



The Role of Complementary and Integrative Medicine on Assisted Reproductive Technologies Outcomes: A Comprehensive Review of Preclinical and Clinical Evidence

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Abstract

Many infertile couples seek complementary and integrative medicines (CIMs) as adjunctive therapies to enhance the effectiveness of assisted reproductive technologies (ART). Repeated unsuccessful in vitro fertilization (IVF) cycles have prompted patients to explore CIM modalities in hopes of improving their chances of successful conception. This review aims to evaluate the impact of various CIM approaches on IVF outcomes and to summarize the potential mechanisms underlying their effects. A systematic search was conducted across four major scientific databases PubMed, Scopus, Web of Science, and Google Scholar resulting in the identification of 141 relevant studies. These included 87 studies on acupuncture, 35 on traditional herbal medicine, 5 on phytochemicals, 3 on yoga, 2 on massage therapy, 1 on Ayurveda, and 8 studies evaluating the combined use of acupuncture and Chinese herbal medicine. Among the CIM interventions analyzed, acupuncture alone and its combination with Chinese herbal medicine demonstrated the most consistent positive effects on IVF outcomes. Herbal medicines were found to exert beneficial effects through multiple physiological pathways, including the regulation of ovulation, stimulation of follicular development, improvement of menstrual flow, modulation of hormonal balance, and enhancement of endometrial thickness. Massage therapy has been associated with improved IVF success rates, potentially due to its capacity to reduce psychological stress, decrease uterine contractions, and promote abdominal blood circulation. Although yoga has shown promise in alleviating stress and anxiety among women undergoing fertility treatments, current evidence remains limited regarding its direct impact on clinical IVF outcomes such as clinical pregnancy rate. Ayurveda, a traditional system of medicine, may offer a holistic approach for managing unexplained infertility; however, further high-quality research is needed to establish its efficacy in this context. Despite the diversity and volume of existing studies, there is growing evidence supporting the safety, affordability, and potential effectiveness of CIM interventions as adjuncts to ART. These modalities may provide valuable, non-invasive options for enhancing fertility and improving treatment outcomes in infertile couples.

Keywords: Infertility; Acupuncture; Complementary and alternative medicine; Herbal medicine; *In vitro* fertilization

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Introduction

Female infertility is clinically defined as the inability to achieve pregnancy following one year of regular, unprotected sexual intercourse in women under 35 years of age, and after six months in women over the age of 35 [1,2]. Globally, it is estimated that approximately 70 million couples suffer from infertility, with a significant proportion residing in developing countries [1]. Of all infertility cases, about 54% are attributed to female factors [1,3]. Approximately 9% of women of reproductive age experience fertility issues, primarily due to conditions such as polycystic ovary syndrome (PCOS), hormonal imbalances, hypothyroidism, and tubal occlusion [1,4].

Assisted reproductive technology (ART) represents a second-line therapeutic approach for infertility following initial pharmacological interventions. Among ART procedures, in vitro fertilization (IVF) is the most widely utilized method [5]. A standard IVF cycle involves several key stages: controlled ovarian hyperstimulation (COH), oocyte retrieval, in vitro fertilization or intracytoplasmic sperm injection (ICSI), and embryo transfer (ET) [6]. Despite advances in reproductive medicine, the overall success rate of IVF remains around 30%, with many patients requiring multiple cycles to achieve a successful pregnancy [7]. The live birth rate per initiated IVF cycle is also approximately 30% [8]. To enhance outcomes, high doses of gonadotropins are often administered, which may lead to complications such as ovarian hyperstimulation syndrome (OHSS) [8]. Poor ovarian response (POR) is another critical factor contributing to IVF failure, accounting for up to 20% of unsuccessful cycles [9, 10]. Recurrent implantation failure is influenced by various factors including maternal age, etiology and duration of infertility, elevated follicle-stimulating hormone (FSH) levels, number and quality of transferred embryos [11, 12]. These repeated cycles impose substantial physical, emotional, and financial burdens on infertile couples [6,8]. Given the limitations of conventional ART; including low live birth rates, adverse effects, psychological stress, and high costs; many patients turn to CIMs as adjunctive therapies [8, 13,14]. Accumulating evidence suggests that CIM modalities have promising effects on gynecological disorders, particularly infertility [15-18]. Moreover, the integration of CIM into fertility treatment has been associated with reduced healthcare costs through potentially decreasing the number of required IVF cycles [12].

Numerous studies have reported improvements in IVF outcomes following CIM interventions. Acupuncture, for instance, has demonstrated beneficial effects on biomarkers of ovarian reserve such as anti-Müllerian hormone (AMH) and antral follicle count (AFC), as well as on the number of retrieved oocytes in women with poor ovarian response (POR) undergoing IVF [19]. It has also been shown to improve endometrial thickness [20], regulate menstrual cycles [21], and increase maximum follicular diameter [22]. Herbal medicines, both single and

compound formulations, exert their effects via mechanisms including estrogen-like activity, antioxidant and anti-inflammatory properties, DNA damage repair stimulation, regulation of estradiol and FSH levels, inhibition of apoptosis, and modulation of granulosa cell secretory function, making them effective in managing premature ovarian failure (POF) [23]. Combined use of acupuncture and herbal medicine has been associated with improved AMH and FSH levels, better menstrual regulation, and reduced risk of miscarriage, ultimately enhancing IVF success rates [2, 24]. Yoga, as a psychological component of CIM, may contribute to improved ART outcomes through its positive effects on sleep quality and mental health [25], although findings remain inconclusive across studies. While certain CIM approaches have shown promise, some interventions have been found ineffective or even harmful, underscoring the need for rigorous evaluation. Therefore, this review aims to systematically summarize recent insights into the role of CIM therapies in improving IVF outcomes, and to identify specific modalities that demonstrate consistent efficacy in enhancing fertility treatment success.

Methods

Search strategy and information sources

The primary objective of this systematic review was to evaluate the effects of various CIM interventions on IVF/ICSI combined with embryo transfer (ET) outcomes. A comprehensive literature search was conducted across four major electronic databases: PubMed, Scopus, Web of Science, and Google Scholar. The search covered all articles published from database inception up to September 2025.

The search strategy was developed using a combination of keywords and medical subject headings (MeSH) terms related to CIM modalities and IVF/ICSI-ET procedures. Keywords included variations of the following terms:

CIM modalities: "herbal medicine", "medicinal plant", "herb", "phytotherapy", "natural product", "traditional medicine", "alternative medicine", "complementary medicine", "integrative medicine", "phytoestrogen", "acupuncture", "spiritual medicine", "body therapy", "cupping", "massage", "uterine physiotherapy", and "leech therapy". Reproductive technologies: "IVF", "in vitro fertilization", "ICSI", "intracytoplasmic sperm injection", "ZIFT", "zygote intrafallopian transfer", "GIFT", "gamete intrafallopian transfer", and "infertility".

Each CIM-related term was combined separately with reproductive technology-related terms using Boolean operators (AND/OR). No restrictions were applied regarding study design (clinical or experimental), allowing for maximum sensitivity in identifying relevant studies.

Inclusion and exclusion criteria

Studies were included if they reported outcomes related

to IVF/ICSI-ET procedures and assessed the impact of any CIM intervention in either human or animal models. Only publications written in English were considered for inclusion.

Exclusion criteria included:

- Non-English language studies,
- Irrelevant studies not focusing on IVF/ICSI-ET outcomes,
- Studies evaluating unconventional or insufficiently described CIM methods,
- Duplicate publications or those lacking original data.

A flowchart summarizing the study selection process is presented in figure 1.

Quality assessments

All identified records were imported into a reference management software and duplicates were removed. Four independent reviewers screened the titles and abstracts of all retrieved studies to assess eligibility based on pre-defined inclusion and exclusion criteria. Full-text articles of potentially relevant studies were then reviewed in detail. Disagreements were resolved through discussion or consultation with a senior reviewer when necessary.

This rigorous screening process ensured that only studies directly addressing the impact of CIM interventions on IVF/ICSI-ET outcomes were selected for further analysis.

Results

Acupuncture Participant Characteristics and Study Populations

A total of 87 studies were included in the analysis, involv-

ing a cumulative sample of 6678 infertile women. The participants primarily presented with various underlying conditions known to affect fertility outcomes, including polycystic ovary syndrome with insulin resistance (PCOS-IR), diminished ovarian reserve (DOR), premature ovarian failure (POF), recurrent implantation failure (RIF), tubal and endometrial disorders, and fallopian tube obstruction. All participants were undergoing ART procedures, specifically IVF/ICSI combined with ET.

Acupuncture Protocols and Timing

Acupuncture interventions varied across studies in terms of duration, frequency, and timing. Sessions typically lasted between 5 to 30 minutes and were administered at different stages of the menstrual cycle, including the follicular phase, luteal phase, ovulation induction, pituitary down-regulation, human chorionic gonadotropin (hCG) trigger day, as well as before and after ET. The duration of treatment ranged from 4 to 12 weeks, with most protocols incorporating regular sessions throughout the IVF/ICSI-ET cycle [26-97].

Biochemical and Molecular Effects of Acupuncture

Findings from these studies indicate that acupuncture exerts a range of beneficial effects on biochemical and molecular markers associated with female fertility. Specifically, acupuncture has been shown to modulate key signaling pathways involved in folliculogenesis and oocyte maturation. For instance, it upregulates phosphoinositide 3-kinase (PI3K) and glucose transporter type 4 (GLUT-4) mRNA expression in ovarian granulosa cells,

