



HERBAL MEDICINE AND INFERTILITY: AN INTEGRATIVE APPROACH TO REPRODUCTIVE HEALTH

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ABSTRACT

Infertility affects approximately 15% of couples worldwide, with male and female factors contributing equally. Herbal medicine has gained popularity as a complementary therapy for infertility, but its effectiveness and safety remain unclear. An increasing global concern, infertility affects both men and women. The effectiveness and safety of herbal medicines, which have been used historically to increase fertility, are yet unknown. The purpose of this systematic review is to assess the available data about the effects of herbal remedies on infertility in both men and women. This systematic review suggests that certain herbal medicines may have beneficial effects on male and female infertility, potentially due to antioxidant, anti-inflammatory, and hormone-regulating properties. However, due to methodological limitations and variability in study design, further rigorous clinical trials are necessary to confirm efficacy and safety. Herbal medicine may offer complementary therapeutic options for infertility treatment. Healthcare providers should consider herbal interventions as part of comprehensive fertility care, while emphasizing the need for standardized extracts, precise dosing, and monitoring. Included were studies looking at how herbal therapies affected men's and women's reproductive outcomes. The review emphasizes how some herbs, like tribulus terrestris, ashwagandha, and Kanchnaar, may help to improve reproductive metrics. To completely comprehend the effects of various plants, more research is necessary as the quality of the data differs. This review offers a thorough summary of the state of the art about the potential advantages, disadvantages, and future research directions of herbal remedies for infertility in both men and women.

KEYWORDS: Reproductive health, Male infertility, Female infertility, Herbal medicine, Fertility supplements, Natural remedies.

INTRODUCTION

Reproductive medicine has always faced a major issue in the form of infertility. According to the World Health Organization (WHO), infertility is a unique disease entity that should be considered a social disease due to its high prevalence. However, there isn't a clear-cut definition in the literature on the topic.^[1] The National Institute for Health and Clinical Excellence (NICE, 2013) proposed that the inability to conceive after two years of consistent, unprotected sexual activity should be considered infertility if there is no known reproductive disease.^[2]

The inability to conceive after 12 months or more of regular, unprotected sexual activity is known as infertility, according to the American Society of Reproductive Medicine. If there are signs of infertility in the medical history and physical findings, an earlier

examination and treatment of infertility are required; treatment is also advised for women over 35 who have not been successful in becoming pregnant after six months of trying. The International Committee for Monitoring Assisted Reproductive Technology and the World Health Organization have similar definitions.^[3] According to a demographic definition, infertility is defined as the "inability of a sexually active, non-contracepting woman to have a live birth." These various highlights the need for a clear concept of infertility; one suggestion is that a clinically appropriate definition should take into account a woman's age as well as the length of time she has tried to conceive. It is known that a sizable portion of the population is affected by infertility and subfertility. According to research on the physiological effects of infertility, infertility is a terrible experience that primarily affects women. Furthermore, the best diagnostic technique and the safest and most

successful treatment approach remain unanswered questions. A list of both tried-and-true techniques for identifying and treating infertility was included in statements issued by the American Society of Reproductive Medicine (ASRM) on January 1st, 2017. Several original publications backed up this commercial medical strategy, which was revised in 2018 and 2019.^[4]

Different definitions of infertility exist in clinical practice and demographic research, as Ulla Larsen describes in detail. "Inability to conceive after one year of regular unprotected sexual intercourse" is the criteria used in the therapeutic setting, where there is a desire to start treatment as soon as possible. The World Health Organization (WHO) recommends that "inability to conceive after two years of regular unprotected sexual intercourse" be the preferred definition of infertility in epidemiological research, where it is important to minimize the number of false positives (where fertile individuals or couples are misclassified as infertile). Demographers define infertility as "the inability of a sexually active woman who is not using contraception to have a live birth".^[5]

If you have been trying to conceive for a year or more, you might consider getting checked for infertility. If you are 35 years of age or older, you should begin the infertility evaluation after around six months of unprotected sexual activity rather than a year in order to avoid postponing potentially necessary therapy. For instance, if you or your partner have a known reproductive condition, or if your monthly periods are severely irregular, which may signal that you are not ovulating or releasing an egg, you should generally seek therapy sooner rather than later. If you and your spouse have failed to conceive, you are not alone. At least one

partner in every seven couples has trouble getting pregnant. During this time, feeling anxious, agitated, envious, and furious is normal. However, you will find that there is a greater chance than ever before for a healthy pregnancy with fertility treatments after you begin researching your medical options. The goal of becoming pregnant is accomplished by the majority of individuals who see a fertility specialist.^[6]

Natural History of Infertility

There is typically a lag between a couple's ability to conceive and their actual conception date. This amount of time is extended by both known and undiscovered problems. Sometimes the disease cannot be treated medically, and conception cannot happen until the flaw is fixed. Sometimes there are flaws that prevent pregnancy and cannot be corrected with current medical knowledge. It is necessary to regard these couples as sterile. The percentage of couples who do not have children by the end of their reproductive years is known as the terminal infertility rate. These couples can be divided into four categories: (1) those who are childless voluntarily; (2) those who are sterile due to defects that prevent conception; (3) those who have defects that lessen but do not prevent conception; and (4) those who do not appear to have any defects but are still unable to conceive. The goal of infertility research is to assist the final two groups.^[7]

Types of Infertility

Basically there are five types of infertility as follow; Primary Infertility, Secondary Infertility, Unexplained Infertility, Male Infertility, Female Infertility.

