

Systematic Review: Conservative Acupuncture Treatment for Infertility Causes in Asia

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ABSTRACT

Background failure to conceive within a year of frequent, unprotected sexual activity is known as infertility, and a variety of conditions or unexplained causes can cause it. A common non-pharmacological therapy approach, acupuncture is essential to complementary and alternative medicine. Acupuncture may enhance the reproductive system's function and regulate the body's hormones by stimulating specific acupoints. This systematic review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. This study aims to identify conservative acupuncture treatment for infertility causes because there is no clear summary of acupuncture and infertility with different infertility issues in Asia. A comprehensive search was performed across several databases, including PubMed and Google Scholar. The search was limited to studies published between 2019 and 2024 that were written in the English language. Infertility in both men and women can be improved with acupuncture treatment. By stimulating specific acupuncture points, acupuncture may better regulate the body's hormones and enhance the function of the reproductive system. For both men and women, acupuncture therapy can aid with infertility.



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INTRODUCTION

Failure to conceive within a year of frequent, unprotected sexual activity is known as infertility, and a variety of conditions or unexplained causes can cause it. The issue has been deemed a public health priority since it can result in some psychological problems, social stigmatization, financial pressure, and even marital strife. Between 1990 and 2017, the age-standardized prevalence of infertility for men and women grew by 8.22% and 14.96%, respectively, and the disability-adjusted life-years (DALYs) and the global illness burden of infertility similarly increased for both genders. At least 180 million couples of reproductive age have been impacted globally (Yang et al., 2023). Apart from that, infertility is defined as the inability to conceive after a year of frequent, unprotected sexual activity. Between 8 and 12 percent of couples worldwide struggle with infertility, and the percentage is rising in the present era. Both male and female factors account for 20% of the instances (Zhu et al., 2018)

A worldwide population health issue, male infertility (MI) affects 2.5% to 15% of the population, and up to 25% of MI is caused by conditions unique to men. Due to locoregional variables such as unequal healthcare system distribution and sociocultural views, particularly in patriarchal civilizations, the Asia-Pacific (AP) region is estimated to have a greater rate of MI than Western nations. In a similar vein, male sexual dysfunction (MSD) is still a very common problem, with an estimated one-third of men experiencing some form of MSD at some point in their lives. Erectile dysfunction (ED), ejaculatory disorders (EjD), orgasmic dysfunction, and decreased sexual desire make up the majority of MSD. Males may be affected by MSD. The emphasis on the importance of acupuncture in Asia and its potential divergence in methodology

or prevalence relative to Western nations is pronounced. This backdrop is beneficial, particularly when discussing the disparities in male infertility rates and treatment methodologies throughout Asia-Pacific (Chung et al., 2023).

The inability to achieve a clinical pregnancy following a year of consistent, unprotected intercourse is the hallmark of female infertility. Except for modern contraception, a variety of conditions, habits, and causes can interfere with pregnancy and result in infertility. Additionally, growing older has been considered a significant contributing element to female fertility. In recent years, there has been a rise in the frequency of female infertility among younger women. Premature ovarian insufficiency (POI), polycystic ovary syndrome (PCOS), chronic endometritis (CE), and endometrial polyps are among the reproductive and endocrine disorders that are steadily increasing in the frequency of female infertility as a result of unhealthy lifestyles and environmental causes. They all prevent pregnancy from developing in various nodes and result in unfavorable pregnancy outcomes (Xu et al., 2022).

