genetic factors) controlling development of specific organs demonstrates remarkable prescience regarding genetic control of embryonic development.[26]

***Garbha Sambhava Sharir*: Conception and Early Embryology**

Classical texts describe conception (*Garbha Dhana*) requiring four essential factors: Ritu (appropriate timing) specifically identified as twelve days following menstruation, recognizing fertile window correlating with ovulation; *Kshetra* (reproductive field/uterus) having proper size, structure, and endometrial receptivity; *Ambu* (nutritional fluid) representing adequate nutritional status supporting conception; and *Beeja* (gametes) that must be healthy, mature, and free from defects.[27]

The moment of conception is described as occurring when *Shukra* (sperm) and *Artava* (ovum) unite in uterus under favourable conditions with presence of consciousness (*Atma*). Description of conception requiring meeting of three entities maternal contribution, paternal contribution, and consciousness demonstrate sophisticated multi-dimensional understanding.[27]

CLASSIFICATION AND ETIOLOGY OF *VANDHYATVA*

Classical Classification Systems

Ayurvedic texts classify infertility through multiple frameworks. *Charaka* classifies *Vandhyatva* into two broad categories: *Vandhya* (absolutely sterile) including individuals with structural abnormalities, chromosomal disorders, or congenital absence of reproductive organs; and *Apraja* (relatively infertile) including individuals with potentially correctable causes such as hormonal imbalances, functional disorders, and lifestyle factors.[11]

Sushruta provides more detailed classification based on etiology: *Dhatu-kshaya janya* (tissue depletion) resulting from inadequate formation or excessive loss of reproductive tissue; *Beeja-dosha* (gametic defects) inherent genetic or developmental abnormalities; *Dosha prakopa janya* (bioenergetic imbalance) functional disorders from *Vata*, *Pitta*, or *Kapha* vitiation; and *Garbhashaya-gata vikriti* (uterine pathology) structural abnormalities of uterus.[9] This multi-factorial classification demonstrates sophisticated understanding that infertility results from diverse etiologies requiring individualized therapeutic approaches.

Table 2 summarizes the classical Ayurvedic classification of *Vandhyatva* with modern clinical correlations.

Table 2: Classification of *Vandhyatva* (Infertility) According to Classical Ayurvedic Texts.

Classification Type	Ayurvedic Term	Description	Modern Correlation
Etiology-Based			
Tissue depletion	*Dhatu-kshaya janya*	Inadequate formation or excessive loss of reproductive tissue	Premature ovarian insufficiency, low sperm production
Gametic defects	*Beeja-dosha*	Genetic or developmental abnormalities in gametes	Chromosomal abnormalities, genetic mutations
Dosha imbalance	*Dosha prakopa janya*	Functional disorders from Vata, Pitta, Kapha vitiation	Hormonal imbalances, functional disorders
Uterine pathology	*Garbhashaya-gata vikriti*	Structural abnormalities of uterus	Uterine malformations, fibroids, adhesions
Prognosis-Based			
Absolute sterility	*Vandhya*	Incurable structural or genetic abnormalities	Congenital absence of organs, severe genetic disorders
Relative infertility	*Apraja*	Potentially correctable causes	Treatable hormonal, functional, lifestyle factors

***Yonivyapada*: Gynecological Disorders Affecting Fertility**

The *Yonivyapad* chapter describes twenty gynecological conditions, several directly impacting fertility. *Arajaska* (amenorrhea) represents absence of menstruation from *Vata* vitiation blocking *Artava* flow or *Dhatu-kshaya* depleting reproductive tissue. Etiological factors include excessive exercise, psychological stress, inadequate nutrition, and constitutional *Vata* predominance, correlating precisely with hypothalamic amenorrhea secondary to energy deficit or stress.[28]

Acharana/*Aticharana* (oligo/polymenorrhea) represents menstrual cycle irregularities from Dosha imbalances affecting hypothalamic-pituitary-ovarian axis function. *Vandhya* (primary infertility) is specifically attributed to *Beeja-dosha* (genetic factors), *Kshetra-dosha* (uterine abnormalities), or severe *Artava-dosha* (ovarian dysfunction). *Garbhasravi* (recurrent pregnancy loss) is attributed to *Vata* vitiation causing downward expulsion or deficiency of *Kapha* and *Pitta* necessary for embryo nourishment, aligning with recognized causes including luteal phase defects and thrombophilias.[29]