Most commonly known types of infertility are primary and secondary infertility.^[7]

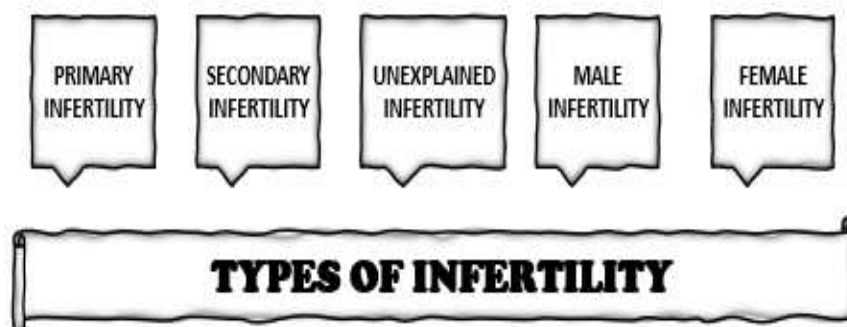


Fig. 1: Types of Infertility.

1) Primary infertility

The inability to conceive after trying unsuccessfully for at least a year is known as primary infertility. Primary infertility can be caused by a variety of reasons. Men may experience problems including poor sperm count or motility concerns, while women may experience disruptions in the release of mature eggs due to ovulation abnormalities. Furthermore, obstacles may arise from

structural anomalies in either partner's reproductive system.^[8]

2) Secondary Infertility

It can be extremely depressing for couples who have previously been blessed with children to struggle with conception again. Secondary infertility is the term used to describe the inability to conceive after having multiple children. A number of causes can contribute to secondary

infertility, including age-related declines in fertility, challenges from previous pregnancies or deliveries, and changes in reproductive health over time.^[9]

3) Unexplained Infertility

About 10% of couples trying to conceive have normal results on all of the aforementioned tests, and it is difficult to determine what is causing their infertility. A much higher percentage of couples simply have minor abnormalities, which shouldn't be severe enough to result in infertility. Infertility in these circumstances is referred to as "unexplained." It may be difficult to diagnose and/or treat problems with sperm or tubal function, genetics, fertilization, or egg quality in couples with unknown infertility. IUI and fertility drugs have been attempted by couples experiencing infertility that cannot be explained, with differing degrees of success. If a pregnancy does not emerge after three to six treatment cycles, IVF, which has been shown to be the most effective treatment for infertility without a known cause, may be recommended.^[10]

4) Male Infertility

1. Sperm Disorders: The quality of the sperm is essential to conception. Male infertility can result from common sperm-related problems such as low sperm count, poor motility, and aberrant morphology. Lifestyle choices like smoking and binge drinking can also affect the health of sperm. Thankfully, for couples affected by sperm abnormalities, intrauterine insemination (IUI) and in vitro fertilization (IVF) offer feasible solutions.^[11]

2. Testicular Disorders: Since the testes are in charge of producing sperm, any conditions that affect them may result in infertility. Infections, hormonal abnormalities, and varicocele are among the conditions that might impair sperm production. Hormone assays and semen analysis (also see the cost of the test) are used as diagnostic methods to find these problems. Testicular diseases can be treated using a variety of methods, including surgery.^[12]

3) Female Infertility

1. Ovulatory Disorders

Ovulation, or the release of a mature egg from the ovaries, is the fundamental process of conception. Nevertheless, ovulatory problems affect some women, impeding this vital process and leading to infertility in women. Disorders include hypothalamic dysfunction, thyroid problems, and polycystic ovary syndrome (PCOS) might interfere with normal ovulation.^[13]

2. Tubal Infertility

The fallopian tubes are essential for the movement of eggs from the ovaries into the uterus. Infertility due to tubal blockage or injury to these tubes can occur. Endometriosis and pelvic inflammatory illness are frequent causes of tubal problems. Healthcare professionals employ a test known as

hysterosalpingography (HSG) to evaluate tubal patency. Examine the cost of the hysterosalpingography test.^[14]

3. Uterine infertility

A healthy uterus is necessary for the successful implantation of a fertilized egg. A number of conditions, such as fibroids, polyps, or anatomical abnormalities within the uterus, can cause infertility in women. Medical professionals can detect these problems using diagnostic techniques like hysteroscopy and provide treatments like uterus surgery to improve the chances of conception at the top fertility clinic in Delhi.^[15]

Symptoms of Infertility

The most typical indicator of infertility is the inability to become pregnant. If your menstrual cycle is irregular, absent, too short (less than 21 days), or too long (35 days or more), you may not be ovulating. There might not be any more obvious symptoms or clues. Early diagnosis of female patients is a critical concern shared by all.^[16] It could also involve dark or pale menstrual blood and pain during intercourse. Hormonal abnormalities are one of the symptoms of male infertility. Erectile dysfunction, changes in the testicles, obesity, and issues with ejaculation.^[17-18]

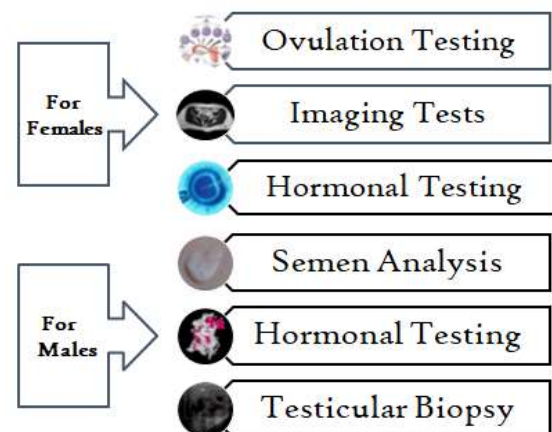


Fig. 2: Diagnostic tests for infertility.