A common non-pharmacological therapy approach, acupuncture is crucial to complementary and alternative medicine. By encouraging local blood circulation, reducing oxidative stress damage, and adjusting hormone levels, acupuncture may help increase sperm number, density, vitality, and morphology, increasing the likelihood of conception. Acupuncture stimulates somatic afferent nerves at designated acupoints, activating neurohormonal pathways that affect autonomic function, endocrine regulation, and local tissue repair. Despite its widespread applicability, gender-specific anatomical and physiological distinctions result in varying therapeutic outcomes. Comprehending these distinctions is crucial for personalized, sex-informed integrative care. Acupuncture influences the hypothalamic-pituitary-ovarian (HPO) axis, impacting the secretion of gonadotropin-releasing hormone (GnRH), follicle-stimulating hormone (FSH), and luteinizing hormone (LH). In males, it enhances testicular blood circulation, diminishes oxidative stress, and regulates the hypothalamic-pituitary-gonadal (HPG) axis. Acupuncture may also improve sperm viability by regulating hormone levels and testicular blood flow, according to several animal studies. It also raises superoxide dismutase (SOD) activity levels to help the body get rid of excess oxygen free radicals, increasing the sperm acrosome response and encouraging the production of β -endorphins. The Inner Canon (Neijing) is where the Acupuncture method known as "Zhibian (BL 54)-to-Shuidao (ST 28)" first appeared. Professor Laixi Ji later standardized and improved it. Both men's and women's reproductive system diseases have been treated with it. The Acupuncture point known as "Zhibian (BL 54)" is situated on the Foot Taiyang's Bladder Meridian and serves to clarify and benefit the bladder by encouraging the flow of meridians. The Acupuncture point "Shuidao (ST 28)" on the Foot Yangming's Stomach Meridian controls water routes, balances menstruation, and is suitable for the kidneys. When acupuncture is applied obliquely from "Zhibian (BL 54)" to "Shuidao (ST 28)," It causes the perineal and pelvic plexus nerves to become stimulated, which permits the needle's sensation to spread throughout the genital region. This encourages "qi" to flow to the afflicted location, which regulates the vicinity's reproductive organs.

Furthermore, according to traditional Chinese medicine (TCM), the kidney and bladder meridians have exterior-interior linkages. Here, acupuncture nourishes the kidneys and restores their essence, making the reproductive system more vibrant (Hao et al., 2024). This study aims to identify conservative Acupuncture treatment for infertility causes because there is no clear summary of acupuncture and infertility with different infertility issues in Asia.

METHOD

This systematic review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. This study aims to identify conservative Acupuncture treatment for infertility causes because there is no clear summary of acupuncture and infertility with different infertility issues in Asia. A comprehensive search was performed across several databases, including PubMed and Google Scholar. The search was limited to studies published between 2019 and 2024 that were written in English.