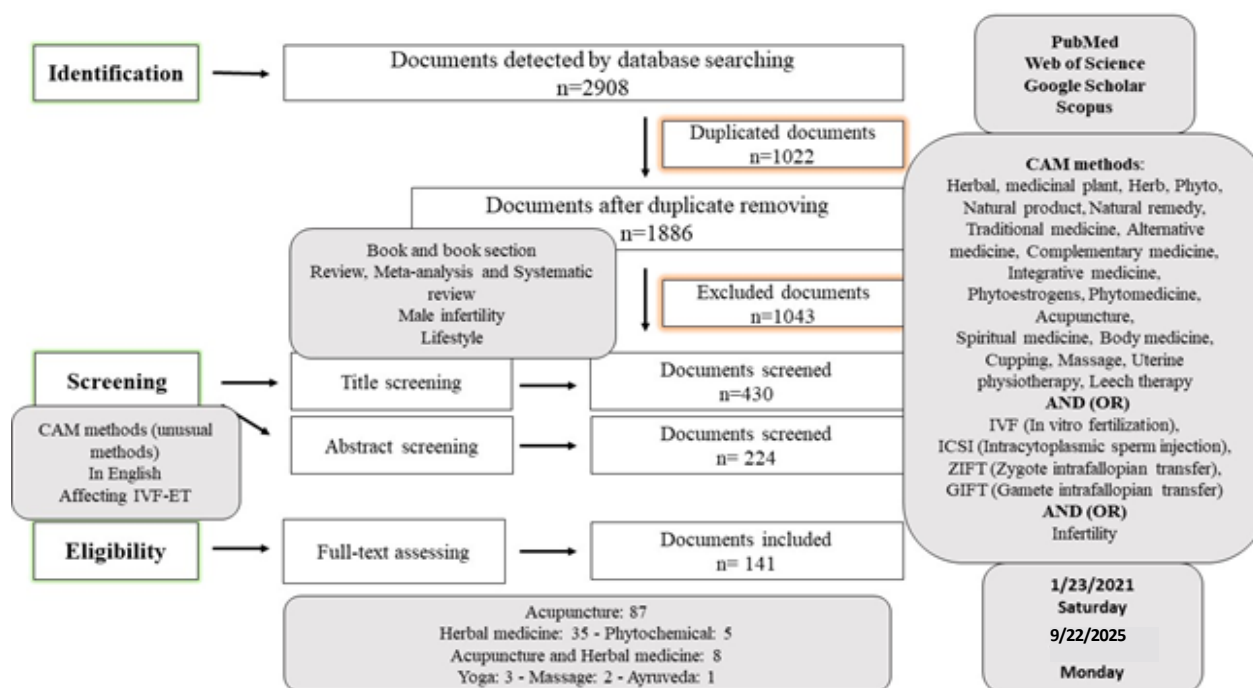


Figure 1. Schematic diagram for search and assessments of recorded documents

which are critical for insulin sensitivity and follicular development [26-97].

Moreover, acupuncture significantly affects several hormonal and metabolic parameters, including:

- Reduction in insulin resistance (IR) and improvement in insulin receptor substrate 1 (IRS-1) function
- Regulation of FSH, estradiol (E2), progesterone (P4), cortisol, prolactin levels
- Modulation of growth differentiation factor-9 (GDF-9), bone morphogenetic protein 15 (BMP-15), stem cell factor (SCF), and insulin-like growth factors (IGF-1 and IGF-2) in follicular fluid
- Enhancement of implantation potential around the time of hCG administration
- Increased serum and follicular fluid brain-derived neurotrophic factor (BDNF) levels

At the gene expression level, acupuncture has been associated with altered expression of microRNAs such as hsa-miR-449a, hsa-miR-3135b, and hsa-miR-345-3p, which may contribute to improved endometrial receptivity through increased estradiol receptor (ER) expression and favorable endometrial remodeling.

Clinical Outcomes and Symptomatic Improvements

Clinically, acupuncture has demonstrated positive effects on multiple ART-related outcomes [26-97]:

- Increased clinical pregnancy rate (CPR) per embryo transfer
 - Improved oocyte maturation and fertilization rates
 - Enhanced implantation and live birth rates (LBR)
 - Increased the number and rate of high-quality and usable embryos
 - Reduced egg retrieval pain and anxiety levels
 - Improved endometrial thickness and proportion of type A endometrium
 - Increased AFC and number of high-quality embryos
 - Decreased gonadotropin (Gn) dosage and stimulation duration
 - Lower cycle cancellation rates
 - Positive impact on phlegm-dampness syndrome score, IR score, and state anxiety (STAI-1)
 - Improved ovarian hemodynamics, including pulsatility index (PI), systolic-to-diastolic peak velocity ratio, and endometrial blood flow
 - Favorable changes in perceived stress scale (PSS) scores
- Additionally, acupuncture was associated with reduced rates of ectopic pregnancy and miscarriage in some studies.

Inconclusive or Negative Findings

Despite the promising findings, a subset of studies reported no significant improvements in IVF outcomes following acupuncture. These null results were observed in 27 out of the 87 reviewed studies [26,29,39,41,43,45,46,48,50,52,54,55,58,59,65,68,70,71,76,78,79, 81,84]. Variability in study design, acupuncture protocols, patient

populations, and outcome measures likely contributed to the heterogeneity of results across trials. In many of the studies investigating the effects of acupuncture on IVF outcomes, methodological limitations have been identified as key factors contributing to the lack of observed beneficial effects. These limitations primarily include a small sample size, inappropriate timing of acupuncture interventions, and insufficient duration of treatment exposure. Furthermore, certain patient subgroups, such as those with DOR, may require tailored acupuncture protocols to achieve clinically meaningful improvements in IVF outcomes [55].

Several studies have examined the impact of short-term acupuncture sessions (25–30 minutes) administered immediately before and after ET. However, these interventions have generally failed to demonstrate a significant effect on pregnancy rates [69, 151]. Notably, in these studies, the sample sizes were often adequate, suggesting that the lack of positive results is more likely attributable to the limited duration and timing of the acupuncture intervention rather than statistical underpowering.

A common focus in the literature has been on administering acupuncture around the time of ET. While this approach does not consistently improve clinical pregnancy rates, it has been associated with beneficial effects on psychological parameters, particularly reductions in stress and anxiety, which may indirectly enhance ART outcomes [68, 148].

Importantly, accumulating evidence suggests that longer-term acupuncture treatment, typically spanning 3 to 4 months prior to the initiation of IVF cycles, may be more effective in improving overall IVF success rates. This extended duration allows for potential regulatory effects on hormonal balance, ovarian response, and endometrial receptivity, thereby optimizing conditions for successful implantation and pregnancy.

Herbal medicine

A total of 35 studies were identified in this review that evaluated the effects of herbal medicine on fertility outcomes in the context of IVF. These included 19 randomized controlled trials (RCTs), 1 clinical study, 2 case-control studies, 7 cohort studies, 4 animal studies, and 2 in vitro investigations.

Uni-component herbal medicines

Several single-component herbal medicines have demonstrated potential in improving reproductive parameters in both human and animal models of infertility. However, findings remain heterogeneous, with some studies reporting beneficial effects and others showing no significant improvement or even adverse outcomes.

Rhodiola sachalinensis Boriss. (Cu jing hong jin tiang, Golden root)

An in vitro study evaluating the aqueous extract of *Rhodiola sachalinensis* on porcine oocyte maturation showed

increased glutathione (GSH) levels, a key indicator of cytoplasmic maturation, suggesting a positive role in early oocyte development [98]. Despite these promising in vitro results, no clinical trials have yet validated its efficacy in human IVF settings.

Glycyrrhiza glabra L. (Licorice)

The ethanolic extract of licorice has shown beneficial effects on follicular development and oocyte maturation in NMRI mice, likely due to its triterpenoid compound, glycyrrhizin, which inhibits β -hydroxysteroid dehydrogenase enzymes and reduces testosterone levels. Additionally, licorice contains flavonoids such as glabridin and glaberrin, which exhibit estrogen-like activity by inducing aromatase expression [99]. In another study, licorice extract improved testosterone and estradiol levels, increased the number of healthy follicles, and enhanced fertilization rates and blastocyst formation in PCOS-induced NMRI mice [100].

However, it is important to note that licorice may also exert dose-dependent negative effects. Prolonged or excessive use of licorice can lead to hypermineralocorticoid-like effects, including hypertension and hypokalemia, which may indirectly affect fertility and should be considered in clinical applications.

Aquilaria malaccensis Leaf Extract

In male rats exposed to cyclophosphamide, *Aquilaria malaccensis* leaf extract improved sperm quality, fertilization rate, early cleavage, and embryo morphology following IVF with oocytes from untreated female rats [101]. This suggests a potential protective effect against chemotherapeutic-induced testicular damage. However, no human studies have confirmed these findings, limiting their translational value.

Silymarin (from *Silybum marianum*)

Silymarin treatment in nicotine-exposed male NMRI mice significantly improved sperm count, motility, and progressive movement. Nevertheless, when these spermatozoa were used for IVF with normal oocytes, there was a reduction in the number of two-cell embryos and blastocysts formed [102]. This discrepancy highlights the importance of assessing not only sperm parameters but also functional fertility outcomes when evaluating herbal interventions.

Glycine max (L.) Merr. (Soybeans)

Cohort studies have reported that regular dietary consumption of soybeans in women undergoing ART was associated with higher clinical pregnancy rates, live birth rates, and fertilization rates, potentially due to improvements in gamete interaction and endometrial receptivity [103]. Another cohort study found that soy intake could reverse bisphenol A (BPA)-induced epigenetic changes, particularly DNA methylation patterns, suggesting a protective role against environmental toxin-related infertility [104]. Nonetheless, conflicting evidence exists regarding the impact of phytoestrogens on hormonal balance and fer-

tility. Some observational studies have raised concerns about high-dose soy isoflavone supplementation possibly disrupting endogenous estrogen signaling, especially in women with hormone-sensitive conditions.

Trapa bispinosa Roxb. (Hishi Extract)

In women undergoing IVF with elevated serum advanced glycation end-products (AGEs), which are associated with insulin resistance and aging, administration of *Trapa bispinosa* extract on day 3 of the cycle led to reduced AGE levels in both serum and follicular fluid. This was accompanied by improvements in oocyte developmental potential, endometrial receptivity, and live birth rates in natural cycles [105].

Despite these encouraging results, larger clinical trials are needed to confirm the safety and reproducibility of these findings across diverse populations.

Multi-component herbal medicines

The majority of studies included in this review focused on multi-component herbal formulations, particularly those rooted in Traditional Chinese Medicine (TCM). These formulations are traditionally believed to improve reproductive health through mechanisms such as kidney-tonifying (shen-bu), blood nourishing (xue-tian), and regulation of the Chong-Ren meridian system [106]. In TCM theory, the kidney is considered the root of congenital essence (tian gui), which plays a central role in reproductive function; therefore, these formulations may serve as effective adjuvants to ART by strengthening the kidney essence and regulating hormonal balance [107].

Numerous clinical and experimental studies have demonstrated that multi-component herbal medicines can enhance IVF outcomes in infertile women via various pathways, including modulation of sex hormone levels, improvement of endometrial receptivity, enhancement of ovarian response, and promotion of uterine blood flow [108,109]. The most commonly used herbs in these formulations include:

Rehmannia glutinosa (Shu Di Huang)

Cuscuta chinensis (Tu Si Zi)

Paeonia lactiflora (Bai Shao)

Angelica sinensis (Dang Gui)

Bupleurum chinense (Chai Hu)

Glycyrrhiza glabra/ *G. uralensis* (Gan Cao)

Salvia miltiorrhiza (Dan Shen)

Eucommia ulmoides (Du Zhong)

Atractylodes macrocephala (Bai Zhu)

Cyperus rotundus (Xiang Fu)

These combinations are tailored based on individual syndromic patterns, with reported improvements in pregnancy rates, embryo quality, and endometrial thickness [110–122]. Below is a synthesis of key findings, including both positive and inconclusive or negative results.