Shukra Dosha: Male Factor Infertility

Classical texts extensively discuss male reproductive disorders under *Shukradosha* (semen abnormalities) and *Klaibya* (sexual dysfunction). *Sushruta* describes eight types of Shukra *Dosha* based on *Dosha* involvement. *Vatika* Shukradosha produces frothy, thin, astringent semen with reduced motility, correlating with asthenozoospermia. *Pittaja Shukradosha* presents yellow or blue-tinged semen with burning sensation, associated with inflammatory conditions and leucocytospermia. *Kaphaja Shukradosha* produces excessively viscous, white semen with delayed liquefaction, correlating with hyperviscosity. *Sannipataja Shukradosha* involves combined *Dosha* vitiation producing severe abnormalities including azoospermia and teratozoospermia.[9]

The text further describes *Klaibya* (erectile and ejaculatory dysfunction) through four categories based on severity and etiology, including psychological factors (*Mansika*), structural abnormalities (*Sharirika*), aging-related (*Vayopranasha*), and disease-induced (*Vyyadhija*). This classification aligns remarkably with modern categorization of male sexual dysfunction.[30]

PHARMACOLOGICAL BASIS OF AYURVEDIC HERBS

Vajikarana Rasayana: Aphrodisiac and Reproductive Tonics

Vajikarana represents specialized Ayurveda branch focusing on enhancement of sexual function, fertility, and reproductive health. The term derives from "*Vaji*" (horse), symbolizing Vigor, strength, and reproductive potency.[18] *Vajikarana Rasayanas* constitute formulation categories specifically designed to optimize reproductive tissue quality, enhance libido, improve gamete parameters, and support conception. Major *Vajikarana* herbs have been subjected to phytochemical and pharmacological investigation revealing mechanisms supporting traditional uses.

Table 3 provides a comprehensive overview of major *Vajikarana* herbs, their active constituents, mechanisms of action, and clinical evidence levels.

Table 3: Major *Vajikarana* Herbs Phytochemical Constituents and Mechanisms of Action.

Herb (*Sanskrit*/Botanical)	Primary Active Constituents	Mechanisms Relevant to Fertility	Clinical Evidence Level
Ashwagandha (*Withania somnifera*)	Withanolides (withaferin A, withanolide A)	• Androgenic effects via LH stimulation• HPA axis modulation (cortisol reduction) • Antioxidant (reduces oxidative stress) • Thyroid hormone regulation	Moderate (multiple RCTs)
Shatavari (*Asparagus racemosus*)	Steroidal saponins (shatavarins)	• Phytoestrogenic activity• Prolactin enhancement• Immunomodulation• Antioxidant properties	Low (limited human studies)
Kapikacchu (*Mucuna pruriens*)	L-DOPA, alkaloids, proteins	• Dopaminergic (prolactin inhibition) • Antioxidant (sperm DNA protection) • Testosterone enhancement• Neuroendocrine modulation	Moderate (several clinical trials)
Gokshura (*Tribulus terrestris*)	Steroidal saponins (protodioscin)	• Gonadotropin stimulation• Testosterone modulation• Improved sperm parameters• Libido enhancement	Low-Moderate (mixed results)

Withania somnifera (Ashwagandha)

Ashwagandha represents among most extensively researched Ayurvedic herbs for reproductive health. Classical texts describe it as *Balya* (strength promoting), *Vajikara* (aphrodisiac), and *Rasayana* (rejuvenative) with specific benefits for *Shukra Dhatu*.[18] Phytochemical analysis identifies withanolides as primary bioactive constituents, including withaferin A and withanolide A.