CAUSES AND RISK FACTORS OF INFERTILITY

In Women- There are many different possible causes of infertility in women. However, it might be difficult to pinpoint the exact cause, and some couples become infertile for no obvious reason at all. Some possible causes of female infertility include the following.^[19]

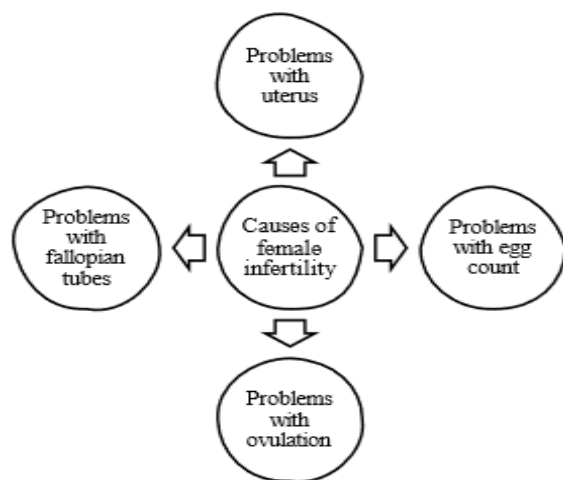


Fig. 3: Causes of female infertility.

Causes why women are infertile? Issues with your uterus: This includes fibroids, uterine polyps, and adhesions (scarring) inside the uterine cavity. Fibroids and polyps can develop on their own at any moment. Following a dilatation and curettage procedure, adhesions may develop (D&C). Fallopian tube issues: Pelvic inflammatory illness (PID) is the most common cause of “tubal factor” infertility. Gonorrhoea and chlamydia are major causes of PID that go untreated. Your fallopian tubes may become scarred as a result of endometriosis. Ovulation issues: There are a variety of causes for irregular ovulation, or the release of an egg. Hormonal imbalances, food disorders, substance use disorders, thyroid problems, excessive stress, and pituitary tumors are a few conditions that might affect ovulation. Problems with the amount and caliber of eggs: You have all of your eggs when you are born, and they can run out before the menopause, which normally starts around age 51, happens. Furthermore, some eggs with the wrong number of chromosomes will not fertilize and grow into a healthy fetus. What is the primary cause of infertility in women? Most cases of uterine infertility are caused by problems with ovulation, or the process by which eggs are produced and released. It may be brought on by conditions like polycystic ovary syndrome (PCOS) or primary ovarian insufficiency (POI), in which your ovaries stop producing eggs before the age of forty because of an unusually low quantity.^[20]

Which factors put women at risk of infertility?

Numerous factors can increase the chance of infertility. Infertility can result from a variety of factors, including age, lifestyle choices, genetic (inherited) traits, and general health conditions. Specific components could include: ages, Fertility typically begins to decline in your 30s. Endometriosis, weight gain, atypical menstrual cycles, hormonal problems that prevent ovulation, tumors, ovarian cysts, uterine fibroids, and structural problems (physical problems with your uterus, ovaries, or fallopian tubes) STIs that result in pelvic inflammatory diseases, immune system disorders (including lupus, rheumatoid arthritis, and Hashimoto's

thyroiditis), and PCOS (polycystic ovarian syndrome). PCOS is a hormonal disorder that can cause primary ovarian insufficiency (POI), infertility, and previous ectopic pregnancies.^[21]

Male infertility can have a variety of causes, They can all be broadly grouped according to the underlying aetiology they share. These include primary testicular defects (i.e. abnormal sperm parameters without identifiable cause) at 65% to 80%, idiopathic disorders (i.e., infertile males with normal sperm and semen parameters) at 10% to 20%, endocrine disorders (usually due to hypogonadism) estimated at 2% to 5% of cases, and sperm transport disorders (such as vasectomy) at 5%.^[2] Due to widespread underreporting, cultural differences, and regional variances, precise numbers are not available, hence these are merely broad estimations. While private patients may never have their data collected, those referred to a tertiary referral centre have a higher chance of having their illness reported. Varicoceles, TURP, bilateral orchiectomy, bilateral obstruction or ligation of the vas deferens, epididymitis, and retrograde ejaculation are a few examples of acquired urogenital abnormalities.^[22]