Key Findings from Clinical Studies

Bushen Yutai Recipe

219 women undergoing mild ovarian stimulation IVF

↑ E2 levels on hCG day, ↑ endometrial receptivity gene expression, ↑ VEGF levels at ET, ↑ overall IVF success rate

Small sample size, lack of placebo control [115]

Erzhi Tiangui (EZTG) Granules

DOR patients

↑ Fertilization rate via altered miRNA expression related to kidney deficiency

Limited mechanistic data [116]

Advanced age women with expected POR

Improving oocyte and embryo quality and ovarian reserve

Robust evidence of the efficacy and safety of EZTG formula [123]

In DOR patients

Significantly increased the number and proportion of high-quality embryos [124].

Zishen Yutai Pill (15 herbs)

1,131 women undergoing IVF

↑ Live birth rate, ↑ implantation rate, ↑ CPR, ↑ biochemical pregnancy rate

Heterogeneity in patient population, no RCT design [117]

In 150 PCOS patients

↓BMI, ↓insulin resistance, ↓androgens and reduced gonadotropin use, and increased oocyte yield, high-quality embryos, and pregnancy rates [125]

In FET cycles (RCT, n=880)

Increased live birth rates when taken from embryo transfer through early pregnancy [124]

Cangfu Daotan Decoction (CDD)

PCOS women

Improved IVF outcomes via modulation of pyruvate and acetone acid metabolism in follicular fluid

No long-term follow-up or safety assessment [118]

Bu-Shen-Tian-Jing Formula (BSTJF)

PCOS women

↑ Cumulative pregnancy rate, ↑ live birth rate, ↑ term delivery rate after 3 months

Observational study design [118]

Ding Kun Dan (DKD)

Poor ovarian responders

↑ Ongoing, clinical, and biochemical pregnancy rates; ↓ Gn stimulation time

No comparison group [119]

Guilu Erxian Ointment

Older poor ovarian responders with kidney qi deficiency

Improved IVF outcomes

Non-randomized, limited reproducibility [120]

Bushen-Tiaojing-Fang and Qi-Zi-Yu-Si Decoction

Repeated COS and elderly kidney qi deficient patients

↑ Available embryo rate, ↑ implantation rate, ↑ high-grade embryo rate, ↓ kidney qi deficiency syndrome score

Lack of standardized dosing protocols [121, 122]

Cai's Prescription (11 herbs)

In poor ovarian responders increased number of high-quality embryos and downregulated ARHGAP4 (a gene linked to oocyte dysfunction) [126].

Kuntai Capsules (5 herbs)

In DOR patients improved embryo utilization rate and reduced egg retrieval failure, despite lower oocyte yield—suggesting better oocyte/embryo efficiency [127]. Evening Primrose Oil: Not a TCM herb, but a natural supplement

In ICSI candidates increased pregnancy and implantation rates with short-term (2-week) supplementation [128].

Multiple randomized and observational studies suggest that TCM herbal formulas particularly those that tonify the Kidney, nourish Yin/Blood, and regulate endocrine function can positively influence ART outcomes. These findings support the integrative use of specific, well-formulated TCM prescriptions as adjunctive therapy in IVF/ICSI/FET cycles, though further large-scale, multicenter RCTs are warranted for standardization and mechanistic validation [123–128].

Mechanistic Insights and Experimental Evidence

In addition to clinical observations, several *in vitro* and animal studies have provided insights into the molecular and cellular effects of these formulations:

Total Flavones from *Cuscuta chinensis* increased estrogen, progesterone, and prolactin receptor expression *in vitro* and *in vivo*, suggesting a role in enhancing endocrine signaling during the luteal phase [129].

Root extract of *Paeonia lactiflora* improved ovarian reserve markers in aged mice by increasing follicle survival, zygote retrieval, and embryo development rates [130]. *Glycyrrhiza spp.* reduced testosterone and increased estradiol levels in healthy women and PCOS models, improving ovulation and embryo development [131–132]. However, its prolonged use has been linked to adrenal suppression and electrolyte imbalance [131].

Salvia miltiorrhiza lowered LH and FSH levels and improved pregnancy rates in PCOS patients [134], though some studies failed to replicate these findings consistently. *Eucommia ulmoides* modulated hypothalamic-pituitary-ovarian axis activity in PCOS rat models, restoring hormonal balance [135].

Atractylodes macrocephala showed anti-abortive properties in murine models by upregulating IL-10 and IL-4 in uterine tissues [136].

Cyperus rotundus enhanced endometrial receptivity *in vi-*

tro by promoting integrin $\alpha V\beta 3$ and $\alpha V\beta 5$ expression via leukemia inhibitory factor (LIF) pathways [137].

Traditional Persian Medicine (TPM) Approaches
Beyond TCM, TPM also offers non-invasive strategies for improving ART outcomes. A prospective study found that lifestyle modifications aligned with TPM principles such as balanced diet, regular exercise, proper sleep-wake cycles, stress management, and environmental hygiene, led to improvements in spontaneous and chemical pregnancy rates [138]. Specific dietary recommendations (e.g., increased intake of vegetables, legumes, olive oil, and sheep meat) were associated with better oocyte quantity and quality, fertilization rates, and live birth outcomes.

For overweight individuals, weight-loss regimens involving chickpea soup (*Nokhodab*), fruits, oat bread, cinnamon, and ginger were recommended and showed beneficial effects on fertility parameters [138].

Animal Model Evidence

Hochuekkito (HET) administered to aging female mice for 12 weeks reduced ovarian inflammation and improved oocyte maturation and cumulus cell gene expression (TNFAIP6, EGFR). However, it did not significantly affect live offspring rates post-IVF [139], highlighting a potential disconnect between preclinical and clinical endpoints.

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Phytochemicals

The use of phytochemicals, bioactive compounds derived from plants, has gained increasing attention as potential adjuvants in the treatment of infertility, particularly among women undergoing IVF. These compounds may exert beneficial effects through modulation of hormonal balance, improvement of ovarian function, enhancement of endometrial receptivity, and regulation of metabolic pathways involved in reproductive health. In this review, five studies were identified that assessed the impact of various phytochemicals on IVF outcomes: two RCTs, one prospective cohort study and two *in vitro* studies.

Key Findings from Clinical Studies

1. Berberine

Berberine, an isoquinoline alkaloid found in several medicinal plants such as *Berberis vulgaris*, has demonstrated promising results in improving fertility outcomes, especially in women with PCOS. A randomized controlled trial showed that berberine significantly improved the metabolic profile in PCOS patients by reducing total testosterone levels and free androgen index, which in turn led to a decrease in estradiol concentration [140]. These hormonal modulations are associated with enhanced follicular development and improved oocyte quality, thereby positively influencing IVF success rates.

2. Soy Isoflavones

Soy isoflavones, a class of phytoestrogens, have also shown favorable effects on IVF outcomes in clinical settings. Another RCT reported that soy isoflavone supplementation increased implantation rate, CPR, and ongoing pregnancy or live birth rate [141]. The mechanism of action appears to be biphasic: at higher doses and longer durations, these compounds exhibit estrogen-like activity on the endometrium, promoting receptivity. Conversely, at high concentrations, they may act as antiestrogens, potentially preventing excessive estrogen stimulation. Additionally, soy isoflavones have been shown to induce the synthesis of LIF, a glycoprotein essential for successful embryo implantation [141]. In another study, higher levels of phytoestrogens in follicular fluid and urine were significantly associated with improved ovarian response, embryo implantation, clinical pregnancy, and live birth rates in women undergoing IVF [142]. These findings suggest that dietary phytoestrogens may positively influence IVF outcomes. However, further prospective studies are needed to optimize their use and confirm their role in enhancing fertility treatment success.

Findings from *in vitro* studies

Isoflavones (Genistein, Biochanin A, Formononetin)

Several *in vitro* studies have investigated the effects of isoflavones, including genistein, biochanin A, and for-

mononetin, on oocyte maturation and early embryo development. While low-dose exposure generally had neutral or mildly positive effects, high-dose administration was associated with impaired embryo development [143]. This suggests a dose-dependent effect, where excessive phytoestrogen exposure may disrupt normal developmental processes in gametes and embryos.

Asiatic Acid

In contrast, asiatic acid, an active triterpenoid compound extracted from *Centella asiatica*, was found to enhance blastocyst formation and overall embryo quality in porcine models [144]. The proposed mechanism involves the upregulation of antioxidant pathways, leading to reduced oxidative stress and improved cellular viability during early embryonic stages. These findings suggest that certain phytochemicals may support embryo development via antioxidant mechanisms, though further human studies are needed to confirm these results.

Conclusion and Future Directions

Phytochemicals represent a promising area of research in the field of reproductive medicine due to their diverse biological activities and relatively low side-effect profiles. Berberine and soy isoflavones have demonstrated encouraging clinical results, particularly in women with PCOS. However, caution must be exercised regarding dosage and duration, as some compounds, particularly isoflavones, may exert negative effects at high concentrations. Further well-designed randomized controlled trials are warranted to validate these preliminary findings and to establish standardized protocols for the safe and effective use of phytochemicals in ART settings. Additionally, mechanistic studies are needed to better understand the molecular pathways through which these compounds influence fertility and embryo development.

Acupuncture + herbal medicine

In TC), the integration of acupuncture and Chinese herbal medicine (CHM) is considered a core therapeutic strategy for managing female infertility. This holistic approach aims to restore physiological balance, enhance reproductive function, and support ART, particularly IVF.

Overview of Clinical Evidence

A total of four case studies, three RCTs and one clinical trial have investigated the effects of combined acupuncture and CHM (TCM) therapy on IVF outcomes [2, 7, 145–147, 148, 149]. These studies included 169 women aged between 27 and 49 years (mean age: 36.7 years), with diverse underlying causes of infertility such as PCOS, DOR, tubal occlusion, POI, RIF, and elevated FSH levels due to advanced maternal age.

In two cases, male partners were also treated with CHM for sperm-related disorders. Additionally, two RCTs

evaluated a comprehensive TCM protocol that integrated multiple modalities, including acupuncture, CHM, dietary and lifestyle advice, and reported promising improvements in IVF success rates [2,24].