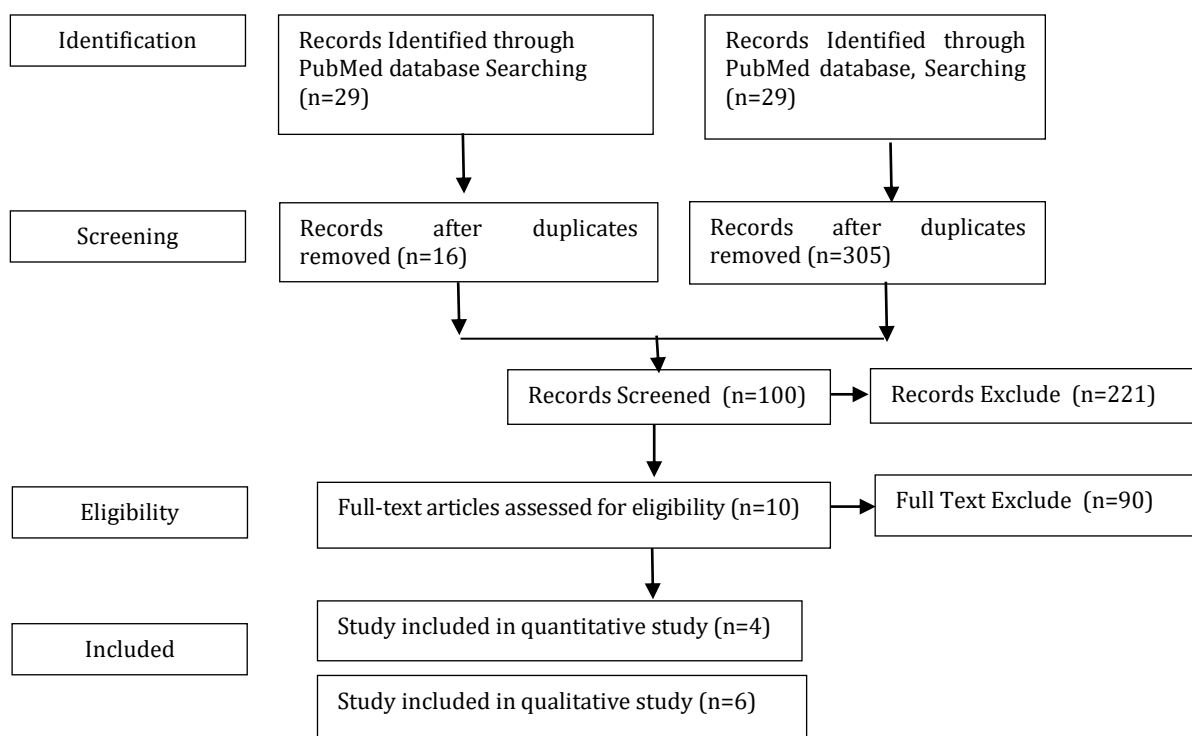


Figure 1. PRISMA analysis

RESULTS

No	Author/Year/Title	Design Study/Results
1.	Han Yang , Zhi-yong Xiao, Zi-han Yin, Zheng Yu, Jia-jia Liu, Yan-qun Xiao, Yao Zhou, Juan Li, Jie Yang , Fan-rong Liang. (2023). Efficacy and safety of acupuncture for polycystic ovary syndrome: An overview of systematic reviews	A descriptive analysis suggested that combining acupuncture with other medicines can effectively improve the clinical pregnancy rate (CPR) and ovulation rate, and reduce the luteinizing hormone/follicle-stimulating hormone ratio, homeostasis model assessment of insulin resistance, and body mass index (BMI). When compared with medicine alone, acupuncture alone can also improve CPR. Further, compared with no intervention, acupuncture had a better effect in promoting the recovery of the menstrual cycle and reducing BMI. Acupuncture was reported to cause no adverse events or some adverse events without serious harm.
2.	Liu Yun, MD; Wu Liqun, MM; Yao Shuqi, MD; Wu Chunxiao, MD; Lu Liming, MD; Yi Wei, MD. (2019). Acupuncture for infertile women without undergoing assisted reproductive techniques (ART): A systematic review and meta-analysis	A systematic review and meta-analysis found that acupuncture and its combined therapy may be effective for treating female infertility. However, the included studies are not robust enough to draw a firm conclusion due to the lack of robust sample quality. Future high-quality RCTs are needed to confirm our findings.
3.	Feng, J., He, H., Wang, Y., Zhang, X., Zhang, X., Zhang, T., Zhu, M., Wu, X., & Zhang, Y. (2022). The efficacy and mechanism of acupuncture in the treatment of male infertility	A Literatur Review Found that The merits of acupuncture in treating male infertility mainly include the following: (1) the advantages of acupuncture for male infertility include no side effects, few adverse effects, and low cost; (2) the combination of acupuncture and conventional therapy can improve the efficacy of male infertility; and (3) from the perspective of TCM, Acupuncture can regulate the body as a whole, thereby treating male infertility.

No	Author/Year/Title	Design Study/Results
4.	Liao YH, Lin JG, Lin CC, Tsai CC, Lai HL, Li TC. (2020). Traditional Chinese Medicine Treatment Associated with Female Infertility in Taiwan: A Population-Based Case-Control Study.	A quantitative analytic study found that TCM is associated with a higher likelihood of successful pregnancy in infertile women, which is worthy of further investigation by a randomized controlled trial.
5.	Huang W, Han X, Li Y, Huang T, Jie H. (2022). Acupuncture Combined with Chinese Herbal Medicine for Tubal Obstructive Infertility: A Systematic Review and Meta-Analysis.	A Meta-analysis showed that Acupuncture and CHM can be used as complementary therapies to treat tubal obstructive infertility with better outcomes than Hydrotubation.
6.	Peng X. (2021). Efficacy of Acupuncture for Male Infertility with Low Sperm Quality 102 Male Cases of Idiopathic Asthenospermia, Oligospermia and Teratospermia.	A quantitative analysis found that acupuncture is effective in treating low sperm quality and in restoring male fertility. It can be used in clinical practice in treating male infertility. Acupuncture can be considered an effective alternative treatment after several failed attempts at IUI or ICSI-IVF.
7.	Li H fang, Zhang J xia, Chen W jun. (2023). Dissecting the efficacy of Acupuncture and Chinese herbal medicine for treating premature ovarian insufficiency (POI): A systematic review and meta-analysis.	A quantitative analysis found that Acupuncture plus Chinese herbal medicine is an efficacious and safe treatment option for POI patients. These findings must be verified by conducting large-scale, multicenter, high-quality, and long-term randomized controlled trials.
8.	Zhang H, Colonnello E, Sansone A, et al. (2023). Acupuncture for premature ejaculation: a systematic review and meta-analysis	The systematic review and meta-analysis show that acupuncture has a significant effect on several subjective PE parameters, such as improving the feeling of control over ejaculation and distress, particularly when used in an integrated way. However, due to the low quality of evidence, acupuncture still needs larger, well-designed RCTs to be confirmed.
9.	Ma Y, Wang R, Yang H, Liu R, Wang D. (2022). Research Progress of Acupuncture and Moxibustion Treatment of Oligoasthenospermia.	A descriptive analysis found that acupuncture can improve the content of neutral α -1,4 glycosidase in seminal plasma, promote the transformation of glucose, provide energy for sperm, and maintain sperm activity by improving the ability to resist oxidative stress.
10.	Hao J, Ren J, Chang B, Xu H, Wang H, Ji L. (2024). Transcriptome and proteomic analysis reveal the protective mechanism of acupuncture on reproductive function in mice with asthenospermia.	A quantitative analysis found that acupuncture can effectively regulate the disruption of cyclophosphamide-induced serum hormone levels in asthenozoospermic mice, repair damaged testicular and epididymal tissues, alleviate germ cell apoptosis, and improve reproductive functions.