These demonstrate multiple mechanisms relevant to reproductive function including androgen modulation through luteinizing hormone stimulation. A randomized controlled trial by Ahmad and colleagues showed significant increases in serum testosterone (fourteen to sixteen percent) in infertile men receiving five grams of *Ashwagandha* root powder daily for ninety days.[31] As adaptogenic herb, *Ashwagandha* modulates hypothalamic-pituitary-adrenal axis function, reducing cortisol levels. Chronic stress and hypercortisolemia significantly impair reproductive function through multiple mechanisms.[32]

Withanolides exhibit potent free radical scavenging and enhance endogenous antioxidant enzyme systems. Oxidative stress significantly compromises sperm DNA integrity, oocyte quality, and embryo development.[19] Ambiye and colleagues reported significant

improvements in sperm concentration, motility, and morphology alongside reduced oxidative stress markers in oligozoospermic men treated with *Ashwagandha*.[33]

***Asparagus racemosus* (*Shatavari*)**

Shatavari, literally meaning "having one hundred husbands," represents preeminent herb for female reproductive health in Ayurveda. Classical texts describe it as particularly beneficial for *Artava* (menstruation), *Stanya* (lactation), and *Garbha* (pregnancy).[11] Steroidal saponins (shatavarins) constitute major bioactive components.

Pharmacological research reveals multiple reproductive benefits including phytoestrogenic activity supporting endometrial proliferation and cervical mucus production without risks associated with synthetic oestrogens. Jethmalani and colleagues documented estrogenic effects in animal models comparable to low-dose oestradiol.[34] The herb significantly enhances prolactin secretion and mammary gland development, validating traditional use for hypogalactia. *Shatavari* enhances immunity while reducing oxidative stress, both critical for reproductive health, and demonstrates stress-reducing effects through hypothalamic-pituitary-adrenal axis modulation.[35]

***Tribulus terrestris* (*Gokshura*)**

Gokshura has been traditionally prescribed for both male and female infertility, with particular emphasis on improving libido and sexual function. The herb contains steroidal saponins (protodioscin, protogracillin) as primary active constituents. Research demonstrates increased testosterone through enhanced gonadotropin secretion, though human clinical trials show inconsistent results.[36]

Tribulus supplementation demonstrates improvements in sperm concentration, motility, and morphology in oligozoospermic men. Sellandi and colleagues reported significant enhancement of total sperm count and motility in infertile men receiving three grams daily for sixty days.[37] Limited research suggests potential benefits for irregular menstruation and polycystic ovarian syndrome through modulation of follicle-stimulating hormone levels.

***Mucuna pruriens* (*Kapikacchu*)**

Kapikacchu seeds contain high concentrations of L-DOPA (levodopa), precursor to dopamine, alongside various alkaloids, saponins, and proteins. Traditional use focuses on male infertility, erectile dysfunction, and neurodegenerative conditions. L-DOPA crosses

blood-brain barrier, increasing dopamine levels. Dopamine physiologically inhibits prolactin secretion, and hyperprolactinemia represents significant cause of male and female infertility affecting approximately five to ten percent of infertile individuals.[38]

The seeds exhibit potent free radical scavenging activity protecting sperm DNA from oxidative damage. Ahmad and colleagues reported significant improvements in sperm concentration, motility, and reduced DNA fragmentation in infertile men treated with *Kapikacchu*.[31] Animal studies demonstrate increased testosterone levels, potentially through gonadotropin stimulation or direct testicular effects.

CLINICAL EVIDENCE FOR AYURVEDIC INTERVENTIONS

Male Factor Infertility: Clinical Studies

Male factor infertility accounts for approximately forty to fifty percent of infertility cases, with semen abnormalities representing primary manifestation.[39] Several clinical trials have evaluated Ayurvedic interventions for oligozoospermia, asthenozoospermia, and teratozoospermia.

A randomized placebo-controlled trial by Ambiye and colleagues evaluated *Ashwagandha* root extract (675 mg per day) in forty-six oligozoospermic men over ninety days. Results demonstrated significant improvements in sperm concentration (167% increase), semen volume (53% increase), and sperm motility (57% increase) compared to placebo. Importantly, fourteen percent of subjects achieved spontaneous pregnancies during study period.[33]

Kumar and colleagues evaluated proprietary Ayurvedic formulation containing *Ashwagandha*, *Kapikacchu*, and *Gokshura* in seventy-five oligozoospermic men through randomized controlled trial. After six months, treatment group showed significant improvements in total sperm count (138% increase), progressive motility (172% increase), and normal morphology (87% increase). Pregnancy rates in partners reached twenty-eight percent compared to four percent in control group.[40]

Most studies suffer from small sample sizes, limited follow-up periods, and inadequate blinding procedures. Standardization of herbal preparations remains problematic, with significant batch-to-batch variations in active constituent concentrations. Publication bias favouring positive results likely inflates apparent efficacy.

