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EXPLORING THE ROLE OF WIDELY USED MEDICINAL PLANTS IN MALE AND FEMALE REPRODUCTIVE HEALTH AND ANTI-INFERTILITY ACTIVITY

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ABSTRACT

Infertility, defined as the inability to conceive after one year of intercourse without the use of contraception, affects 15% of couples. This review aimed to provide a comprehensive overview of the medicinal plants used historically to treat male and female infertility by various tribes and ethnic groupings. By looking through academic publications and textbooks and contacting globally renowned scientific databases, we carried out an extensive analysis of the scientific literature. To locate pertinent publications published in journals indexed by the Information Sciences Institute, CENTRAL, Embase, PubMed, Science Direct, Google Scholar, Scopus, and Scientific Information Databases were employed for infertile couples, plants offer an accessible and reasonably priced therapeutic alternative, and phytotherapy is a crucial component of our healthcare system. However, a large percentage of medicinal plants used traditionally to treat male reproductive diseases have not yet been scientifically examined, and herbal products are still utilized anarchically in many regions and countries. Numerous medicinal plants, including *Apium graveolens, Asparagus racemousus, Cassia alata, Cinnamomum zeylanicum, Fumaria officinalis, Fumaria parviflora, Moringa oleifera, Nigella sativa, Withania somnifera, and Zingiber officinale*, have been reviewed in this paper based on research on their use in the reproductive systems of both male and female. This evaluation establishes a strong basis for future research on the effectiveness of plants that are now utilized in conventional anti-infertility medications.

KEYWORDS: Infertility, Phytomedicine, Phytotherapy, Antioxidant, Chemotherapeutics.

1. INTRODUCTION

Infertility, which affects 15% of couples, is defined as the failure to conceive after a year of sexual activity without the use of contraception.[1] Male infertility is more prevalent than female infertility; it affects around one in twenty men and accounts for half of infertile marriages, with the remaining 50% stemming from problems with women.[2] Diabetes has a detrimental effect on both male and female reproductive functioning.[3] Infertility is a major issue for the current population because of the intricate relationships between biological and social interactions and sexual dysfunction. Assisted reproductive techniques (ART), varicocelectomy, gamete intrafallopian transfer (GIFT), transurethral ejaculatory duct resection (TEDR), and other preliminary tubal reanastomosis procedures are commonly used to treat infertility, although they have the danger of resulting in an ectopic pregnancy. The adverse effects of the chemical techniques, which include obesity, cholethiasis, stomach problems, ovarian cancer, breast and cervical cancer, mental disorders, neural tube defects, asthma, and thromboembolism, reduce their usefulness and popularity among women. Additionally, hormonal contraceptives can cause cancer. Because of their little and nonexistent adverse effects, plant products are currently attracting the interest of numerous scientists as a major source of naturally occurring fertility regulating agents.[4] The World Health Organization (WHO) estimates that 80% of people in developing countries mostly use herbal treatments.[5] It is now recognized that a third of commonly used drugs come from natural sources, and between 40,000 and 70,000 species of medicinal plants have been found to have extraordinary therapeutic potential.[6] Nonetheless, a large portion of medicinal plants are still utilized to treat reproductive problems from antiquity, and many countries and regions still use herbal medicines indiscriminately. The medicinal plants used to treat infertility and the effectiveness of phytomedicines as a therapeutic approach are the main topics of this study.

2. REVIEW METHODOLOGY

Data gathered from publications found in scientific databases including Embase, Pubmed, Science Direct, Google Scholar, and Scopus. In order to properly collect data on the medicinal plants used to treat infertility, a large number of papers were evaluated.

3. MALE INFERTILITY

According to Agarwal et al. male infertility causes a great deal of psychological and social suffering in addition to placing a heavy financial burden on the healthcare system.[7] According to Oztekin et al. male infertility is most commonly caused by low sperm count (Oligozoospermia), impaired sperm motility (Asthenozoospermia), decreased sperm vitality (Necrozoospermia), impaired sperm morphology (Teratozoospermia), or a combination of these parameters (Oligoasthenoteratozoospermia and Azoospermia).[8] Raheem and Ralph (2011) state that azoospermia, varicocele, testicular cancer, hypogonadism, undescended testicles, and premature ejaculation can all lead to male infertility.[9] In addition, genitourinary tract infections, immunological variables, endocrine diseases, and drug-related issues might cause infertility in men.[10] By influencing spermatogenesis, hormone modulation, oxidative stress, and the regulation of genes linked to spermatogenesis, conditions such systic fibrosis, Turner syndrome, and fragile X syndrome can result in male infertility. The two most widely used chemotherapeutics for male infertility are clomiphene citrate and anastrozole.[11,12,13]