DISCUSSION

According to the World Health Organization, infertility is a serious worldwide health issue that is becoming increasingly common. It is defined as the inability to obtain a clinical pregnancy after 12 months or more of frequent, unprotected sexual activity. The presence or lack of a prior pregnancy determines whether infertility is classified as primary or secondary. Abnormal sperm function or blockages that hinder sperm delivery and result in low sperm production can be the cause of male infertility. Anovulation, endometriosis, uterine anomalies, obstructed fallopian tubes, and pelvic adhesions are the most prevalent reasons for infertility in women. Furthermore, there are many other risk factors for infertility, ranging from reproductive history

to maternal health and lifestyle. Infertility is also influenced by age and genetic factors, which are risk factors that cannot be changed (Lee et al., 2024)

Knowledge of the pregnancy cycle and preceding information is necessary to comprehend female infertility. Sperm enter the vagina and go upward via the cervix into the uterus to begin the pregnancy cycle. The sperm next proceeded to the fallopian tubes, where they met the ova and fertilized them. Cilia in the fallopian tube lining travel toward the uterine cavity with the fertilized egg. It is implanted in the endometrium after entering the uterus; in other words, the embryo is injected to finish the pregnancy. Therefore, for a conception to be successful, the sperm must reach the cervix, meet the ova in the fallopian tubes, fertilize without interference, travel successfully into the uterus, and implant the embryo (Xu et al., 2022).

In China, acupuncture has traditionally been used to treat reproductive disorders in both men and women. According to basic studies, acupuncture can enhance uterine blood flow and impact the menstrual cycle and gonadotropin-releasing hormone release. Acupuncture has been found in prior systematic reviews to reduce the pregnancy loss rate. Additionally, studies have demonstrated that acupuncture can improve mental health and fertility results for both men and women. A growing number of patients are choosing acupuncture as a conservative treatment due to a string of side effects, inexplicable repeated implantation failure, or the high expense of ART. (Tian et al., 2024)

Acupuncture and female infertility

First off, PSOS is a contributing factor to infertility. Anovulation, hyperandrogenism, and polycystic ovarian morphology are the hallmarks of PCOS, an endocrine and reproductive condition. According to this somewhat trustworthy data, acupuncture alone or in combination with medication may increase the clinical pregnancy rate (CPR) in PCOS patients when compared to medication alone. When combined with medication, acupuncture can also effectively increase the ovulation rate and decrease body mass index (BMI), HOMA-IR, and LH/FSH. Acupuncture was more effective than no intervention, promoting menstrual cycle recovery and lowering body mass index. Acupuncture was believed to offer no extra benefit in lowering the miscarriage rate (MR) (Yang et al., 2023).