Female Factor Infertility: Clinical Evidence

Polycystic ovarian syndrome affects eight to thirteen percent of reproductive-age women and represents leading cause of anovulatory infertility. Dayani and colleagues conducted randomized controlled trial comparing Ayurvedic treatment (including Shatavari, *Ashwagandha*, and lifestyle modifications) versus metformin in one hundred women with polycystic ovarian syndrome. Both groups demonstrated comparable improvements in menstrual regularity, ovulation rates, and hormonal parameters. However, Ayurvedic intervention showed superior effects on stress reduction and quality of life measures.[16]

A pilot study by Pal and colleagues evaluated combined Ayurvedic herbal treatment and Panchakarma detoxification procedures in thirty women with polycystic ovarian syndrome experiencing infertility. Results showed restoration of regular menstrual cycles in seventy-three percent of participants, with forty-three percent achieving ovulation and twenty percent conceiving within six months. Significant reductions in androgen levels and improvements in insulin sensitivity were documented.

A prospective observational study evaluated forty women with history of recurrent pregnancy loss treated with Ayurvedic formulations emphasizing *Vataghna* (*Vata*-pacifying) and *Garbhasthapaka* (pregnancy-stabilizing) herbs including *Ashoka*, *Shatavari*, and *Bala*. Of twenty-eight women who conceived during study period, eighty-two percent successfully carried pregnancies to term compared to their previous pregnancy histories showing one hundred percent loss rates.[29]

Table 4 summarizes key clinical studies evaluating Ayurvedic interventions for infertility, highlighting study designs, interventions, outcomes, and limitations.

Table 4: Summary of Clinical Studies on Ayurvedic Interventions for Infertility.

Study	Sample Size	Intervention	Duration	Primary Outcomes	Results	Limitations
Ambiye et al., 2013[33]	46 men (oligozoospermia)	*Ashwagandha* root extract 675 mg/day	90 days	Sperm parameters	• 167% ↑ sperm concentration• 57% ↑ motility• 14% pregnancy rate	Small sample, single centre
Kumar & Sharma, 2010[40]	75 men (oligozoospermia)	Combined formulation (*Ashwagandha*, *Kapikacchu*, *Gokshura*)	6 months	Sperm parameters, pregnancy	• 138% ↑ sperm count• 172% ↑ motility• 28% pregnancy rate vs 4% control	Lack of standardization

Dayani & Munshi, 2015[16]	100 women (PCOS)	Ayurvedic treatment vs Metformin	Not specified	Menstrual regularity, ovulation	• Comparable improvements• Superior quality of life in Ayurveda group	Short follow-up
Sellandi et al., 2012[37]	60 men (oligozoo spermia)	*Tribulus terrestris* 3 g/day	60 days	Sperm count and motility	• Significant improvements in both parameters	Lack of placebo control

RCT = Randomized Controlled Trial; HPA = Hypothalamic-Pituitary-Adrenal; LH = Luteinizing Hormone; PCOS = polycystic ovarian syndrome; ↑ = increase

Integrative Approaches Combining Ayurvedic and Conventional Treatments

Emerging evidence suggests potential synergistic benefits when combining Ayurvedic interventions with assisted reproductive technologies. Wani and colleagues conducted randomized trial including sixty-eight women undergoing in vitro fertilization, comparing standard protocol versus standard protocol plus Ayurvedic adjunctive treatment (*Shatavari* and *Ashwagandha*). Adjunctive therapy group demonstrated superior endometrial thickness (9.8 mm versus 8.2 mm), higher quality embryos, and increased clinical pregnancy rates (forty-eight percent versus twenty-nine percent).

PHYSIOLOGICAL CORRELATIONS BETWEEN AYURVEDIC AND MODERN CONCEPTS

Hypothalamic-Pituitary-Gonadal Axis and Dosha-Dhatu Relationships

The hypothalamic-pituitary-gonadal axis represents primary regulatory system for reproductive function in modern endocrinology, involving coordinated interactions between hypothalamus, pituitary, and gonads. Ayurvedic concepts of *Vata-Pitta-Kapha* governance of reproductive processes demonstrate interesting parallels.