Reported Outcomes and Benefits

The combination of acupuncture and CHM has been associated with several beneficial effects:

Improved menstrual regularity and hormonal profiles in female patients

Enhanced sperm parameters, including count and motility, in male partners

Regulation of DOR through improved AFC and reduced FSH levels

Increased embryo quality and endometrial receptivity

Reduced stress and anxiety, which are key psychological factors affecting ART outcomes

Improved uterine environment and pelvic circulation

Lowered risk of early miscarriage

Improved clinical pregnancy rate

Hormonal & endometrial improvements

Superior endometrial & hemodynamic outcomes

Increased the number of retrieved oocytes, mature oocytes and available embryos

Acupuncture may enhance ovarian function by increasing blood flow and neuro-vascularization to the ovarian cortex and follicles, thereby stimulating follicular development and estradiol synthesis. The subsequent negative feedback mechanism reduces circulating FSH levels [145]. Moxibustion at CV8 warms the uterus, promotes qi-blood circulation in lower jiao, enhances endometrial growth and receptivity [148]. CHM may further modulate FSH activity by sensitizing FSH receptors on granulosa cells, thus enhancing follicular responsiveness [148]. Shenque (CV8) moxibustion combined with a herbal mixture of Bai Zhi, Shu Fu Zi, and Chuan Jiao (3 g) may improve IVF success by positively influencing oocyte quality [149].

Case Study Highlights

A 35-year-old woman with DOR experienced significant reductions in FSH levels and increases in AFC following TCM treatment, ultimately achieving a successful pregnancy via IVF [145].

A 41-year-old woman with DOR and a history of 11 failed IVF cycles showed improvements in menstrual cycle regularity, endometrial environment, and oocyte implantation potential after periodic TCM intervention [146].

These findings suggest that TCM can positively influence ovarian reserve, endometrial thickness, and overall reproductive health, especially in older or poor ovarian responders.

Mechanistic Insights from RCTs

Two RCTs demonstrated that multi-channel TCM interventions significantly improved:

Fertilization rate

Clinical and ongoing pregnancy rates Live birth rates

Reduced early abortion rates

According to TCM theory, kidney deficiency, liver qi stagnation, and blood stasis (collectively referred to as KLB syndrome) are major pathogenic patterns contributing to IVF failure [2, 24]. Targeting these imbalances through kidney-tonifying, liver-regulating, and blood-activating formulas helped improve luteal function and endometrial receptivity, thereby supporting embryo implantation and maintaining pregnancy [24].

Moreover, miscarriage-preventing TCM prescriptions, often containing spleen-strengthening and liver-nourishing herbs, were shown to reduce the risk of early pregnancy loss, a critical factor in improving IVF success [24].

Quality of Evidence and Limitations

While all reported case studies resulted in live births, the overall quality of evidence remains low; due to small sample sizes, lack of control groups, and methodological limitations. In contrast, the two RCTs provided higher-quality data and reported consistent benefits of TCM as an adjunct to IVF [2, 24].

Despite these encouraging results, the current body of evidence is insufficient to make strong clinical recommendations. Therefore, larger, well-designed RCTs are needed to confirm the efficacy and safety of combined acupuncture and CHM in IVF settings.

The integration of acupuncture and CHM within TCM shows promise as an adjuvant therapy for improving IVF outcomes. The observed benefits include enhanced ovarian response, improved endometrial receptivity, reduced miscarriage risk, and better psychological well-being. However, most existing studies suffer from methodological weaknesses and limited generalizability.

To fully assess the role of TCM in ART, future research should focus on large-scale, high-quality RCTs with standardized treatment protocols, long-term follow-up, and objective outcome measures. Such efforts will help determine whether this integrative approach can be reliably incorporated into mainstream fertility care.

Massage

Massage therapy is increasingly acknowledged as a safe, non-invasive, and effective intervention for managing both physical discomfort and psychological stress, with minimal risks or adverse effects [150]. Although less commonly studied than other complementary therapies, its application in the context of ART has shown promising results in recent years.

Evidence from Clinical Studies

To date, only two studies have specifically investigated the role of massage therapy in fertility treatment: Prostatic Massage in Male Infertility Due to Spinal Cord

Injury (SCI)

A case report described the successful use of prostatic massage in a 27-year-old male patient with SCI and a 3-year history of primary infertility. Despite preserved libido, the patient experienced erectile dysfunction and had previously undergone unsuccessful attempts with penile vibratory stimulation and multiple electroejaculations. Prostatic massage was employed as a non-traumatic method for sperm retrieval, followed by ICSI and three embryo transfers, ultimately resulting in a successful triplet pregnancy [151].

This case highlights prostatic massage as a simple, cost-effective, and non-invasive alternative to electroejaculation for sperm retrieval in men with SCI. It also underscores the potential utility of targeted physical interventions in overcoming male factor infertility associated with neurological impairments.

Deep Relaxation Massage Prior to Embryo Transfer (ET)

In a retrospective observational study involving 267 women undergoing frozen embryo transfer (FET) cycles (mean age: 36.3 years), participants who received a standardized 30-minute deep relaxation massage, known as andulation, immediately before ET demonstrated significantly higher clinical pregnancy, ongoing pregnancy, and live birth rates compared to control subjects who did not receive any form of massage [152].

No adverse events were reported in the massage group, reinforcing the safety profile of this intervention. The observed improvements in ART outcomes are hypothesized to result from several mechanisms:

Reduction in maternal stress levels

Decreased uterine contractions that may interfere with implantation

Enhanced abdominal and pelvic blood circulation, potentially improving endometrial receptivity

Although limited in number, existing studies suggest that massage therapy can play a supportive role in ART. Whether through direct sperm retrieval techniques such as prostatic massage or through indirect benefits like stress reduction and improved uterine environment, massage appears to be a safe and potentially effective adjunct to fertility treatments.

Given the low risk profile and encouraging preliminary findings, further research, including RCTs, is warranted to better understand the mechanisms and broader applicability of massage therapy in reproductive medicine.

Yoga

Given the well-established influence of psychological stress and anxiety on reproductive health, yoga has gained increasing attention as a complementary intervention that may alleviate emotional distress and potentially enhance fertility outcomes. As a mind-body practice incorporating physical postures (asanas), controlled breathing (pranayama), and meditation, yoga is believed to modulate

the hypothalamic-pituitary-adrenal (HPA) axis and autonomic nervous system, thereby reducing stress-related hormonal imbalances that may impair fertility.

Evidence from Clinical Studies

Several studies have explored the effects of yoga interventions on psychological well-being and ART outcomes: Six-Week Yoga Program Prior to IVF

A study involving 49 infertile women demonstrated that participation in a structured 6-week yoga program before undergoing IVF treatment led to significant reductions in anxiety and depressive symptoms. Additionally, participants reported improvements in fertility-specific quality of life measures, suggesting that yoga may serve as an effective preconception psychological support strategy [153].

Hatha Yoga (HY) and IVF Outcomes

In another observational study, Hatha Yoga, characterized by physical postures and regulated breathing aimed at enhancing physical health and mental calmness, was offered to 143 women prior to their first IVF cycle. Of these, 45 participated in the program while 75 declined. Although no direct comparison of clinical pregnancy rates was made between groups, the findings indicated that women experiencing higher levels of distress were more likely to engage in yoga interventions, suggesting a potential role for yoga in addressing emotional barriers to fertility treatment [154].

Case Report: Integrated Yoga Prana Vidya (YPV)

A case report described a woman with two previous failed IVF cycles who achieved a confirmed twin pregnancy after receiving daily sessions of Integrated Yoga Prana Vidya (YPV), a holistic yoga therapy focusing on energy healing and mindfulness, for three weeks prior to embryo transfer [155]. This case highlights the potential value of intensive, personalized yoga-based interventions in improving IVF outcomes among emotionally distressed patients.

Mechanistic Insights and Potential Benefits

The beneficial effects of yoga on fertility are thought to be mediated through multiple pathways:

- Reduction in cortisol and other stress-related hormones
- Improved regulation of GnRH and subsequent gonadotropin secretion
- Enhanced emotional resilience and coping strategies
- Promotion of relaxation and improved sleep quality

These mechanisms may collectively contribute to a more favorable hormonal and psychological environment for conception and implantation. While evidence remains preliminary, current findings suggest that yoga may serve as a valuable non-pharmacological intervention for reducing stress and anxiety in women undergoing fertility treatments. The observed improvements in emotional

well-being and quality of life indicate that yoga could play a supportive role in optimizing the psychological readiness of patients prior to IVF.

Further high-quality randomized controlled trials are needed to determine whether yoga interventions can directly improve clinical pregnancy and live birth rates. Nonetheless, given its safety profile and potential benefits, integrating yoga into fertility care plans warrants consideration.

Ayurveda

Ayurveda, the ancient Indian system of medicine, offers a holistic approach to fertility by emphasizing balance among mind, body, and environment. It is particularly considered in cases of unexplained infertility, where conventional diagnostic methods fail to identify a clear cause. Ayurvedic principles describe conception as dependent on four essential factors:

- Ritu* (~fertile period/menstrual cycle)
- Kshetra* (~uterus and reproductive organs)
- Ambu* (~nutritional and hormonal support)
- Beeja* (~quality of ovum and sperm) [156]

These foundational concepts align with modern understanding of fertility determinants and highlight the importance of systemic health in reproductive success.

Case Report: Nitya Virechana for unexplained infertility
A case report documented the successful treatment of a 35-year-old woman with long-standing unexplained infertility using Nitya Virechana (~daily therapeutic purgation) with Eranda Sneha (~castor oil). This intervention aimed at restoring physiological balance through several mechanisms:

- Regulation of Agni (~digestive fire), which plays a central role in metabolic and hormonal homeostasis
- Normalization of Vata dosha via Vata Anulomana Karma (~carminative action), potentially improving pelvic circulation and ovarian function

Psychological benefits through Medhya (~cognitive-enhancing) and Smritikara (~memory-improving) properties of castor oil, which may reduce stress and improve emotional well-being

Following three menstrual cycles of treatment, the patient achieved a spontaneous pregnancy and delivered a healthy male infant [157]. This case suggests that Ayurvedic interventions may exert beneficial effects on fertility through multiple pathways, including modulation of digestion and metabolism, regulation of hormonal axes, and improvement of psychological status.

Mechanistic Insights

The observed improvements may be attributed to the following:

Impact on hypothalamus-pituitary-ovarian (HPO) axis: The regular use of mild purgatives like Eranda Sneha may help regulate hormonal feedback systems involved in ovulation and endometrial preparation.

Improvement in dysmenorrhea and chronic constipation: These conditions are often associated with pelvic congestion and suboptimal reproductive function; their alleviation may enhance uterine receptivity.

Anti-inflammatory and detoxifying properties: Ayurvedic purification therapies are believed to remove accumulated toxins (Ama) that may interfere with reproductive processes.