Undescended testes, vas deferens abnormalities, ejaculatory duct disorders (cysts), and missing, dysfunctional, or obstructed epididymis are examples of congenital urogenital abnormalities. Congenital urogenital abnormalities include defects of the vas deferens, undescended testes, ejaculatory duct diseases (cysts), and missing, dysfunctional, or obstructed epididymis. Endocrinological reasons include familial cerebellar ataxia, head trauma, intracranial radiation, testosterone supplementation, hyperthyroidism, Prader-Willi syndrome, Laurence-Moon-Beidl syndrome, iron overload syndrome, and congenital GnRH deficiency (Kallmann syndrome). Here are some instances of genetic causes: Chromosome abnormalities, Y chromosome microdeletion, AR mutations, primary ciliary dyskinesia, Kallmann syndrome, Klinefelter syndrome, Young syndrome, Sertoli cell-only syndrome, Kal-1, Kal-2, FSH, LH, FGFS, GnRH1/GNRHR PROK2/PROK2R gene deficiencies, chromosomal abnormalities, and Kal/gr deletion. 10% to 20% of cases of male infertility are due to idiopathic factors; in these cases, the male’s semen parameters are normal but his infertility persists. Immunological causes include fungal infections, sarcoidosis, hemosiderosis, hemochromatosis, histiocytosis, and tuberculosis. Testicular tumors, pituitary macroadenomas, craniopharyngiomas, adrenal tumors that produce an excess of androgens, and the surgical or radiation treatment for these conditions are examples of malignancies. Medication or drugs include alkylating agents, antiandrogens, ketoconazole, cimetidine, opioids, cannabis, psychiatric drugs that can inhibit GnRH, GnRH antagonists and analogues used in prostatic cancer, prolonged glucocorticoid therapy, and alpha-blocker therapies for BPH. Exogenous testosterone or androgenic steroids supplementation. This is a

thorough list of drugs that could be harmful.^[8] Sexual dysfunction includes erectile dysfunction, infrequent sex, premature ejaculation, and anejaculation. Urogenital tract infections include syphilis, chlamydia, TB, recurrent prostatitis, recurrent prostatovesiculitis, and gonococci.^[23]

What Are the Male Infertility Risk Factors?

Lifestyle and Behavioural Risk Factors: Male infertility is associated with a number of significant behavioural and lifestyle risk factors, including cigarette or tobacco use, alcohol consumption, poor health-seeking behaviour on the part of men, untreated or poorly treated STDs, sexual promiscuity, overweight/obesity, medication, and frequency of coital encounters. Alcohol Use, Smoking, STDs, and Medication The statistical association between semen analysis and particular variables. The following risk factors for male infertility were statistically correlated with the semen analysis (normal and abnormal): history of smoking, alcohol consumption, and prior STD therapy. With the exception of alcohol consumption, all categories had a larger percentage of aberrant semen than normal semen, and there was a strong correlation between risk variables and semen analysis. **Environmental Risk Factors:** Exposure to hazardous metals, including lead, zinc deficiency, pesticides, industrial chemicals, and mycotoxins, was mentioned in review studies on the risk factors of male infertility. The evaluations also revealed other risk factors for male infertility, such as radiation exposure, chemotherapy, and pharmaceuticals that either directly act as spermatotoxins or through a steroidal pathway.^[24]

COMPLICATIONS

In females, The three primary adverse consequences of infertility treatments include multiples, ovarian hyperstimulation syndrome, and ectopic pregnancy. **Multiple Gestations:** The potential for multiple births has been a worry ever since artificial reproductive technologies were developed. In the United States, 32% of pregnancies arising from assisted reproductive technology were multiple births, compared to 3.4% of spontaneously conceived births. According to a 2009 research by the Centers for Disease Control (CDC), 62%, 29%, and 3% of IVF fresh embryo transfers produced singleton, twin, or higher-order pregnancies, respectively. With respective percentages of twins, triplets, and quadruplets of 7%, 0.5%, and 0.3%, letrozole and clomiphene, oral ovarian induction medications, had a lower risk of multiple gestations than gonadotropins. For gonadotropins, the chance of multiple gestations, including triplets, is 13%. The ASRM and CDC are currently strongly promoting elective single embryo transfer, or eSET, for patients with favorable prognoses. Using eSET reduced the frequency of twins and triplets to less than 1%. Additionally, there is continuous debate on the use of gonadotropins for ovulation induction outside of an IVF procedure due to the elevated risk of multiples. Gonadotropin use in combination with IUI is likely to continue to decrease as the number of IVF operations increases.^[24]

Ectopic Pregnancy: Another concern that necessitates intensive counselling is ectopic pregnancy that develops after therapy for infertile patients. Patients with infertility have a two-to three-fold increase in ectopic pregnancies. This is believed to be linked to a high rate of infertility caused by tubal factors. The greatest chance of an ectopic pregnancy follows tubal surgery to treat infertility caused by tubal factors. After tubal reconstructive surgery, ectopic pregnancy rates range from 9% to 30%, according to certain reports. Although the total rate of ectopic pregnancies with IVF is about 1.3%, the risk of ectopic pregnancy with fresh embryo transfer is higher than with frozen embryo transfer. Using ovulation induction agents in conjunction with IUI does not appear to increase the risk of ectopic pregnancies compared to natural conception; however, in a large study comparing the ovulation induction agents, the rates of ectopic pregnancy were 4%, 6%, and 8% for clomiphene, letrozole, and gonadotropins, respectively. Ovarian hyperstimulation syndrome (OHSS), an iatrogenic consequence of controlled ovarian hyperstimulation, is linked to a wide range of symptoms, such as abdominal distention, nausea, vomiting, enlarged ovaries, third-spacing of fluids, renal failure, venous thrombosis, acute respiratory distress syndrome, electrolyte imbalances, cardiac arrhythmias, and sepsis. The following consequences can result in fatality if severe OHSS is not treated and closely watched. Golan *et al.* characterised the various stages of OHSS in 1989. Increased capillary permeability is the underlying pathologic feature that results in a fluid shift into the third space. The women most at risk for OHSS are those who have more than 20 mature follicles and who also receive an HCG trigger dose. IVF carries a 6% risk of mild OHSS and a 1% risk of severe OHSS. There is no discussion of OHSS diagnosis, prevention, or treatment in this publication.^[25]