Apana Vayu governs pelvic region and menstrual flow, correlating functionally with hypothalamic pulsatile gonadotropin-releasing hormone secretion and neural coordination of ovulation and menstruation. Hypothalamic amenorrhea from stress, excessive exercise, or eating disorders represents archetypal *Vata* derangement affecting *Apana Vayu* function.[28]

Pitta governs transformation and metabolism, conceptually encompassing steroidogenesis, enzymatic conversions of androgens to oestrogens, and progesterone synthesis. Conditions involving excessive androgens or deficient progesterone reflect *Pitta* imbalances affecting *Artava* formation. Kapha's anabolic, nourishing functions correlate with oestrogen-induced

endometrial proliferation, follicular growth, and structural maintenance of reproductive organs.

Oxidative Stress, Inflammation, and *Ama* Formation

The Ayurvedic concept of *Ama* (incompletely metabolized metabolites) resulting from impaired *Agni* demonstrates remarkable correlation with modern understanding of oxidative stress and chronic inflammation.[18] Contemporary research confirms oxidative stress and inflammation significantly impair reproductive function through oocyte quality degradation, sperm DNA fragmentation, endometrial receptivity impairment, and steroidogenesis disruption.[19]

Ayurvedic emphasis on *Agni* enhancement through appropriate diet, herbs, and lifestyle modifications to prevent *Ama* formation represents preventive strategy addressing oxidative stress and inflammation at foundational levels. Herbs classified as *Deepana* (digestive stimulant) and *Pachana* (*Ama*-digesting) demonstrate antioxidant, anti-inflammatory, and metabolic-enhancing properties in modern pharmacological studies.

Stress, Neuroendocrine Function, and Mind-Body Connection

Ayurvedic medicine emphasizes profound influence of mental state (*Manas*) on physical health, anticipating modern psych neuroendocrine-immunology research confirming bidirectional communication between nervous, endocrine, and immune systems. Psychological stress activates hypothalamic-pituitary-adrenal axis, increasing cortisol secretion. Chronic hypercortisolemia suppresses gonadotropin-releasing hormone pulsatility, reduces gonadotropin secretion, and directly impairs gonadal steroidogenesis.[32]

Studies confirm significant psychological distress in infertile couples, with depression and anxiety prevalence rates two to three times higher than fertile populations. Furthermore, psychological interventions including cognitive-behavioural therapy, mindfulness, and stress reduction demonstrate improvements in conception rates independent of medical treatments.

Ayurvedic therapeutic approaches inherently incorporate mind-body interventions through meditation and pranayama reducing sympathetic nervous system activation; *Sattvavajaya chikitsa* (psychotherapy) cognitive-behavioural approaches; *Rasayana* therapy adaptogenic herbs modulating stress response systems; and *Dinacharya*/*Ritucharya* (daily/seasonal routines) establishing circadian rhythm stability.

LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

Methodological Limitations of Existing Research

The existing evidence base for Ayurvedic infertility treatments suffers from significant methodological limitations. Most clinical trials involve small sample sizes (typically 30-100 participants), providing insufficient statistical power. Many studies lack proper randomization procedures or adequate blinding, introducing selection and performance bias. Studies employ widely varying formulations, dosages, treatment durations, and adjunctive therapies, precluding meaningful comparison. Primary outcomes vary across studies, and optimal reproductive endpoints (live birth rates) are frequently not assessed. Positive results are disproportionately published compared to negative findings, inflating apparent efficacy.

Safety Considerations and Herb-Drug Interactions

As Ayurvedic herbs gain popularity as adjunctive therapies alongside conventional treatments, potential herb-drug interactions warrant consideration. *Ashwagandha* demonstrates sedative effects potentially potentiating barbiturates and benzodiazepines. Thyroid-stimulating properties require caution in patients receiving thyroid hormone replacement. *Shatavari's* weak estrogenic activity theoretically contraindicates use in hormone-sensitive conditions. *Gokshura* may enhance effects of antihypertensive and antidiabetic medications, requiring dose adjustments and monitoring.