While Ayurveda is not commonly integrated into mainstream pre-IVF care, this case highlights its potential as a complementary strategy for managing unexplained infertility, especially when associated with functional gastrointestinal disorders and subtle hormonal imbalances. However, due to the limited number of clinical studies and reliance on anecdotal or case-based evidence, more rigorous research is needed to establish the efficacy, safety, and reproducibility of Ayurvedic interventions in fertility treatment. Given the increasing interest in integrative approaches to reproductive medicine, future studies, particularly randomized controlled trials, should explore standardized Ayurvedic protocols alongside conventional ART to determine their role in optimizing fertility outcomes.

Discussion

Despite significant advancements in ART, the clinical pregnancy rate following IVF-ET remains suboptimal, with many couples experiencing repeated cycle failures. The need for multiple IVF cycles not only imposes substantial financial and emotional burdens but also increases exposure to gonadotropins and invasive procedures. In response, an increasing number of infertile couples are turning to CIM as an adjunct to conventional ART to enhance fertility outcomes and improve overall well-being [158, 159].

The current body of literature includes a wide range of study designs, ranging from RCTs and before-after clinical studies to pilot trials, case-control studies, observational studies, case reports, and cohort analyses, highlighting the growing interest in CIM modalities across different cultural and clinical contexts (see table 1 and table 2 (supplementary)).

Acupuncture: Mechanisms and Evidence Base:

Acupuncture has emerged as the most extensively studied CIM modality in relation to IVF outcomes. A large number of clinical studies have reported beneficial effects on various reproductive parameters, including [160-173]:

Increased CPR

Improved LBR

Higher-quality embryos

Enhanced fertilization and implantation rates

Reduced cycle cancellation and ectopic pregnancy risks

These improvements appear to be mediated through three primary mechanisms:

Ovarian Pathway: Acupuncture enhances ovarian func-

tion by modulating biochemical factors involved in folliculogenesis, increasing AFC, improving follicular fluid growth factors, and enhancing ovarian blood flow.

Uterine Pathway: It promotes endometrial receptivity via upregulation of estrogen receptor expression and regulation of microRNA activity, which supports optimal endometrial thickness and morphology.

Psychological Pathway: Acupuncture reduces stress and anxiety, key contributors to impaired fertility, by regulating the HPA axis and promoting relaxation.

Moreover, acupuncture is often applied at various time points during the IVF cycle, including during controlled ovarian hyperstimulation, pituitary down-regulation, and around embryo transfer, using diverse techniques tailored to individual needs. When combined with CHM, this integrative approach has demonstrated even greater efficacy in improving oocyte quality, ovarian function, endometrial receptivity, and overall IVF success rates.

However, despite promising results, limitations remain. There is a relative paucity of high-quality RCTs, and standardization of acupuncture protocols (including point selection, duration, and frequency) is lacking. Additionally, many CHM formulations are region-specific and may not be easily accessible or culturally acceptable outside of China, limiting their global applicability.

Herbal Medicine: Promise and Precautions:

CHM has shown encouraging effects in managing specific infertility conditions such as PCOS, POF, and POR. Several plant-based compounds have demonstrated positive impacts on hormonal regulation, follicular development, and endometrial health [174-180]. However, challenges persist.

Many of these interventions are rooted in traditional practices and lack rigorous scientific validation in non-Chinese populations. Furthermore, concerns regarding the presence of phytoestrogens in certain herbs, such as; soy, isolate them from use in patients with estrogen receptor-positive (ER+) cancers due to potential tumor-promoting effects [181].

Other safety considerations include:

Adverse effects at therapeutic doses

Herb-drug interactions, particularly with medications metabolized by cytochrome P450 enzymes

For example, licorice (*Glycyrrhiza glabra*) has been associated with pseudohyperaldosteronism, characterized by hypertension and hypokalemia. Additionally, licorice extract and its active constituent glycyrrhizin can inhibit or induce P450 enzyme activity, potentially altering drug metabolism and increasing the risk of adverse interactions [182-184].

Therefore, while herbal medicine holds promise as an adjunct to ART, further pharmacological and clinical research is needed to establish standardized dosing, safety profiles, and mechanisms of action across diverse populations.

Yoga, Massage, and Ayurveda: Emerging Modalities with Limited Evidence:

Although yoga, massage therapy, and Ayurveda are increasingly embraced by infertile individuals seeking non-invasive approaches, the evidence base for these modalities remains limited. Most studies to date have been small-scale, observational, or case-based, with inconsistent methodologies and outcome measures.

Nonetheless, preliminary findings suggest that:

Yoga improves psychological well-being, reduces stress, and enhances fertility-related quality of life [185]

Massage therapy may enhance uterine blood flow and reduce uterine contractions post-embryo transfer

Ayurvedic treatments, such as Nitya Virechana using Eranda Sneha (castor oil), have shown anecdotal success in treating unexplained infertility through systemic detoxification and hormonal modulation

Given the limited number of high-quality studies and the unclear mechanisms of action of these interventions, definitive conclusions about their effectiveness cannot yet be drawn. Future research should focus on conducting well-designed RCTs, employing standardized protocols, and incorporating objective biomarkers of fertility outcomes to better assess the role of these therapies in reproductive medicine.

CIM offers a range of safe, cost-effective, and patient-centered options that may enhance fertility outcomes when used alongside conventional ART. Among these, acupuncture, particularly when combined with CHM, demonstrates the strongest evidence base for improving IVF success rates through both physiological and psychological pathways. While herbal medicine shows promise, it requires further standardization and pharmacological evaluation to ensure safety and reproducibility across diverse populations.

Yoga, massage, and Ayurveda, although widely practiced, require more robust scientific validation before they can be recommended as routine components of fertility care. In conclusion, CIM interventions hold considerable potential as supportive strategies in ART, but future research must focus on generating high-quality, reproducible evidence to guide clinical integration and optimize patient outcomes.

Conclusion

CIMs have increasingly been adopted as adjunctive therapies alongside IVF across various healthcare systems worldwide. These modalities are often utilized to enhance fertility outcomes, improve patient well-being, and reduce the psychological burden associated with infertility treatments. This review comprehensively summarized the existing body of evidence regarding the use of CIM

interventions in conjunction with IVF, while also exploring the potential mechanisms through which these therapies may exert their effects. Despite our efforts to include all relevant studies, several limitations hinder the ability to definitively recommend a single best CIM approach for improving IVF success:

Limited number of high-quality clinical trials

Small sample sizes in many studies

Heterogeneity in study designs, including variations in:

Infertility diagnoses (e.g., PCOS, DOR, unexplained infertility)

CIM interventions (e.g., acupuncture techniques, herbal formulations)

Study populations and cultural contexts

Lack of mechanistic depth in most studies, limiting understanding of how CIMs influence reproductive physiology

Given these challenges, it is essential that future research focuses on standardizing effective CIM protocols, documenting treatment regimens, and conducting large-scale, multi-center clinical trials across diverse populations to validate findings and ensure reproducibility.

Among CIM modalities, acupuncture stands out as a particularly promising intervention due to its relatively robust evidence base, favorable safety profile, and demonstrated benefits on both physiological and psychological aspects of fertility. With further refinement and standardization, acupuncture could be integrated into mainstream IVF protocols as a routine supportive therapy.

In contrast, TCM and other herbal-based approaches require more rigorous scientific validation. Additional studies are needed to:

Clarify pharmacological mechanisms of action

Ensure safety and minimize herb-drug interactions

Adapt formulations for global applicability and regulatory compliance

In conclusion, while complementary and integrative medicine holds significant potential to enhance IVF outcomes, a stronger evidence base is required before any specific CIM modality can be universally recommended as a standard component of fertility care. We encourage researchers and clinicians to prioritize methodologically sound studies that combine traditional practices with modern scientific rigor to optimize patient-centered fertility treatments.

Conflict of Interests

None.

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Supplementary

Table 1. Clinical studies on the effects of complementary and integrative medicine on reproductive assisted technologies outcomes