In men, psychological anguish, stress, and marital relationship problems are the main causes of complications. There can be money problems as well. Infertility evaluation and treatment can be costly and stressful in the United States because there are no promises of success and insurance usually does not cover this disease. Complications from any necessary surgical operations also have a risk.^[26]

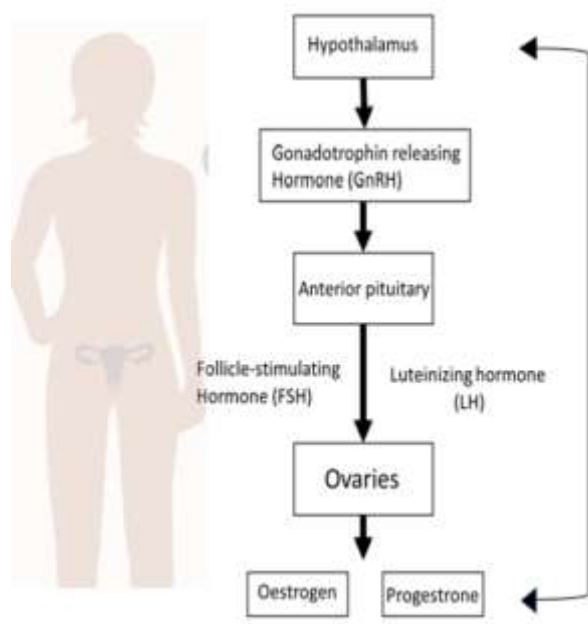


Fig. 4: Pathophysiology of female infertility.

In Womens,

The female reproductive function is primarily, though not solely, regulated by a series of interconnected hormones. Gonadotrophin-releasing hormone (GnRH) is the starting hormone. It is released by hypothalamic cells and causes the anterior pituitary to release two more gonadotrophins: luteinizing hormone (LH) and follicle stimulating hormone (FSH). The ovaries are then stimulated by these two hormones to create the sex hormones, progesterone and estrogen, as well as to regulate the development of follicles and ovum. The female reproductive system and other bodily organs are greatly impacted by the sex hormones. A negative feedback loop is in place because at least one other hormone, inhibit, acts as a feedback mechanism on GnRH, FSH, and LH. About a million follicles are present in females at birth, and none more develop after that. In most cases, only one follicle reaches maturity per cycle, however numerous will start to become larger. More than one ovum may ovulate if two or more follicles mature. This is the most frequent natural reason for multiple births, producing twins that are fraternal rather than identical. There are only 400 or so people who will mature fully in an active and productive life. By the time a female reaches the age of about fifty, most of the others have degenerated to the point that very few are left. Infertility in women will arise if things go the other way.^[27]

In Mens,

Infertility in males is caused by a number of problems related to the male reproductive system. Oxidative stress is caused by a few main factors, including immature/abnormal spermatozoa, prolonged stasis of spermatozoa in the epididymis or in transit, systemic pathologies (lifestyle diseases like diabetes, cancer, etc.), excessive drug intake, smoking, pollution, male

accessory gland infections, etc. When the body's natural antioxidant defences against potentially harmful reactive oxygen species (ROS) are overwhelmed, oxidative stress ensues and causes cellular damage. A prevalent disease observed in around half of all infertile males is oxidative stress. Two main processes lead to infertility caused by ROS, which are characterized as oxygen ions, free radicals, and peroxides produced by sperm and seminal leukocytes inside semen. They first cause damage to the sperm membrane, which reduces motility and the sperm's capacity to fuse with the egg. Second, ROS have the ability to change sperm DNA, which can lead to the conceptus absorbing faulty paternal DNA. Consequently, spermatozoal malfunction arises and leads to male infertility. Sperm are unable to fertilize the ovum or egg to form the zygote or to conceive as a result of spermatozoal malfunction.^[28]

Allopathic Remedies used in Infertility

1. Clomiphene Citrate

Clomiphene citrate is the first medication used to induce ovulation when there are no particular indications. This is especially helpful for polycystic ovarian syndrome (PCOS) women who have sufficient estrogen levels, as demonstrated by typical withdrawal bleeding following the administration of a progestational drug, like medroxyprogesterone acetate (10 mg/d for five days).^[29]

2. Glucocorticosteroids

Women who exhibit clinical signs of hirsutism or biochemical hyperandrogenism may benefit from glucocorticoid treatment alone.² It is necessary to rule out major underlying disorders such as Cushing's syndrome first. In order to prevent the nocturnal surge of ACTH, glucocorticoids should be administered at bedtime as they will decrease adrenal androgens. A concurrent decrease in ovarian androgen production may also occur.^[30]