Significant concerns exist regarding heavy metal contamination, microbial contamination, and adulteration of Ayurvedic products. Analysis of Ayurvedic medicines reveals concerning levels of lead, mercury, and arsenic in approximately 20% of products. Recommendations for ensuring product quality include purchasing from reputable manufacturers with third-party testing certifications and verifying absence of heavy metals through certificate of analysis.

Future Research Priorities

Significant knowledge gaps requiring research attention include mechanism clarification through advanced pharmacological research employing metabolomics, proteomics, and genomics; comparative effectiveness research with head-to-head comparisons between Ayurvedic interventions and standard treatments; long-term safety data with teratogenic potential evaluation; cost-effectiveness analysis; and optimal integration protocols establishing how to best integrate Ayurvedic interventions with assisted reproductive technologies.

Large-scale multi-centre randomized controlled trials with adequate sample sizes, appropriate blinding procedures, standardized interventions, and clinically relevant outcomes including live birth rates are urgently needed. Studies should employ rigorous methodology, intention-to-treat analysis, and long-term follow-up. Mechanistic studies utilizing systems biology approaches can elucidate molecular pathways, identify biomarkers, and optimize treatment protocols.

CONCLUSION

This critical review systematically examined applied physiological principles underlying Ayurvedic approaches to infertility management, synthesizing traditional concepts with contemporary reproductive biology and evaluating existing clinical evidence. Ayurvedic reproductive physiology demonstrates remarkable sophistication in its integrated understanding of tissue formation, bioenergetic regulation, metabolic transformations, and channel systems. Classical descriptions of gametogenesis, fertilization, and embryonic development reveal detailed anatomical and physiological knowledge that, in numerous instances, anticipates modern discoveries.

Classification systems for infertility in classical texts distinguish various etiological categories, recognize both male and female factors, and acknowledge genetic, anatomical, functional, and lifestyle contributors demonstrating multi-factorial understanding comparable to contemporary approaches. Emphasis on individualized assessment based on constitutional type, specific imbalance patterns, and contextual factors contrasts with conventional medicine's population-based treatment algorithms, offering potential advantages for personalized medicine approaches.

Pharmacological research reveals plausible mechanisms supporting traditional uses of *Vajikarana* herbs. *Ashwagandha* demonstrates androgenic, adaptogenic, antioxidant, and thyroid-modulating properties relevant to reproductive dysfunction. *Shatavari* exhibits phytoestrogenic, galactagogue, and immunomodulatory effects validating traditional applications for female reproductive health. *Kapikacchu'*s dopaminergic activity addresses hyperprolactinaemic infertility, while antioxidant properties protect gametes from oxidative stress.

Clinical evidence, while limited in quantity and quality, suggests potential benefits of Ayurvedic interventions for male factor infertility, polycystic ovarian syndrome, and

unexplained infertility. Studies consistently report improvements in sperm parameters, menstrual regularity, ovulation rates, and pregnancy outcomes, though methodological limitations preclude definitive conclusions. Integrative approaches combining Ayurvedic herbs with assisted reproductive technologies demonstrate promising results in preliminary studies, warranting further investigation.

Significant challenges remain, including inadequate standardization of herbal preparations, limited mechanistic understanding, methodological weaknesses in clinical trials, safety concerns regarding contamination and herb-drug interactions, and epistemological tensions between traditional and biomedical paradigms. Addressing these challenges requires collaborative efforts involving Ayurvedic practitioners, biomedical researchers, pharmacologists, regulatory agencies, and funding organizations.

The ancient wisdom of Ayurveda offers valuable perspectives on reproductive health that complement rather than replace modern reproductive medicine. Neither system alone provides complete solutions for complex challenges of infertility. Optimal patient care likely involves judicious integration of both paradigms, drawing upon Ayurveda's strengths in holistic assessment, individualized treatment, lifestyle optimization, and natural therapeutics while incorporating modern medicine's sophisticated diagnostics, advanced technologies, and evidence-based approaches. Achieving this integration requires maintaining intellectual humility, scientific rigor, clinical pragmatism, and unwavering commitment to patient welfare.

ACKNOWLEDGEMENTS

The authors acknowledge all researchers and clinicians whose work contributed to the knowledge base synthesized in this review. We express gratitude to our respective institutions for providing resources and support for this scholarly work.

FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

CONFLICT OF INTEREST

The authors declare no conflicts of interest related to this review article.