Category	Type of study	Subject	Intervention	Duration of intervention	Outcomes	Author/Ref.
Acupuncture + herbal medicine	Case report	A 35-year-old female case with DOR	TCM Formula: <i>Eucommia ulmoides</i> Oliv. (hardy rubber tree), <i>Cuscuta chinensis</i> Lam. (chinese dodder), <i>Bupleurum chinense</i> DC. (Bei Chai Hu, Bupleurum), <i>Paeonia lactiflora</i> Pall. (Chinese peony), <i>Dioscorea batatas</i> Decne. (Shan yao, Chinese yam), <i>Atractylodes macrocephala</i> Koidz. (Bai Zhu), <i>Codonopsis pilosula</i> (Franch.) Nannf. (Dangshen, Bellflower), <i>Astragalus propinquus</i> Schischkin (Huanqi, Mongolian milk vetch), <i>Ophiopogon japonicus</i> (Thunb.) Ker Gawl. (Mondo grass), <i>Ziziphus jujuba</i> Mill. (Zao, Common jujube) twice daily, on cycle day 5-24 only Acupuncture: twice per week on CD 5-11	3 months	Decreased : FSH Improved: AFC & get pregnancy	[146]
	Case report	a 41-year-old female with infertility and 11 failures in ART during 3 years	3 herbal decoction formulas: 1. at follicular phase: <i>Epimedium grandiflorum</i> C.Morren (Yin yang huo, Barrenwort), <i>Angelica sinensis</i> (Oliv.) Diels (Dong gui, Chinese angelica), <i>Cornu cervi degelatinatum</i> , <i>Achyranthes bidentata</i> Blume (Niu Xi), <i>Rehmannia glutinosa</i> (Gaertn.) DC. (Chinese foxglove), <i>C. chinensis</i> , and <i>Spatholobus suberectus</i> Dunn (Jixueteng). 2. at ovulation phase: <i>E. grandiflorum</i> , <i>Placenta Hominis</i> , <i>A. propinquus</i> , <i>A. sinensis</i> , <i>Cornu Cervi Degelatinatum</i> , <i>A. bidentata</i> , <i>R. glutinosa</i> , <i>Lycium barbarum</i> L. (Ning xia gou qi, Wolfberry), <i>C. chinensis</i> , <i>Ligusticum striatum</i> DC. (Chuan xiong, Ligusticum) and <i>Salvia miltiorrhiza</i> Bunge (Danshen, Chinese salvia) 3. at the luteal phase: <i>Taxillus chinensis</i> (DC.) Danser (Guang ji shen, Chinese mistletoe), <i>Dipsacus inermis</i> Wall. (Xu duan, Teasel root), <i>Tropaeolum majus</i> L. (Nasturtium), <i>C. chinensis</i> , <i>P. lactiflora</i> , <i>Amomi Fructus</i> (<i>Amomum villosum</i> Lour. (Sha ren, Amomum), <i>Amomum villosum</i> var. <i>xanthioides</i> (Wall. ex Baker) T.L.Wu & S.J.Chen (suo sha ren), <i>Amomum longiligulare</i> T.L.Wu (Hainan amomum, Chinese amomum)), <i>Pseudostellaria heterophylla</i> (Miq.) Pax (Hai er shen, False starwort), and <i>R. glutinosa</i> orally twice a day except during menstruation acupuncture: once every 2 days (3 times per week) until getting pregnancy	2 months	Increased: FSH & LH Improved: oocyte quality, uterine environment	[147]
	Retrospective case study	39-year-old female	Acupuncture treatments and Herbal prescription every week, once a week for 12 weeks. Dose of herbal medicine: 3 spoons 3 times a day for a total of 10.5g/day Herbs: <i>C. chinensis</i> , <i>E. ulmoides</i> , <i>D. asperoides</i> , <i>R. glutinosa</i> , <i>S. miltiorrhiza</i> , <i>P. lactiflora</i> , <i>C. pilosula</i> , <i>A. sinensis</i> , <i>Schisandra chinensis</i> (Turcz.) Baill. (Wu wei zi, Magnolia-vine), <i>Rubus coreanus</i> Miq. (Cha tian pao, Korean blackberry), <i>Artemisia annua</i> Pall. (Sweet Annie), <i>B. chinense</i> , <i>Prunus persica</i> (L.) Batsch (Peach), <i>Carthamus tinctorius</i> L. (Safflower), <i>A. villosum</i> , <i>Cornus officinalis</i> Siebold & Zucc. (Japanese cornel), <i>Ligustrum lucidum</i> W.T.Aiton (Chinese privet), <i>Coptis chinensis</i> Franch. (Huang Lian), <i>R. glutinosa</i> , <i>L. barbarum</i> , <i>S. chinensis</i> , <i>Glycyrrhiza uralensis</i> Fisch. (Gan zao, Chinese liquorice), <i>R. glutinosa</i> , <i>Pinellia ternata</i> (Thunb.) Makino (Ban xia, Crowdiipper), <i>Poria cocos</i> (Schwein.) F.A.Wolf (Fuling), <i>Albizia julibrissin</i> Durazz. (silk tree), <i>A. macrocephala</i> , <i>Polygonatum sibiricum</i> F.Delaroche (huang jing), <i>P. lactiflora</i> , <i>C. chinensis</i> , <i>Paeonia suffruticosa</i> var. <i>papaveracea</i> (Andrews) A. Kern. (tree peony), <i>T. chinensis</i> , <i>P. cocos</i>	3 months	Decreased : FSH level	[145]
	Case report	6 cases IVF cannot be offered	Acupuncture and Chinese Herbal Medicine Case 1: 3-month treatment Moxibustion Acupuncture: once per week Herbal Medicine: 15 pills each, twice daily - Jiaweixiaoyao Wan: <i>B. chinense</i> , <i>A. sinensis</i> , <i>P. lactiflora</i> , <i>A. macrocephala</i> , <i>P. cocos</i> , <i>P. suffruticosa</i> , <i>Gardenia jasminoides</i> J.Ellis (cape jasmine), <i>Mentha haplocalyx</i> Briq. (Japanese mint), and <i>G. uralensis</i> - Renshengguipi Wan: <i>Panax ginseng</i> C.A.Mey. (Ren seng, Asiatic ginseng), <i>A. macrocephala</i> , <i>A. membranaceus</i> , <i>P. cocos</i> , <i>Polygala tenuifolia</i> Willd. (Yuan zhi, Chinese senega-root), <i>Z. jujuba</i> , <i>Dimocarpus longan</i> Lour. (Longan), <i>A. sinensis</i> , <i>Z. jujuba</i> , and <i>G. uralensis</i> . Case 2: 5 months treatment Wife's treatment: Moxibustion Acupuncture: once per week Herbal Medicine: 6 g in powder form, orally, twice daily. <i>R. Glutinosa</i> , <i>Curculigo orchoides</i> Gaertn. (Kali musli, Golden eye grass), <i>Epimedium acuminatum</i> Franch.	Case 1: 3 months Case 2: 5 months Case 3: 1 year Case 4: 6 months Case 5: 2 years Case 6: 3 months	Case 1: Pregnancy by IUI Case 2: Pregnancy by ICSI Case 3: Pregnancy by IVF Case 4: Pregnancy by IVF Case 5: Pregnancy by IVF Case 6: Pregnancy by IVF	[7]

(Bishop's hat), *A. sinensis*, *P. oenate*, *A. macrocephala*, *L. striatum*, *P. lactiflora*, *Leonurus japonicus* Houtt. (Yi mu cao, Chinese motherwort), *P. cocos*, *Cyperus rotundus* L. (Purple nutsedge), *C. tinctorius*,
 Before ovulation: Fluoritum and *P. persica*
 Before menstruation: *C. chinensis*, *Lycopus lucidus* Turcz. ex Benth. (Shiro-ne) *Lycopus asper* Greene (Shiny bugleweed),
 Husband's treatment:
 Herbal Medicine: 15 pills of each, twice daily.
 - Wuziyanzongwan: *Plantago asiatica* L. (Asian plantain), *L. barbarum*, *R. coreanus*, *C. chinensis*; and *S. chinensis*
 - Jiaweixiaoyaowan: *B. chinense*, *A. sinensis*, *P. lactiflora*, *A. macrocephala*, *P. cocos*, *P. suffruticosa*, *G. jasminoides*, *M. haplocalyx* and *G. uralensis*
 Case 3:
 Moxibustion
 Acupuncture: once per week
 Herbal Medicine: 1 dose per day, 6 doses per week.
R. glutinosa, *A. sinensis*, *Polygonum multiflorum* Thunb. (He shou wu, Chinese knotweed), *L. barbarum*, *L. lucidum*, *Eclipta prostrata* (L.) L. (False dais), *B. chinense*, *Curcuma longa* L. (turmeric), *Citrus × aurantium* L. (bitter orange), *C. tinctorius*, *Dioscorea oppositifolia* L. (Cinnamon vine), *P. cocos*, *P. lactiflora*
 Before ovulation:
 Fluoritum, *Phellodendron amurense* Rupr. (Amur cork tree) and *Anemarrhena asphodeloides* Bunge (Zhi Mu)
 Before menstruation:
Artemisia argyi H.Lév. & Vaniot (Chinese mugwort), *C. chinensis* and *D. asperoides*
 Case 4:
 Moxibustion
 Acupuncture: once per week
 Herbal Medicine: 15 pills of each twice daily
 - Zhi Bai Di Huang Wan: *P. amurense*, *A. asphodeloides*, *R. glutinosa*, *D. oppositifolia*, *C. officinalis*, *P. suffruticosa*, *P. cocos*, and *Alisma orientale* (Sam.) Juz. (Ze Xie, Water plantain)
 - Jia Wei Xiao Yao Wan: *B. chinense*, *A. sinensis*, *P. Lactiflora*, *A. macrocephala*, *P. cocos*, *P. suffruticosa*, *G. jasminoides*, *M. haplocalyx*, and *G. uralensis*.
 Case 5:
 wife's treatment:
 Moxibustion
 Acupuncture: once per week then once every 2 weeks
 Herbal Medicine: 6 g twice daily
B. chinense, *C. rotundus*, *C. aurantium*, *P. lactiflora*, *L. striatum*, *A. sinensis*, *L. heterophyllus*, *C. longa*, *Vaccaria hispanica* (Mill.) Rauschert (cow herb), *P. persica*, *C. tinctorius*
 after menstruation: *L. lucidum*, *E. prostrata* and *P. multiflorum*
 during ovulation time: YueYueShu
 after ovulation: *P. lactiflora* and *Colla corii asini* (donkey-hide gelatin)
 husband's treatment:
 Herbal Medicine: 15 pills each, twice daily.
 - Chaihuashugan Wan: *P. lactiflora*, *M. Haplocalyx*, *Citrus reticulata* Blanco (Mandarin orange), *Rheum palmatum* L. (Da huang, Chinese rhubarb), *A. sinensis*, *A. villosum*, *P. cocos*, *C. longa*, *Saposhnikovia randiflor* (Turcz.) Schischk. (fang feng), *Platycodon randifloras* (Jacq.) A.DC. (Jie geng, Chinese-bellflower), *Scutellaria baicalensis* Georgi (Baikal skullcap), *Crataegus pinnatifida* Bunge (Shan zha, Chinese hawthorn), *Massa Fermentata Medicinalis* (*A. annua*, *Persicaria hydropiper* (L.) Delarbre (water-pepper), *Prunus armeniaca* L. (apricot), *Triticum aestivum* L. (wheat), *Vigna umbellata* (Thunb.) Ohwi & H. Ohashi (rice bean), *Xanthium sibiricum* Patr. ex Widder (Common cocklebur), *C. rotundus*, and *C. aurantium*
 - Wuziyanzong Wan— *P. asiatica*, *L. barbarum*, *R. coreanus*, *C. chinensis*; and *S. chinensis*
 Case 6:
 Moxibustion
 Acupuncture: once per week
 Herbal Medicine: decoction for drinking twice daily. 1 dose per day, 6 dose per week.
C. rotundus, *R. glutinosae*, *A. sinensis*, *L. heterophyllus*, *P. lactiflora*, *C. tinctorius*, *L. striatum*, *P. persica*, *P. amurense*, *A. asphodeloides*, *L. lucidum*, *C. officinalis*, *E. prostrata*, Fluoritum