3. Bromocriptine: Normal ovarian function is impeded by excessive prolactin production. The disturbance can take many different forms, such as irregular anovulatory cycles, low estrogen amenorrhea, or ovulatory cycles with an inadequate luteal phase. On physical examination, over 80% of women have galactocorrhea. Since the hypothalamic release of dopamine ordinarily inhibits prolactin, prolactin secretion from both normal and aberrant pituitary lactotrophs will be suppressed by dopamine agonist medications. Bromocriptine is a dopamine agonist that has been used in most investigations.^[31]

4. Gonadotrophin-Releasing Hormone: Individuals suffering from hypothalamic amenorrhea lack adequate endogenous pulsatile GnRH release to initiate a regular ovulatory cycle.³ When a responsive woman receives exogenous synthetic gonadotrophin-releasing hormone, her ovulatory gonadotrophin-releasing hormone levels typically return to normal.^[32]

5. Gonadotrophins: When combined with HCG, gonadotrophins are extracted from postmenopausal human urine. Preparations consist of either pure FSH or mixed LH and FSH. The greater price for pure FSH is rarely justified due to the inconclusive results. The follicle is directly impacted following intramuscular injection. Any premenopausal patient should therefore have follicular development in response. The use of this medication in postmenopausal individuals is still experimental and yields subpar outcomes. Women with hypothalamic amenorrhea have a greater cumulative pregnancy rate—90% versus 40%—than women with polycystic syndrome.^[33]

6. Intramuscular testosterone injection: It seems that the frequency of injection matters more than the dosage. Therefore, 200–300 mg of testosterone esters injected

intramuscularly every two–three weeks should be enough to prevent mal virilization. Drug therapy may also be necessary for an extended period of time because normal pubertal development takes place over a period of two to five years. After then, gonadotrophin or pulsatile GnRH injection will be needed for three to twelve months of therapy to induce spermatogenesis. With a programmable pump, pulsatile GnRH can be injected subcutaneously whenever needed or just when the patient is asleep.^[34]

Plants Used to Treat Male and Female in Fertility

Female infertility accounts for 35–40 % of overall infertility. Treatment depends upon the specific identifiable cause.

Pathophysiology of Infertility

Table 1: Plants Used to Treat Female Infertility Ayurvedic herbal treatment of female infertility is discussed below.

Disorders	Herbal drug
Ovarian Disorders	Yograj Guggulu, Dashmoolarishta, Ashokarishta, and Chandraprabha Vati. The following herbal remedies are helpful for this condition: Harmal (Paganum), Guggulu (Commiphoramukul), Ashoka (Saraca indica), Dashmool (Ten Roots), Shatavari (Asparagus racemosus), and Aloes (Aloe vera). ^[35]
Ovulation problems caused due to polycystic ovarian syndrome (PCOS)	Varun (Crataevanuevula), Kanchnaar (Bauhinia variegata), Guggulu, and Latakaranj (Caesalpinia crista). Arogya Vardhini, Kanchnaar Guggulu, and Punarnava Guggulu are used to treat thyroid gland diseases. ^[36]
Premature ovarian failure (POF)	Ashoka, Dashmool, Chandraprabha, Shatavari, Guduchi, and Jeevanti (Leptadania reticulata). These medicines can be given in addition to hormone replacement therapy. ^[37]
Blocked fallopian tubes, adhesions (scar tissue) and pelvic inflammatory disease	KaishorGuggulu, Triphala, Guggulu, Guduchi, Kutki (Picrorrhizakurroa) and Punarnava can be used in these conditions. ^[38]
Cervical mucus	Vata (Ficus bengalensis), Ashwatha (Ficus religiosa), Udumbara (Ficus glomerata), Plaksha (Ficus infectoria), Shirisha (Albizia lebec), Haridra (Curcuma longa), Yashtimadhuk (Glycerrhiza glabra), Saariva and Manjishtha (Rubia cordifolia). ^[39]
Women who are underweight or have a small, undeveloped uterus or cervix	Shatavari, Ashwagandha (Withaniasomnifera), Vidarikand (Pueraria tuberosa), Ksheeridari (Ipomoea digitata), Bala (Sida cordifolia), Samudrashok (Argyria speciosa), Nagbala (Grewia hirsuta), Shrungatak (Trapa natans) and Yashtimadhuk. ^[40]
Some women do conceive, but are unable to retain the pregnancy till full-term	Guduchi, Kantakari (Solanum xanthocarpum), Brihati (Solanum indicum), Gokshur (Tribulus terrestris), Bhrungraj (Eclipta alba), Yashtimadhuk, Pippali (Piper longum), Bharangi (Clerodendrum serriatum), Padmakashtha (Prunus cerasoides), Rasna (Pluchea lanceolata) and Manjishtha. ^[41]

Herbal remedies for male infertility: A number of herbal remedies have been shown to be effective in treating or curing male infertility. The identified cause of infertility will determine the course of treatment and herbal medicine selection. The herbal remedies listed below are used to treat male infertility:

Y-Virilin: A double-blind randomized controlled study was conducted in India to examine the effects of the

herbal preparation Y-virilin (Rege et al., 1997a). There were two stages of the investigation. 52 patients in all were randomly assigned to one of two equal groups: the therapy group or the placebo group. For six months, the therapy group received one capsule of Y-virilin twice a day. There was no discernible difference in serum FSH levels or sperm motility after 6 months. A rise in the concentration of sperm was noted, and 25% of the couples succeeded in becoming pregnant.^[42]