Second, endometriosis, uterine fibroids, damaged or blocked fallopian tubes, ovulatory dysfunction (e.g., PCOS), and tubal patency, which is abnormal because of adhesions, tubal obstruction, etc, are common reasons for female infertility. Tubal Obstructive Infertility (TOI) is the ensuing infertility, which accounts for 11–67% of infertility in women. The following elements are part of the evidence supporting CHM and Acupuncture for TOI: (1) Improving the uterine and ovarian hemodynamics. According to one study, the hemodynamic rheological markers of the uterus and ovary might be successfully improved by using Chinese herbal medication to treat salpingitis-related obstructive infertility. Rats in the experimental group of this study's tubal obstructive infertility model had hemorheological indices that were noticeably lower than those of the group receiving cefuroxime and metronidazole treatment from Western medicine. Another study found that when used with traditional Chinese medicine to treat salpingitis-related obstructive infertility, acupuncture could successfully enhance hemorheological indicators, decrease the expression of sICAM-1 protein, and encourage the absorption and dissipation of inflammation. 2) Immunity regulation. A study verified that acupuncture may successfully raise β -endorphin levels in rats' hypothalamus and peripheral blood. A universal messenger of the immunological, endocrine, and neurological systems, β -endorphin, an endogenous opioid peptide, regulates the female gonadal axis and is essential for neuromodulation and preserving the stability of the body's internal environment. (3) Controls the pituitary-ovarian-hypothalamic axis. Treatment with traditional Chinese medicine has been shown to enhance women's ovarian function and boost the rate of natural conception both domestically and internationally. A meta-analysis revealed that women's FSH levels were dramatically lowered by CHM therapy, while another study demonstrated the in vitro estradiol action of Danggui Buxue decoction (Huang et al., 2022).

Third, in females under forty, impaired hormonal and reproductive processes are the hallmark of premature ovarian insufficiency (POI). About 1% of women in the general

population are afflicted by it at the moment, and its prevalence is steadily rising. POI is a multifactorial gynecological endocrine disease that may be linked to autoimmune diseases, socioeconomic status, or exposure to ethanol during pregnancy. ElectroAcupuncture and needle Acupuncture are two distinct but popular forms of acupuncture that have been demonstrated to improve ovarian function, control the reproductive endocrine system, and increase ovarian blood flow in women with POI. Guanyuan (RN4), Sanyinjiao (SP6), and Zigong (EX-CA1) are the three most commonly used acupoints, and the Ren Meridian, Spleen Meridian of Foot-Taiyin and, and Bladder Meridian of Foot-Taiyang are the most commonly used meridians. Most acupoints are found in the chest, belly, lumbar area, and lower limbs. According to a study, acupuncture treats POI in the same way that estrogen does. It may do this by increasing the production of genes and proteins in the phosphoinositide 3-kinase/Akt/mammalian target of rapamycin signaling pathway (Li et al., 2023).

Then, in Taiwan, only the categories of regular and irregular menstrual cycles showed a consistent relationship between TCM use and a successful pregnancy, according to the findings of our subgroup analysis. Although the magnitude of OR was marginally greater than or comparable to those in women without these corresponding comorbidities, there was no significant correlation between TCM and a successful pregnancy in women with polycystic ovarian syndrome, endometriosis, or dysmenorrhea. The limited sample size for women with endometriosis, dysmenorrhea, or polycystic ovarian syndrome may be the cause of these findings. Although this relationship is not significant, it appears that uterine fibroids harm the use of TCM and a successful pregnancy (Liao et al., 2020).

Assisted Reproductive Techniques (ART), which includes controlled ovarian stimulation (COS) with or without intrauterine insemination (IUI) and in vitro fertilization (IVF), is the current infertility treatment. The chances of treating infertility have improved with the use of ART. However, success rates are still only about 30% every cycle, and failure can cause significant financial and psychological strain on the family and society, giving the first convincing proof that acupuncture could be a helpful treatment for infertile women who are not using ART. Comparing the Acupuncture group to the control group, there was evidence of a significant improvement in endometrial thickness, LH, ovulation rate, and pregnancy rate. For many years, the first-line treatment for ovulation induction has been clomiphene citrate, a selective estrogen-receptor modulator that can boost ovarian stimulation by endogenous gonadotropin. The overall lack of robustly observed efficacy, a comparatively high likelihood of multiple pregnancies, and an unfavorable side-effect profile that includes mood problems and hot flashes are some of the disadvantages of clomiphene citrate. Our findings demonstrated that acupuncture or its combination therapy is more successful than clomiphene citrate, suggesting that acupuncture may offer a less harmful option for inducing ovulation. We discovered that acupuncture may help ovulation rates and hormone levels by itself or in conjunction with other constructive interventions. Acupuncture's neuroendocrine pathways have been investigated in the field of reproductive medicine. The hypothalamic-pituitary-ovarian axis can be influenced by acupuncture. Our results supported the idea that acupuncture influences the formation of beta-endorphins in the pituitary, influencing the release of GnRH and LH. The common consensus is that optimal pregnancy rate requires adequate endometrial thickness. According to the meta-analysis, Acupuncture treatment could considerably increase the degree of endometrial thickness. The mechanism behind the improvement of endometrial thickness in Acupuncture treatment may be the central sympatho inhibitory effect of acupuncture in lowering uterine artery impedance, which results in increased blood flow to the uterus, since endometrial thickness is a function of uterine artery blood flow. Therefore, it makes sense to speculate that acupuncture might create a physiological setting that promotes conception and ovulation (Yun et al., 2019).