Randomized controlled trial	95 cases undergoing IVF-ET	- Dual therapy group: TCM + auricular acupoint therapy <i>C. chinensis</i>, <i>L. barbarum</i>, <i>B. chinense</i>, <i>Lilium lancifolium</i> Thunb. (true tiger lily), <i>Rubus chingii</i> Hu (Fu-Pen-Zi), <i>P. lactiflora</i>, <i>C. aurantium</i>, <i>G. uralensis</i>, <i>R. glutinosa</i>, <i>A. sinensis</i>, <i>L. striatum</i>, and TCM prescription of miscarriage prevention: <i>C. chinensis</i>, <i>D. asperoides</i>, <i>Adenophora triphylla</i> (Thunb.) A.DC. (nan sha shen), <i>C. reticulata</i>, <i>T. chinensis</i>, <i>A. macrocephalae</i>, Honey, <i>G. uralensis</i> and <i>L. barbarum</i>, - Triple therapy group: TCM + auricular acupoint therapy + retention enema of TCM and combination treatment the same as dual therapy group after transplantation) - Control group	3 months before IVF-ET	Increased: natural pregnancy rate in triple therapy. The fertility rate, clinical pregnancy rate, biochemical pregnancy rate in both dual and triple therapy. Decreased: early abortion rate in both dual and triple therapy. Improved: kidney deficiency, liver depression and blood stasis syndrome in both dual and triple therapy	[2]
Case – control study	67 cases undergoing IVF-ET	Trial group: Four stages 1. TCM prescription: <i>C. chinensis</i>, <i>L. barbarum</i>, <i>B. chinense</i> and <i>L. lancifolium</i> + ear point + the TCM rectum drops: <i>S. miltiorrhiza</i>, <i>Sparganium stoloniferum</i> (Buch.-Ham. ex Graebn.) Buch.-Ham. ex Juz. (branched burreed), and <i>Curcuma phaeocaulis</i> Valetton 2. same as stage 1 +normal down regulation, ovulation induction. 3. TCM of miscarriage prevention: <i>C. chinensis</i>, <i>D. asperoides</i>, <i>A. triphylla</i>, and <i>C. reticulata</i> + ear point + normal luteal supporting 4. same as stage 3	The 1st stage (from the failure of IVF-ET to the next IVF-ET down regulation day) The 2nd stage (from down regulation to the ET day) The 3rd stage (from the ET day to 14 days after the ET day) The 4th stage (from diagnosis of pregnancy to 70 days after ET) for 3 months	Increased: clinical pregnancy rate, fertilized egg number, fertilization rate, pregnancy rate, conception rate. Decreased: symptoms of KLB. NS: higher natural pregnancy rate	[24]
Case-control study	60 RIF of kidney deficiency and blood stasis patients who planned for frozen embryo transfe	combined treatment group and a western medication group; combined group: <i>Tongyuan</i> needling combined with <i>jingyu</i> herb-separated moxibustion	Once every two days, 3 sessions a week till the day of embryo transfer	Increased: CPR, serum E2 and P, endometrial thickness. NS: β -HCG. Positive Rate	[148]
Randomized controlled trial	100 Women eligible for IVF	Shen Que moxibustion (SQM) Group: undergo IVF protocol plus 12 sessions of herb-partitioned moxibustion administered at RN8 (Shen Que), with a 3-day (+ 1 day) interval between	from the previous menstrual cycle day	Increased: the number of retrieved oocytes,	[149]

Acupuncture	Randomized, controlled trial	122 women with RIF undergoing fresh embryo transfer cycle	sessions from the previous menstrual cycle day 2 before OS until oocyte retrieval. The formula contained Bai Zhi (<i>R. Angelicae</i>), Shu Fu Zi (<i>Radix Aconiti Lateralis Preparata</i>), Chuan Jiao (<i>Zanthoxylum bungeanum</i> Maxim., 3 g). Control Groups: Only IVF TEAS: 30 min of stimulation (9–25 mA, 2Hz) MTEAS: The patients in control group received	2 before OS until oocyte retrieval.	mature oocytes and available embryos	
				From day 5 of the ovarian stimulation cycle once every other day until the day of ET	Increased: IR, CPR, LBR Thicker endometrium on the day of hCG injection NS: number of days of stimulation, total dose of gonadotrophin, serum E2 concentrations on the day of hCG administration, number of retrieved oocytes or embryos transferred	[66]
	Single-blind, randomized controlled trial	228 women undergoing IVF or ICSI	Three sessions of acupuncture,	Day 9 of stimulating injections, before ET, immediately after ET (3 sessions)	NS: higher ongoing pregnancy and achieving a pregnancy, pregnancy rate (fetal heart rate) was 31% in the treatment group and 23% in the control group	[160]
	Randomized controlled trial	1168 women undergoing IVF or ICSI	Acupuncture based on TCM	On days 6 to 8 of the stimulated cycle and two treatments on the day of ET	A protocol	[161]
	Multicenter randomized controlled trial	848 women undergoing a fresh IVF cycle	Acupuncture based on TCM	Between days 6 and 8 of ovarian stimulation, and two treatments on the day of ET	Decreased: anxiety, emotional well-being Improved: general health NS: Quality of life	[162]
	Randomized controlled trial	370 patients undergoing IVF	Real acupuncture based on TCM and placebo acupuncture	25 min of real or placebo acupuncture before and after ET	Increased: overall pregnancy rate in placebo vs real acupuncture NS: ongoing pregnancy rate and live birth,	[163]

				lower endometrial and sub-endometrial vascularity, serum cortisol concentration and anxiety level following both real and placebo acupuncture	
Randomized trial	150 women undergoing IVF or ET	EA + PCB (lidocaine hydrochloride) vs Alfentanil + PCB (lidocaine hydrochloride)	Between September 1996 and May 1997, EA at least 30 min before oocyte aspiration and PCB at the start of the procedure	Increased: in EA group implantation rate, pregnancy rate, and take-home baby and stress before oocyte aspiration NS: pain directly related to oocyte aspiration	[164]
Randomized, multicenter clinical trial	286 women undergoing oocyte aspiration	EA + PCB (10 ml lidocaine (5 mg/ml)) vs alfentanil (0.5 mg alfentanil and 0.25 mg atropine) + PCB (10 ml lidocaine (5 mg/ml))	EA at least 30 min before oocyte aspiration	Increased: NPY concentration in FF in the EA group Decreased: less abdominal pain, other pain, nausea and Stress in the EA group NS: Pregnancy rate	[68]
Case - control study	27 female patients with low ER after TCRP	Warming acupuncture combined with acupoint injection (human placenta tissue fluid) after ER recovery	from January 2015 to July 2018	Decreased: time spent on FET NS: Type A rate of endometrial, sub-endometrial blood flow, number of high-quality embryos Transferred, clinical pregnancy rate	[85]
Randomized controlled trial	51 women undergoing IVF-ET or ICSI	Needle acupuncture or laser acupuncture	Needle-acupuncture group, for 10 minutes, twice per week, for 3 months (24 sessions)	Decreased: Needle-acupuncture group, tension/Anxiety, depression/dejection, anger/host	[165]

			Laser-acupuncture for a total of 20 minutes until the patient's skin felt warm, twice per week, for 3 months (24 sessions)	ility, confusion, and total mood disturbance Laser-acupuncture group, tension/anxiety, and vigor/activity NS: Needle-acupuncture group, vigor/activity, and fatigue Laser-acupuncture group, depression/dejection, anger/hostility, fatigue, confusion, or TMD	
Retrospective, intervention al, and longitudinal study	111 cycles of patients undergoing ART	Acupuncture immediately before and after the embryo transfer and for 30 min	From June 2005 to January 2007	NS: higher clinical pregnancy rate	[69]
Case study	A woman was diagnosed with unexplained infertility when she underwent IVF and FET procedures	Acupuncture using GV 20 stimulations	8 acupuncture treatments approximately once per week, with each treatment lasting between 30 and 60 minutes	Successful pregnancy	[70]
Randomized controlled trial	60 patients undergoing IVF	Acupuncture treatment sessions before gonadotropin starts, before oocyte retrieval, the day before embryo transfer, and the day after embryo transfer	Unknown	NS: Clinical pregnancy rate per transfer Increased: higher pregnancy rate in patients whose FSH was higher than mean	[71]
Randomized controlled trial	84 infertile patients who had had at least two unsuccessful attempts of IVF	patients with moxibustion at nine acupuncture points on the first and seventh day of ovulation induction, on the day before ovarian puncture, and the day after embryo transfer	moxibustion unilaterally for 5 min and acupuncture for 20 min	Increased: clinical pregnancy rate	[31]
Matched Controlled Study	Unknown	Acupuncture was performed using Sterile stainless-steel needles (0.25x0.25mm) were inserted about 5 to 10mm	from day 5 of the follicular phase through the luteal phase but not on the day of the transfer twice weekly for 30 min	NS: Clinical and ongoing (delivered pregnancy rates per transfer)	[72]

Case-control study	160 IVF-ET cases	Acupuncture 10 min before the egg retrieval vs Dolantin Anesthesia 10 min before the egg retrieval	From January 2007 to December 2008	NS: egg retrieval pain, VAS scores, numbers of retrieved eggs	[73]
Randomized controlled trial	273 patients undergoing IVF or ICSI	One group of patients received acupuncture on the day of ET, another group on ET day, and again 2 days later (i.e., closer to implantation day) vs a control group that did not receive acupuncture.	Immediately before and after ET in both groups and for 25 min and one 25 min again 2 days later in the second group	Increased: Clinical and ongoing pregnancy rates in the ACU I group as compared with controls NS: Higher clinical and ongoing pregnancy rates	[74]
Retrospective study	106 fresh oocyte donor/recipient cycles	Acupuncture through ET	From January 2009 to July 2010	Increased: clinical pregnancy rate NS: pregnancy rate, maximum estradiol, oocyte retrieved, fertilization rate, implantation rate, and use of ICSI	[43]
Case-control study	68 patients undergoing IVF-ET	fire needling therapy was applied after ovulation at the end of the premenstrual stage	(The 1st time point, on the 1st day after ovulation) and (the 2nd time point, 3 days before the menstruation)	Increased: endometrial thickness on the day of transplantation NS: Higher biochemical pregnant rate and clinical pregnant rate	[75]
Randomized controlled trial	76 PCOS-IR patients undergoing IVF-ET	Two groups were treated with EA or pseudo-acupuncture vs Control group	Before undergoing IVF for 3 menstrual cycles and about 25 min twice a week until the day of oocyte collection	Increased: transplantable embryo rate high-quality embryo rate and LBR, IRS-1, PI3K and GLUT4 mRNA in ovarian granulosa cells Decreased: The phlegm-dampness syndrome	[76]

				score and the IR scores NS: number of oocytes retrieved and clinical pregnancy rate	
Multicenter, randomized controlled trial	246 repeated IVF-ET failure patients	Acupuncture and moxibustion treatment	Three times a week starting from the third day of menstruation in the ovary stimulation cycle	This trial is currently in the recruitment phase	[77]
Randomized controlled trial	360 infertile women with tubal blockage	control group, TEAS-2 Hz group for 30 min, 24 h before TVOR, TEAS-100 Hz group for 30 min, respectively at 24 h before TVOR and 2 h before ET and TEAS-2/100 Hz group for 30 min, respectively at 24 h before TVOR and 2 h before ET	six-month period (April 21, 2014, to October 20, 2014)	Decreased : in 2/100 Hz TEAS state anxiety and preoperative anxiety	[78]
Case – control study	69 IVF/ICSI-ET female recipients	Acupuncture	on the 7th day of menstruation (during the follicular phase) daily till the day of HCG injection for 30 min	Increased: Biochemical pregnancy rate and clinical pregnancy rate Decreased : ovarian arterial hemodynamic index, the pulsatility index (PI), resistance index (RI), and the systolic-to-diastolic peak velocity ratio (S/D)	[79]
Randomized controlled trial	309 patients undergoing cryopreservation or fresh cycle IVF with or without ICSI	Mock TEAS treatment, single TEAS treatment. Double TEAS treatment	For 30 min after ET	Increased: clinical PR, embryos implantation rate, and LBR in mock TEAS treatment group	[81]
Case – control study	90 patients undergoing IVF-ET oocyte retrieval	Acupuncture treatment into bilateral Hegu (LI 4) points	15 min before the operation	Increased: The NPY levels in FF Decreased : PRI, VAS, and PPI after operation and 1 h after operation	[80]
Randomized controlled trial	70 patients undergoing IVF	Three sessions based on the Delphi consensus acupuncture protocol	Session 1: between days 6 to 8 of the stimulated IVF cycle	A protocol	[82]