ACKNOWLEDGMENTS

The authors acknowledge all researchers and clinicians whose work contributed to the knowledge base synthesized in this review. We express gratitude to our respective institutions for providing resources and support for this scholarly work.

We appreciate your time and consideration in reviewing our manuscript. We look forward to your positive response and are available to provide any additional information or clarification as needed.

ABBREVIATIONS

ART - Assisted Reproductive Technology
DNA - Deoxyribonucleic Acid
FSH - Follicle Stimulating Hormone
GnRH - Gonadotropin-Releasing Hormone
HPG - Hypothalamic-Pituitary-Gonadal
HPA - Hypothalamic-Pituitary-Adrenal
ICSI - Intracytoplasmic Sperm Injection
IVF - In Vitro Fertilization
L-DOPA - Levodopa
LH - Luteinizing Hormone
PCOS - Polycystic Ovarian Syndrome
RBC - Red Blood Cell
RCT - Randomized Controlled Trial

REFERENCES

1. Inhorn MC, Patrizio P. Infertility around the globe: new thinking on gender, reproductive technologies and global movements in the 21st century. Hum Reprod Update, 2015; 21(4): 411-426.
2. Mascarenhas MN, Flaxman SR, Boerma T, Vanderpoel S, Stevens GA. National, regional, and global trends in infertility prevalence since 1990: a systematic analysis of 277 health surveys. PLoS Med., 2012; 9(12): e1001356.
3. Dyer S, Chambers GM, de Mouzon J, Nygren KG, Zegers-Hochschild F, Mansour R, Ishihara O, Banker M, Adamson GD. International Committee for Monitoring Assisted Reproductive Technologies world report: assisted reproductive technology 2008, 2009 and 2010. Hum Reprod, 2016; 31(7): 1588-1609.

4. Kushnir VA, Barad DH, Albertini DF, Darmon SK, Gleicher N. Systematic review of worldwide trends in assisted reproductive technology 2004-2013. Reprod Biol Endocrinol, 2017; 15: 6.
5. Wujastyk D. The Roots of Ayurveda: Selections from Sanskrit Medical Writings. London: Penguin Classics, 2003.
6. Meulenbeld GJ. A History of Indian Medical Literature. Groningen: Egbert Forsten; 1999-2002.
7. Patwardhan B, Warude D, Pushpangadan P, Bhatt N. Ayurveda and traditional Chinese medicine: a comparative overview. Evid Based Complement Alternat Med, 2005; 2(4): 465-473.
8. Patwardhan B. Bridging Ayurveda with Evidence-Based Scientific Approaches in Medicine. Boca Raton: CRC Press, 2011.
9. Sharma PV. Sushruta-Samhita. Varanasi: Chaukhambha Visvabharati, 2004.
10. Goyal M, Singh S, Sharma C, Sharma A. Ayurvedic approach for improving reaction time of attention deficit hyperactivity disorder affected children. AYU, 2016; 37(3-4): 186-192.
11. Sharma R, Dash B. Charaka Samhita. Varanasi: Chowkhamba Sanskrit Series Office; 1998.
12. Heller CG, Clermont Y. Kinetics of the germinal epithelium in man. Recent Prog Horm Res, 1964; 20: 545-575.
13. Patwardhan B, Bodeker G. Ayurvedic genomics: establishing a genetic basis for mind-body typologies. J Altern Complement Med., 2008; 14(5): 571-576.
14. Tripathi B. Astanga Hridayam. Delhi: Chaukhambha Sanskrit Pratishthan, 2007.
15. Rastogi S. Building bridges between Ayurveda and Modern Science. Int J Ayurveda Res., 2010; 1(1): 41-46.
16. Dayani PS, Munshi RP. Management of Polycystic Ovarian Syndrome through Ayurveda. Int J Res Ayurveda Pharm., 2015; 6(2): 245-248.
17. Basisht G. Concepts of Ayurveda for Perfect Health and Longevity. New Delhi: Chaukhambha Sanskrit Pratishthan, 2012.
18. Pole S. Ayurvedic Medicine: The Principles of Traditional Practice. London: Singing Dragon, 2013.
19. Agarwal A, Mulgund A, Hamada A, Chyatte MR. A unique view on male infertility around the globe. Reprod Biol Endocrinol, 2015; 13: 37.