Hochu-ekki-to: Three investigations carried out in Japan documented the effectiveness of Hochu-ekki-to, a traditional Japanese herbal remedy. An experimental (single-blind) study design was used for the first investigation (Ishikawa et al., 1992). For three months, a daily dosage of 7.5 g of the plant was given to 67 individuals. Both sperm motility and density showed a notable rise. The serum density values were $26 \pm 32 \times 106/\text{ml}$ and $38 \pm 38 \times 106/\text{ml}$, respectively, prior to and following the treatment. From $43 \pm 23 \times 106/\text{ml}$ to $54 \pm 22 \times 106/\text{ml}$, there was an increase in sperm motility. There was no change in serum FSH. Plants Used to Treat Female Infertility.^[43]

According to Furuya et al. (2004), the second study was also an experimental (single-case) investigation. 22 patients in all received 7.5 g of herb daily for three months of treatment. The number of sperm was raised to $42 \pm 32 \times 106/\text{ml}$ from $28 \pm 31 \times 106/\text{ml}$. Seminal plasma soluble Fas (sFas) was shown to have significantly enhanced, and sperm motility increased from $32 \pm 17\%$ to $39 \pm 19\%$. There was no discernible shift in IL-6 or IL-8 levels.

According to Akashi et al. (2008), the third study was also an experimental (single-case) investigation. For three months, 7.5 g of the herb were administered daily to 20 infertile patients as treatment. The amount of sperm motility rose from $33.0 \pm 13.5\%$ to $42.6 \pm 15.6\%$, while seminal RANTES, TNF- α , and IL-6 showed a minor decline. The same patients' baseline data and the outcome values were compared in all three studies.^[44]

Alpinia officinarum: A double-blind randomized controlled trial (RCT) was conducted in Iran to examine the effects of *A. officinarum*. 76 males with idiopathic infertility participated in this trial; they were randomized to receive therapy or a placebo. The treatment group received 100 mg of the herb's rhizome extract, whereas the placebo group was given 100 mg of sucrose three times a day for a period of twelve weeks. There was no discernible alteration in the motility of sperm or the volume of semen. However, there was a 62% rise in sperm count.^[45]

Nigella sativa: This member of the Ranunculaceae family's black cumin oil is thought to contain a favorable effect on male infertility. A double-blind RCT was used to investigate this impact. For two months, a total of eighty patients were randomly assigned to one of two groups: the intervention group, which received 2.5 ml of oil twice daily, and the placebo group, which received 2.5 ml of liquid paraffin twice daily. Sperm parameters showed a noteworthy rise in the treatment group.^[46]

Withania somnifera: An experimental (single-case) study was carried out in India to determine the impact of milk on the medicinal plant. From the Indian subcontinent, *Withania somnifera* root powder. The therapeutic group and control group comprised 150 male

patients in total, distributed equally. For three months, the intervention group was given 5 g of herb every day with milk. In comparison to the baseline, the patients' sperm parameters and hormones increased, and their lipid peroxide levels decreased. their starting point. By conducting a triple-blind randomized controlled trial in Iran to evaluate the comparative efficaciousness of *W. somnifera* and pentoxifylline. Two treatment groups were randomly assigned to a total of one hundred patients. In the pentoxifylline group, participants received six capsules in two different colors, three times a day for ninety days, containing 800 mg of this medication and a placebo. Group 1 received treatment with six capsules created in two different colors, containing 5 g of the WS root in three divided doses. Then, group 1 saw increases of 12.5% in sperm count, 21.42% in motility, and 25.56% in morphology; group 2 had smaller increases without a corresponding increase in sperm count. Groups 1 and 2 had conception rates of 18 and 12%, respectively.^[47]

Aphrodisiac plants: An experimental (single-case) study was conducted in India to investigate medicinal aphrodisiac plants, specifically *Mucuna pruriens*, *Chlorophytum borivilianum*, and *Eulophia campestris* (Mahajan et al., 2012). Twenty oligozoospermic patients in total were split equally between the treatment and control groups. The treatment group was then given a 20 mg/kg herbal composition twice a day for ninety days. Following treatment, the patients' serum levels of FSH, LH, testosterone, and sperm motility were all significantly higher than they were at baseline.^[48]

Crocus sativus Linn: Iran carried out a double-blind RCT to evaluate the effectiveness of saffron (*C. sativus*). A total of 260 patients were randomized to receive a placebo and an intervention. For 26 weeks, the treatment group received 30 milligrams of saffron twice a day, while the placebo group received 30 mg of starch twice a day. Saffron is ineffective in treating male infertility since no discernible improvement in semen parameters or hormones was observed during the therapy period.^[49]

Topalaf: It is a powdered mixture of several plants, such as *Lepidium sativus*, *Amygdalus communis*, *Ficus carica*, pollen from *Phoenix dactylifera*, *Tribulus terrestris*, and *Orchis mascula* root. In an experimental investigation, 62 patients were divided into treatment and placebo groups (Khoradmehr et al., 2014). For three months, Topalaf was given to the therapy group three times a week. Sperm motility increased by a total of 12.9%, while sperm count increased by 8.14% from the baseline. Nonetheless, a slight alteration in the morphology of sperm was noted. In the therapy group, 18.75% of couples became pregnant, whereas the control group's rate was 3.3%.^[50]