Acupuncture and male infertility

For almost fifty years, male infertility has been caused by varicocele. It is the easiest condition to treat male infertility due to varicocele, and some people can even conceive naturally. Varicocele is a type of vascular illness that affects 35% to 44% of men with primary

infertility and 45% to 81% of men with subsequent infertility. It is characterized by abnormal dilatation and tortuosity of the pampiniform plexus veins. A growing body of research indicates that varicocele-mediated infertility is caused by a combination of variables, including oxidative stress, hypoxia, and food scarcity, rather than being caused by a single component. Numerous studies currently demonstrate that acupuncture is an effective treatment for male infertility caused by varicocele. A study comparing the effects of subinguinal microscopic varicolectomy and acupuncture on sperm parameters and conception rates in patients with primary infertility. They discovered that for the majority of infertile patients with aberrant semen, acupuncture appears to be just as effective as varicolectomy. The Acupuncture arm had a higher enhanced sperm concentration ($p=0.039$) than the varicolectomy arm, and both arms had the same pregnancy rate (33%) (Feng et al., 2022).

Male fertility is measured by a test of semen quality, which considers both the quantity and quality of sperm. Three typical discoveries in semen quality cause male infertility. The medical word for decreased sperm motility is asthenospermia. Semen with a low sperm count or concentration is referred to as oligospermia. The disorder known as teratospermia is typified by the presence of sperm with an unusual shape. The meridians of the kidneys, liver, and bladder serve as the foundation for Acupuncture treatment. The meridians of the stomach, spleen, ruling vessel, and conception vessel complement these. Treatment involves warming renal yang, nourishing the kidneys and liver, encouraging blood flow, and removing collateral blockage. Electric Acupuncture stimulation is also performed concurrently. Three of the chosen acupoints, CV6 (QiHai), CV4 (GuanYuan), and CV3 (Zhongji), have a strong connection to reproduction. They boost vital energy, support kidney yang and renal essence, and eliminate genital moisture and cold. Acupoints on the back and abdomen are chosen for alternate therapy sessions to balance and enhance yin and yang. In the six yin and six yang meridians, the preferred meridians for regulating the balance of yin and yang, the conception vessel and the ruling vessel are the major leaders of yin and yang. This combination of Acupuncture points improves the sperm quality because it heats the kidney yang, calms the liver qi, nourishes the kidney essence and liver blood, and energizes the congenital and acquired qi (Peng, 2021).

The International Society for Sexual Medicine defines premature ejaculation (PE) as a male sexual dysfunction that is typified by the following symptoms: (1) the inability to delay ejaculation in all or nearly all vaginal penetrations; (2) ejaculation that always or nearly always occurs before or within about 1 minute of vaginal penetration (lifelong PE); or (3) a clinically significant and bothersome reduction in latency time, frequently <3 minutes (acquired PE); and (4) adverse personal consequences, such as distress, bother, frustration, and/or the avoidance of sexual intimacy. Based on TCM theory, acupuncture is a significant therapeutic approach to treating various illnesses. It is frequently used to treat PE and is successful in basic and clinical research. Several therapies have been contemplated for the treatment of PE. The most effective medication for both acquired and chronic PE is dapoxetine, a short-acting selective serotonin reuptake inhibitor (SSRI) that is developed from fluoxetine. Treating the underlying contributing factor, such as thyrotoxicosis or prostate inflammation, is the top priority in cases of acquired PE. Another option for lifelong PE has been the use of local anesthetics. According to TCM theory, acupuncture can prolong the latency of ejaculation by controlling the blood-qi balance.

Additionally, research has demonstrated that acupuncture on the acupoints of Taichong (LR3), Zusanli (ST36), and Tianshu (ST25) can lower nerve sensitivity and modify neurotransmitter 5-hydroxytryptamine levels. This process may also be connected to PE. The evidence currently available indicates that acupuncture was significantly less effective than SSRIs in improving the CIPE-5 (Chinese Index of Premature Ejaculation-5) and did not improve the IELT (intravaginal ejaculation latency time), PEDT (Premature Ejaculation Diagnostic Tool), or treatment success rate. From a different angle, acupuncture could not be worse than SSRIs, which could be encouraging given the negative consequences of SSRIs. The two additional comparisons revealed the positive effects of acupuncture: first, compared to sham Acupuncture, Acupuncture was superior in extending IELT and improving PEDT scores; second, acupuncture in combination with other treatments was superior to other treatments alone in terms of all outcomes taken into account (Zhang et al., 2023).