4. FEMALE INFERTILITY

Endometriosis, fallopian tube blockage, and irregular ovulation are the causes of female infertility.[14] Female infertility can result from a number of diseases, including hormonal imbalances and cervical issues, such as benign polyps or

tumors and cervical stenosis. Female infertility can result from a number of serious hormonal conditions, including polycystic ovary syndrome (PCOS), uterine fibroids, hypothalamic malfunction, hyperprolactinemia, pelvic inflammatory disease (PID), and premature ovarian failure (POF).[15] Since metformin is the only treatment for PCOS, and because it is a common cause of infertility, PCOS has garnered a lot of attention. This insulin-sensitivity drug promotes ovulation, which lowers weight and boosts fertility.[16,17] Physical signs of female infertility include changes in sex drive and desire, weight increase, excessive hair growth, skin changes, and irregular or painful menstrual cycles. Similarly, the mental sickness linked to the same includes poorer self-esteem, sadness, worry, despair, guilt, and worthlessness.[18] Gonadotropins and clomiphene citrate are the two drugs most commonly used to treat infertile women.[19]

5. ADVERSE EFFECTS OF SYNTHETIC ANTI-INFERTILITY DRUGS

One of the often used therapy approaches to reverse infertility is the use of chemical-based anti-infertility medications. By interfering with the brain and endocrine systems, synthetic drugs can impair the body's capacity to reproduce. Natural hormone production, secretion, transport, and action may be hampered by these chemicals. Ovarian hyperstimulus syndrome, numerous pregnancies, and the long-term danger of ovarian tumors are frequently linked to female anti-infertility medications. Similar side effects include altered energy levels, heightened aggression, male pattern baldness, and clouded eyesight in men taking anti-infertility medications.[20]

6. MEDICINAL PLANTS USED IN INFERTILITY TREATMENTS

According to Nanita et al. phytotherapy is an essential kind of treatment in our healthcare system, and plants provide a cost-effective and accessible therapeutic alternative.[21] A single plant contains a range of phytochemicals that can interact to cause different effects.[22] The majority of herbal medications work by managing oxidative stress through their anti-oxidant properties, which in turn mediate infertility. According to Akbaribazm et al. a number of plants and their secondary metabolites can help women with reproductive issues like endometriosis, hyperprolactinemia, hypothalamic malfunction, PCOS, and premature ovarian failure (POF). *Apium graveolens, Asparagus racemousus, Cassia alata, Cinnamomum zeylanicum, Fumaria officinalis, Fumaria parviflora, Moringa oleifera, Nigella sativa, Withania somnifera, Zingiber officinale* are some of the well known medicinal plants commonly used in traditional medicine to treat male and female reproductive problems problems.[23]

6.1. *Apium graveolens* (Celery)

The marshland plant *Apium graveolens* is a member of the Apiaceae family and has been grown for its edible properties since ancient times. According to earlier reports, celery can protect testicles from toxins including sodium valproate, propylene glycol, and diethyl phthalate. According to Kooti et al. the spermatogenesis process is accelerated by the hydroalcoholic extract of *Apium graveolens* leaves. The plant's flavonoid components, which include phenolic acids, vitamin E, vitamin C, and adrenaline, may be the cause of this effect. Because greater doses can be harmful, the administration range should be carefully examined.[24,25]

6.2. *Asparagus racemousus* (Satawar)

The Liliaceae family includes the spiny shrub *Asparagus racemousus*. It is a revitalizing medicinal herb that can reverse infertility in females. It can be taken orally to treat miscarriage, libido loss, and menopausal problems.[26] One of the most important herbal medicines that is commonly used to enhance ovarian function and increase the synthesis of reproductive hormones is *Asparagus racemousus*. Satavar can control stress-related reproductive health problems in

women because of its antioxidant properties. The function of the bioactive chemicals found in satawar to enhance reproductive health has not yet been clarified, despite the fact that its efficacy against infertility has been established.[27]

6.3. *Cassia alata* (Ringworm bush)

The shrub *Cassia alata* is a member of the fabaceae family. Antibacterial, antihyperlipidemic, antifungal, antilipogenic, antioxidant, and antihelmintic qualities are among *C. alata's* main biological effects. However, its anti-infertility qualities are not mentioned in many studies. A new study claims that the roots and seeds might be utilized to control uterine disorders, hence enhancing the reproductive health of women.[6]

6.4. *Cinnamomum zeylanicum* (Cinnamon)