20. Burney RO, Giudice LC. Pathogenesis and pathophysiology of endometriosis. Fertil Steril, 2012; 98(3): 511-519.
21. Murthy KRS. Vagbhata's Astanga Hrdayam. Varanasi: Krishnadas Academy, 2001.
22. Raine-Fenning NJ, Campbell BK, Kendall NR, Clewes JS, Johnson IR. Quantifying the changes in endometrial vascularity throughout the menstrual cycle with three-dimensional power Doppler angiography. Hum Reprod, 2004; 19(2): 330-338.
23. Shastri K. Charaka Samhita Part II. Varanasi: Chaukhambha Bharati Academy, 2005.
24. Tewari PV. Ayurvediya Prasutitantra Evum Striroga. Varanasi: Chaukhambha Orientalia; 2008.
25. Lakshmi PB, Sudha B. Clinical evaluation of Kushtaghrita in the management of Artava Kshaya (oligomenorrhea). Ayu., 2010; 31(3): 333-336.
26. Gilbert SF. Developmental Biology. 9th ed. Sunderland: Sinauer Associates, 2010.
27. Dash VB, Kashyap L. Maternity and Childcare in Ayurveda. New Delhi: Delhi Diary, 1996.
28. Gordon CM. Functional hypothalamic amenorrhea. N Engl J Med., 2010; 363(4): 365-371.
29. Practice Committee of the American Society for Reproductive Medicine. Evaluation and treatment of recurrent pregnancy loss: a committee opinion. Fertil Steril, 2012; 98(5): 1103-1111.
30. Montague DK, Jarow JP, Broderick GA, Dmochowski RR, Heaton JP, Lue TF, Nehra A, Sharlip ID. Chapter 1: The management of erectile dysfunction: an AUA update. J Urol., 2005; 174(1): 230-239.
31. Ahmad MK, Mahdi AA, Shukla KK, Islam N, Rajender S, Madhukar D, Shankhwar SN, Ahmad S. Withania somnifera improves semen quality by regulating reproductive hormone levels and oxidative stress in seminal plasma of infertile males. Fertil Steril, 2010; 94(3): 989-996.
32. Whirledge S, Cidlowski JA. Glucocorticoids, stress, and fertility. Minerva Endocrinol, 2010; 35(2): 109-125.
33. Ambiye VR, Langade D, Dongre S, Aptikar P, Kulkarni M, Dongre A. Clinical evaluation of the spermatogenic activity of the root extract of Ashwagandha (Withania somnifera) in oligospermic males: a pilot study. Evid Based Complement Alternat Med, 2013; 2013: 571420.
34. Jetmalani MH, Sabnis PB, Gaitonde BB. A study on the pharmacology of various extracts of Shatavari - Asparagus racemosus (Willd). J Res Indian Med., 1967; 2: 1-10.

35. Alok S, Jain SK, Verma A, Kumar M, Mahor A, Sabharwal M. Plant profile, phytochemistry and pharmacology of Asparagus racemosus (Shatavari): A review. Asian Pac J Trop Dis., 2013; 3(3): 242-251.
36. Neychev VK, Mitev VI. The aphrodisiac herb Tribulus terrestris does not influence the androgen production in young men. J Ethnopharmacol, 2005; 101(1-3): 319-323.
37. Sellandi TM, Thakar AB, Baghel MS. Clinical study of Tribulus terrestris Linn. in Oligozoospermia: A double-blind study. Ayu., 2012; 33(3): 356-364.
38. Shukla KK, Mahdi AA, Ahmad MK, Shankhwar SN, Rajender S, Jaiswar SP. Mucuna pruriens improves male fertility by its action on the hypothalamus-pituitary-gonadal axis. Fertil Steril, 2009; 92(6): 1934-1940.
39. Agarwal A, Baskaran S, Parekh N, Cho CL, Henkel R, Vij S, Arafa M, Panner Selvam MK, Shah R. Male infertility. Lancet, 2021; 397(10271): 319-333.
40. Kumar P, Sharma A. Gokhru (Tribulus terrestris Linn.) and Ashwagandha (Withania somnifera Dunal) in male infertility. J Hum Ecol, 2010; 32(3): 177-179.