Acupuncture can improve sperm motility and raise the neutral α -1,4 glycosidase, zinc, and fructose content of seminal plasma. The spermatogenic function of the testis and epididymis can be indicated by biochemical markers found in the urine. In seminal plasma, neutral α -1,4 glycosidase is a particular marker enzyme of epididymis that supplies energy for sperm activity, influencing sperm density and motility. By increasing the neutral α -1,4 glycosidase in semen, acupuncture can convert a range of carbohydrates into glucose and provide sperm motility with energy sources. FSH and LH can be brought back to normal levels using acupuncture. The endocrine system regulates the reproductive system's growth and development. Through the benign stimulation of acupoints, acupuncture and moxibustion can regulate the hypothalamic-pituitary-gonadal endocrine abnormalities and function, raise blood testosterone levels, support hormone balance, correct the dysfunctional gonadal axis, and enhance sperm quality. The number of gonadotropin-releasing hormone neurons is increased by electroacupuncture (EA), and these neurons interact with pituitary hormone-releasing hormone neurons to synthesize FSH and LH. The curative impact of acupuncture in the treatment of oligoasthenospermia and asthenospermia can be confirmed by analyzing how it has been used to treat these conditions in recent years. Acupuncture can increase the neutral α -1,4 glycosidase in seminal plasma, encourage glucose transformation, give sperm energy, and sustain sperm activity by strengthening their resistance to oxidative stress. Restoring the secretion level of reproductive hormones to the normal range improved the damage to spermatogenic epithelium and testicular interstitial cells; enhancing testicular blood supply, addressing inflammation of the reproductive tract, and lowering scrotal temperature, the three synergistic effects guarantee the sperm's living environment and development space, and enhance the quality of semen.

As a specialized cell, sperm move mostly thanks to flagella. After ejaculation, the sperm enters the female vagina, moves through the cervix, attaches itself to the egg in the fallopian tube, and fertilizes the egg. Thus, sperm vitality is a crucial reference measure of male fertility, and a sufficient number of forward-moving sperm is necessary for successful conception. Cyclophosphamide is an alkylating chemical that is mostly employed in cancer treatment. It damages cells by interfering with the structure and function of deoxyribonucleic acid (DNA). However, other healthy cells, especially those in the reproductive system, may also be impacted by this detrimental effect (Ma et al., 2022).

Furthermore, TCM highlights how emotions affect physical health. The reproductive system may be negatively impacted by prolonged mental stress, anxiety, depression, and other negative emotions. In order to cure asthenozoospermia, the spleen and kidneys should be toned, and psychological issues should also be addressed. The "Zhibian (BL 54)-to-Shuidao (ST 28)" Acupuncture technique was employed in this investigation as an intervention therapy. Situated in the sacrococcygeal area, the Zhibian (BL 54) is an Acupuncture point of the Foot Taiyang Bladder Meridian. It shares a strong relationship with the Kidney Meridian, which nourishes the kidneys, controls menstruation, and stimulates the collaterals. An Acupuncture point on the stomach meridian of foot yangming, "Shuidao (ST 28)", is situated in the lower belly. It controls water channels, tones the kidneys, and restores essence, intimately associated with the Spleen Meridian. The testes and other reproductive organs can be regulated by stimulating the pelvic plexus and perineal nerves with oblique needling from "Zhibian (BL 54)-to-Shuidao (ST 28)." This will allow the meridian qi to reach the affected location. Additionally, during acupuncture, patients could feel a sensation that radiates to the perineum, which could have beneficial psychological consequences. Nowadays, many male and female reproductive system diseases are treated with the "Zhibian (BL 54)-to-Shuidao (ST 28)" Acupuncture approach (Hao et al., 2024).