The Lauraceae family includes the evergreen tropical tree *Cinnamomum zeylanicum*. According to earlier findings, cinnamon has a significant function in treating male infertility. According to Fathiazad et al. giving cinnamon to a man can boost his antioxidant properties and testosterone levels overall. Since ginger and cinnamon have significant good effects on sperm viability, motility, serum total testosterone, LH, FSH, and serum antioxidant levels, combining them can aid in preserving advantageous sperm parameters and male reproductive processes.[28,29]

6.5. *Fumaria officinalis* (Common fumitory)

The herbaceous annual blooming plant *Fumaria officinalis* belongs to the Papaveraceae family. Extracts from Fumaria species have long been used to treat male infertility because they contain isoquinoline alkaloids. It was discovered that F. officinalis extracts might repair testicular injury and encourage the growth of germ cells.[30]

6.6. *Fumaria parviflora* (Fineleaf fumitory)

The flowering plant *Fumaria parviflora* is a member of the Papaveraceae family. According to some reports, the natural extract of *F. parviflora* promotes male fertility and has anti-inflammatory, anti-diarrheal, bronchodilator, anthelmintic, laxative, and anti-protozoal properties. The extract from *F. parviflora* leaves may improve male reproductive function and hence increase fertility due to its potent antioxidant properties and androgenic effects. Given that oligospermia and azoospermia are two of the causes of male infertility, the extract of *F. parviflora* is also helpful in promoting the development of germinal cells.[31,32]

6.7. *Moringa oleifera* (Drumstick tree)

The Moringaceae family includes the desiduous plant *Moringa oleifera*. *M. oleifera* can eradicate all of the detrimental effects of reactive oxygen species on the male reproductive system by directly affecting the pathways of male reproductive function. Additionally, it can improve erection, ejaculatory function, desire, and semen quality.[33] A recent study found that consuming *M. Oleifera* leaf extract can dramatically raise progesterone levels, which encourages pregnancy.[34] However, further research is necessary to determine the precise mechanism of action of *Moringa oleifera's* involvement in the mechanisms that manage reproductive health.

6.8. *Nigella sativa* (Black cumin)

The Ranunculaceae family includes the annual plant *Nigella sativa*. Its seeds are used as a herb and as a powerful herbal remedy. The scientific community generally agrees on *N. sativa's* nutritional value and biological activities. *Nigella sativa* and its main ingredient, thymoquinone, have been shown in animal experiments to improve the

properties of sperm, semen, Leydig cells, reproductive organs, and sexual hormones. *N. sativa's* ant-oxidant properties, which are essential for scavenging free radicals, are the main potential mechanism.[35]

6.9. *Withania somnifera* (Aswagandha)

A little evergreen shrub, *Withania somnifera* is a member of the Solanaceae family. According to Sengupta et al. *W. somnifera* has antioxidant qualities and inhibits lipid peroxidation in spermatozoa, which is believed to be a major factor in idiopathic male infertility. Research indicates that administering aswagandha can considerably boost sperm motility and concentration. The standardization of sex hormone levels in infertile males experiencing physiological or psychological stress is associated with *Withania somnifera.*[36]

6.10. *Zingiber officinale* (Ginger)

The Zingiberaceae family includes the herbaceous plant *Zingiber officinale.* According to Zahedi et al. the ginger extract was observed to increase testosterone levels, which in turn stimulated spermatogenesis and cauda epididymal sperm stores.[37] Morakinyo et al. claim that Z. officinale's antioxidant properties can increase sperm motility and testosterone levels. Men's reproductive processes and healthy sperm parameters can be preserved by combining ginger and cinnamon.[38]

CONCLUSION

The fact that around one in six adults worldwide experience infertility highlights the critical need to give those in need access to affordable, high-quality reproductive care. Herbal-based medications are replacing chemical-based ones these days due to their severe negative effects. Anti-infertility properties have been found in a number of ethnomedicinal herbs from different families and genera. This study critically evaluates a number of anti-infertility medicinal plants, including *Apium graveolens, Asparagus racemousus, Cassia alata, Cinnamomum zeylanicum, Fumaria officinalis, Fumaria parviflora, Moringa oleifera, Nigella sativa, Withania somnifera, and Zingiber officinale. Cinnamomum zeylanicum, Fumaria officinalis, Fumaria parviflora, Moringa oleifera, Nigella sativa, Withania somnifera, and Zingiber officinale* are among the *Apium graveolens* species that have been found to preserve male reproductive health and prevent infertility, while other species are used to treat female infertility issues. These plants have strong anti-reproductive properties because they contain a number of bioactive chemicals. The vast majority of these plants interfere with antioxidant pathways by scavenging free radicals, although their precise mechanism of action is not well understood. Therefore, further research should be conducted to determine the pharmacological, phytochemical, and toxicological impacts of medicinal plants used to treat infertility. It's also critical to identify the active compounds in order to adequately verify the genuine remedies.

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