Gushenyutai: This transdermal patch is created from twenty-three different plants. An RCT was carried out in China by Peng et al. to determine the degree to which

Gushenyutai plaster affected male infertility. A therapy group and a control group were randomly assigned to a total of sixty-two patients. For eight weeks, comprehensive therapy was given to the control group and Gushenyutai plaster was supplied to the treatment group. There was a noticeable increase in sperm density. In the treatment and control groups, the corresponding pregnancy rates were 38.71 and 16.13%, respectively.^[51]

Date palm pollen (DPP): An experimental investigation in which 40 male infertiles were enrolled. Patients received 120 mg/kg of powdered DPP capsules every other day. After 60 days, the patients' semen concentration, morphology, and motility showed a discernible improvement over their baseline values. 4.6% more sperm motility was observed. The volume of semen did not, however, alter considerably.^[52]

Qixiong Zhongzi: An RCT was conducted in China to examine the effects of Qixiong decoction, a Chinese herbal remedy. A total of sixty-six patients were split into two groups at random: the treatment group and the control group. A 150 ml decoction of QixiongZhongzi was administered twice a day to the treatment group, and 1 g of levocarnitine was administered twice a day to the control group. After 12 weeks, there was no discernible difference in the amount of semen or sperm density. Not a single couple became pregnant. Nonetheless, there was a noticeable rise in sperm motility.^[53]

Korean red ginseng: To evaluate the effectiveness of red ginseng in male infertility, Park et al. (2016) carried out a double-blinded RCT. Eighty patients in all, one for the intervention and one for the placebo. For a duration of 12 weeks, the treatment group was administered three 500 mg red ginseng capsules every day. All sperm parameters showed a considerable rise by the conclusion of the research, whereas the hormone concentrations in the plasma did not alter.^[54]

Compound herbal medicine: 40 patients received 700 mg capsules of a compound herbal cure once day as part of an experimental trial carried out by Ouladsahebmadarek et al. Allium cepa, Cinnamomum verum, Zingiber officinale, Ocimumbasilicum, Citrullus lanatus, Citrus sinensis peel, and Daucus carota seeds were included in the compound herbal medicine (Ouladsahebmadarek et al., 2016). After six months, the patients' sperm parameters showed a considerable rise, and 17.9% of the couples said they were pregnant.^[55]

Tomato juice: To assess the impact of tomato juice on male infertility, a randomized controlled trial was carried out in Japan. Two therapy groups and one control group were randomly assigned to a total of 54 patients. Over the course of 12 weeks, treatment groups 1 and 2 received different doses of lycopene (30 mg from tomatoes and an antioxidant capsule, respectively). By the sixth week, group 1 of the treatment showed a

significant improvement in both sperm concentration and motility, while group 2 showed no improvement.^[56]

Ceratonia siliqua: To find out how well carob syrup (*C. siliqua*), an evergreen shrub or tree, works as an antioxidant in conjunction with vitamin E to treat male infertility, a parallel randomized controlled study was carried out. Sixty individuals were allocated into two therapy groups for this trial. For three months, group 2 received 100 mg of vitamin E twice a day, while group 1 received 7.5 ml of carob syrup twice a day. The group that consumed carob syrup had significantly lower levels of malondialdehyde (MDA) and significantly higher semen parameters and testosterone levels. Semen parameters improved in the vitamin E group as well, albeit not as much as in the carob syrup group. The conception rate was 23% for the carob syrup group versus 13% for the vitamin E group.^[57]

Sheng Jing Zhong Zi Tang: Yang et al. (2001) conducted an experimental (single-case) investigation to determine the effectiveness of the Chinese decoction Sheng Jing Zhong Zi Tang in treating spermatopathy patients. The decoction was used to cure 83 out of 87 (95.4%). The findings also suggested that the decoction might regulate testosterone, cortisol, luteinizing hormone, and follicle-stimulating hormone levels in two ways.^[58-60]

Future Directions

Research on the use of herbal medications for infertility is a promising field with the following possible avenues for further investigation:

1. Standardization and Quality Control

To guarantee the uniformity and effectiveness of herbal products, standardized extracts and quality control procedures should be established.

2. Mechanistic Studies

Examining herbal components' molecular mechanisms of action to comprehend how they affect reproductive health.

3. Clinical Trials

Performing carefully planned clinical studies to assess the effectiveness and safety of herbal treatments for infertility.

4. Personalized Medicine

Investigating how herbal medicine might be used to create individualized treatment plans that adjust treatments to each patient's requirements and genetic makeup.

5. Integration with Conventional therapy

Creating integrative treatment plans that enhance reproductive outcomes by combining herbal therapy with traditional medical techniques.^[61-62]

CONCLUSION

Male and female infertility can be summarized as follow; Infertility is a complex issue influenced by various factors, including hormonal imbalance, lifestyle choice, environmental factors and genetic predispositions. Male infertility often involves issues such as decreased sperm quality and motility, hormonal disorder and anatomical problems. Female infertility may arise from ovulation disorders, damage fallopian tubes and uterine abnormalities.

Herbal remedies and lifestyle changes, such as maintaining a balance diet, regular exercise and managing stress can support both male and female infertility. However, it is crucial to seek medical advice before starting any treatment. Ultimately, addressing infertility requires a personalized approach that combines medical interventions with holistic methods.

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