Acupuncture mechanism

Acupuncture, a traditional element of Chinese medicine, is progressively being examined through the perspective of contemporary biomedical science. This work investigates the physiological principles of acupuncture, emphasizing its impact on hormone control and the functional uniqueness of the Zhibian (BL 54) to Shuidao (ST 28) acupoint pathway. Recent studies indicate that acupuncture influences systemic functions by modulating the neurological,

endocrine, and immunological systems, affecting pain management, stress response, and organ performance. (Han J.S., 2004) Acupuncture entails the insertion of slender needles into specific locations on the body, typically along meridians. Although its therapeutic efficacy is well-established for illnesses like chronic pain and urogenital problems, the processes that underlie its actions remain inadequately understood. This research integrates traditional knowledge with biological evidence, concentrating on hormone modulation and acupoint-specific neuroanatomical pathways (Zhou, Longhurst, 2007).

Studies have repeatedly demonstrated that acupuncture induces the release of endogenous opioids and regulates the hypothalamic-pituitary-adrenal (HPA) axis. Han (2004) established that electroacupuncture induces the release of beta-endorphins, enkephalins, and dynorphins, which contribute to analgesic and mood-regulating effects (Han, 2004). Zhou and Longhurst (2007) indicated that acupuncture at designated locations can alter sympathetic nervous system activity and decrease plasma norepinephrine concentrations, implying a downregulatory influence on the HPA axis, subsequently affecting cortisol and ACTH levels.

Functional magnetic resonance imaging (fMRI) studies demonstrate brain activation after acupuncture. Hui et al. (2005) discovered that stimulation of ST 36 activated brain areas linked to sensory processing, emotion, and autonomic regulation, including the limbic system and cerebellum. The results corroborate that central neural connections facilitate acupuncture's systemic effects (Hui *et al.*, 2005).

Zhibian (BL 54), situated in the gluteal area, is next to the sacral plexus and may affect pelvic autonomic function. Shuidao (ST 28), situated in the lower abdomen, corresponds to the iliohypogastric and genitofemoral nerves. Choi et al. (2012) assert that activating acupoints in these areas may impact local and systemic visceral processes by changing peripheral nerve activity and affecting spinal cord segments associated with pelvic organ regulation. This anatomical correlation may elucidate the application of this point combination in addressing reproductive and urinary diseases. Acupuncture affects the body via intricate neurohumoral mechanisms, encompassing the modulation of endogenous opioid systems and hormonal pathways, including the hypothalamic-pituitary-adrenal (HPA) axis. The particular effects of acupoints such as Zhibian and Shuidao are likely attributable to their closeness to essential brain regions implicated in pelvic and abdominal control. Ongoing multidisciplinary research that combines neuroanatomy, endocrinology, and traditional medicine is crucial for enhancing our comprehension of the biological principles underlying acupuncture (Choi et al., 2012).

CONCLUSION

According to current findings, both men and women may experience infertility issues. Endometriosis, uterine fibroids, damaged or blocked fallopian tubes, ovulatory dysfunction (e.g., PCOS), premature ovarian insufficiency (POI), and aberrant tubal patency due to adhesions and tubal obstruction are among the fertility issues that affect women. In contrast, men experience premature ejaculation, varicocele, and sperm quantity and quality. Acupuncture can affect the menstrual cycle, the release of gonadotropin-releasing hormones, and uterine blood flow. Previous systematic reviews have revealed that acupuncture lowers the rate of pregnancy loss. In trials, acupuncture has also been shown to enhance fertility outcomes and mental wellness in both men and women.

LIMITATIONS

This study has limitations, such as the necessity for additional high-quality randomized controlled trials (RCTs). This candor is crucial for readers to comprehend the deficiencies in the evidence. One of the most significant challenges in establishing the efficacy of acupuncture as a treatment for infertility is the absence of research that is both extensive and of high quality. Including recommendations for potential future study methodologies or paths would be a very

beneficial addition. According to the paper, one of the most significant challenges in establishing the efficacy of acupuncture as a treatment for infertility is the absence of research that is both extensive and of a high quality. Including recommendations for potential future study methodologies or paths would be a very beneficial addition. According to the paper, one of the most significant challenges in establishing the efficacy of acupuncture as a treatment for infertility is the absence of research that is both extensive and of a high quality. Including recommendations for potential future study methodologies or paths would be a very beneficial addition.

AUTHOR'S DECLARATION

Authors' contributions and responsibilities

FN: Writing original draft, visualization, funding acquisition, conceptualization; **DSSR:** Writing original draft (supporting), funding acquisition; **SPMW:** Supervision (lead), validation (equal), visualization (equal), funding acquisition (equal), review and editing.

Availability of data and materials

All data are available from the authors.

Competing interests

The authors declare no competing interests.

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