			Session 2: on the day of the embryo transfer at least 1 h before the transfer session 3: within 48 h post-ET for about 30 ~ 40 min Once every two or three days from day 3 of menstruation in the ovarian stimulation cycle till the day of ET		
Multicenter, randomized controlled trial	2220 women undergoing fresh IVF or ICSI	TEAS (2/100 Hz) + IVF EA (2/100 Hz) + IVF Control + IVF		A protocol	[83]
Case – control study	63 patients of DOR undergoing IVF or	Menstrual cycle-based acupuncture therapy	Twice a week until the second menstrual cycle of oocyte retrieval	Increased: E2, AFC, number of retrieved oocytes, number of high qualities embryos, and number of fertilization Improved: the implantation rate, the clinical pregnancy rate Decreased: cycle cancellation rate	[84]
Randomized controlled trial	160 women undergoing IVF or ICSI and with good embryo quality	embryo transfer with/without acupuncture	25 min before and after ET	Increased: pregnancy rate	[60]
Retrospective study	147 patients completing an IVF cycle with a transfer	Acupuncture along with IVF	-	Increased: pregnancy outcomes	[52]
Retrospective case-controlled study	114 infertile patients undergoing IVF-ET with normal Day 3 FSH, normal uterine artery pulsatility indices, sperm morphologies over 7% normal, and good response to ovarian hyperstimulation protocols	Acupuncture along with IVF	-	Increased: birth outcomes Decreased: ectopic pregnancies and miscarriage rates	[50]
Randomized, controlled, cross-over pilot trial	17 women with a history of failed IVF cycle	Acupuncture along with IVF	NM	Decreased: the amount of gonadotropins used	[64]
Retrospective study	178 IVF cycles	Acupuncture along with IVF	Data analysis	NS: embryology	[53]

Randomized controlled trials	22 patients	Acupuncture along with IVF	NM	characteristics	[49]
Retrospective study	232 IVF cycles	Acupuncture along with IVF	-	Improved: Prolactin level	[51]
				Patients with infertility caused by Tubal factor, PCOS, and Male factor had better outcomes	
Randomized-controlled trial	124 women undergoing IVF	real or placebo acupuncture along with IVF	25 min before and after embryo transfer	NS: pregnancy rate	[57]
Prospective cohort	67 reproductive-age infertile women undergoing IVF	Acupuncture along with IVF	Within 24 hours before and 1 hour after ET.	Increased: cortisol levels and Prolactin level	[54]
Randomized controlled trial	160 patients undergoing IVF	Real or placebo acupuncture along with IVF	25 min before and after ET	NS: clinical or chemical pregnancy rates	[166]
Non-randomized clinical study	432 patients who were undergoing IVF or ICSI	acupuncture during stimulation and/or before and after ET along with IVF	G1: Once or twice from 1 to 8-day cycle G2: only on the day of the ET, 30 min before ET	NS: clinical pregnancy rate	[59]
Randomized, controlled study	305 infertile patients with tubal blockage who were referred for IVF	auricular acupressure along with IVF	six days	Decreased: anxiety levels	[63]
Randomized controlled trials	164 infertile patients who	Acupuncture along with IVF	Before ET on oocyte puncture day, 2 days after puncture, and one cycle before ET, three times each for 25 min	Improved: outcomes of IVF	[61]
			Before and after the ET on the day of fresh or frozen-thawed ET	Increased: Pregnancy level, preterm delivery, mode of delivery	
Retrospective study	212 women	Real or placebo acupuncture along with IVF	25 min before and after ET	NS: pregnancy outcomes	[65]
Randomized Controlled Trial	843 patients	Laser Acupuncture along with IVF	25 min before and after ET	Improved: implantation rate	[56]
Case series study	20 women with DOR and low AMH, who had unsuccessful IVF trials	EA, manual acupuncture, acupressure and sliding-cupping along with IVF	Three menstrual cycles	All of these 20 women got pregnant	[55]
Randomized Controlled Trial	Women undergoing IVF	Acupuncture along with IVF	Three sessions	NS: self-perceived stress levels or tissue perfusion	[167]
Randomized controlled trial	481 infertile patients with bilateral tubal	TCEA Stimulation along with IVF	for 30 min, at 24 h before	Increased: Clinical pregnancy	[62]

	blockage who were referred for IVF		TVOR and 2h before ET	rate, Implantation rate, LBR, and NPY	
Case series study	12 women with thin endometrium at childbearing age undergoing embryo transplantation	Acupuncture along with IVF	from the first day of two menstrual cycles before entering IVF-ET to the day of IVF-ET, once every other day	hsa-miR-449a, hsa-miR-3135b and hsa-miR-345-3p may underly mechanisms by which acupuncture therapy helps increase ER and promote endometrium receptivity in preparation for IVF and ET.	[58]
Randomized, controlled trial	Infertile polycystic ovary syndrome patients aged 20-40 years	Acupuncture at the follicular phase for 30-40 min according to the principles of TCM	March 2011 to July 2012	NS; AMH Decreased: P and E2 on the day of giving HCG and oocytes pickup, ovarian hyperstimulation syndrome rate improved: embryos transferred, pregnancy rates	[26]
Single-blind, parallel-group RCT	848 women aged 18 to 42 years	Acupuncture between days 6 to 8 of follicle stimulation and 2 additional treatments before and following embryo transfer The Sham control group received a non-insertive acupuncture needle placed away from the true acupuncture points	10 months	NS: Frequency of live birth	[67]
Observational, prospective, cohort study	57 subjects undergoing IVF-ET	acupuncture for 25 min before undergoing ET	-	Decreased: Perceive Stress Scale scores before and after ET Increased: pregnancy rates	[27]
Randomized controlled trial	144 participants undergoing IVF-ET	Acupressure on the H7 and P6 acupoints on both the hands The infertility self-efficacy scale was completed before and after the intervention	September 2015 to August 2016	Improved: ovulation factor and spouse's job NS: self-efficacy and frequency of clinical pregnancy	[28]
Randomized controlled trial	60 cases with the poor ovarian response or decreased reserve in IVF	EA intervention at Guanyuan (CV 4), Taixi (KI 3), Sanyinjiao (SP 6) etc	-	Improved: serum estradiol, fertilization rate, oocyte maturation	[29]

					rate, good quality embryos rate, implantation rate on (hCG) injection day, and stem cell factor (SCF) in follicular fluid and serum NS: Lower pregnancy rate, and abortion rate	
Randomized controlled trial	114 patients undergoing IVF-ET at the luteal phase	Moxibustion at the beginning of ovulatory induction at Shenque (CV 8) and acupuncture Zhongji (CV 3), Guanyuan (CV 4), Qihai (CV 6), Zigong (EX-CA 1), Xuebai (SP 10), etc. till the transfer time for one session of treatment (Totally, 3 sessions)	-		Improved: high-quality embryo rate, endometrial blood flow state, and morphology, estrogen level on hCG day,	[4]
Case - control study	302 cycles performed in 273 patients attending ART	acupuncture group: Neiguan (CX 6), Diji (SP 8), Taichong (Liv 3), Baihui (Gv 20), and Guilai (S 29). two times before and after ET in a single day and auricular acupuncture at ear points, including ear point 55 (Shenmen), ear point 58 (Zhigong), ear point 22 (Neifenmi), and ear point 34 (Naodian)	Before and after ET (August 2013 to August 2016)		Increased: clinical pregnancy rate, LBR	[30]
Prospective, physician-blinded randomized controlled trial	113 women undergoing IVF-ET	one acupuncture session before and after the transfer using a modified Paulus protocol	May-June 2014		Decreased: pregnancy rate, live births, lower odds of clinical pregnancy	[168]
Randomized controlled trial	66 patients with PCOS and undergoing IVF-ET	EA was applied to Guanyuan (CV 4), Zhongji (CV 3), Sanyinjiao (SP 6), Zigong (EX-CA 1) and Taixi (KI 3)	-		Improved: fertilization rate, cleavage rate, and the rate of high-quality embryos and follicular fluid on the day of ovary collection NS: Higher clinical pregnancy rate	[169]
Randomized controlled trial	186 participants who had undergone IVF treatment	Acupuncture 25 min before embryo transfer (ET) (ACU1 group, n = 62), acupuncture 25 min before and after ET (ACU2 group, n = 62), and ET without acupuncture	between September 2015 and February 2016		Improved: ACU1 biochemical clinical, and ongoing pregnancies. Decreased: (ACU2) pregnancy rates than one-session	[170]

Randomized, controlled clinical trial	225 infertile patients undergoing IVF/ICSI	luteal-phase acupuncture according to the principles of TCM and placebo acupuncture	-	acupuncture (ACU1) Improved: clinical pregnancy rate and ongoing pregnancy rate	[32]
Randomized, controlled, single blind trial	150 patients undergoing ET	Acupuncture for 25 min before and after ET Control group		NS: Pregnancy rate Improved: anxiety post-transfer and reported feeling more optimistic about their cycle	[33]
Case series study	6 women received ICSI and acupuncture along with agents for ovarian stimulation.	acupuncture treatment at the same time that they began follicle-stimulating hormone injections, 3 or 4 twice-weekly treatments, on days 1-3, 4-6, 7-9, and in some cases 9-11, with the final treatment on the day of or before egg retrieval	-	Increased: higher recruited follicles in 3 women and estradiol levels, pregnancy occurred in 3 women	[34]
Randomized controlled trial	1000 women undergoing IVF-ET	Acupuncture and laser Acupuncture	Before and after ET	Increased: Implantation rate NS: Chemical pregnancy rate, clinical Pregnancy rate, ongoing pregnancy rate and Delivery	[171]
Case - control study	261 women undergoing IVF-ET	Acupuncture Chinese and Japanese	Before and after ET	Increased: Pregnancy rate, clinical pregnancy and ongoing pregnancy rate Decreased : Miscarriage rate	[35]
Randomized controlled trial	82 cases of kidney deficiency syndrome (group A), 74 cases of liver qi stagnation syndrome (group B), and 54 cases of phlegm dampness syndrome (group C)	Guanyuan (CV 4), Zlgong (EX-CA 1), and Sanyinjiao (SP 6) were taken as main points, added points according to syndromes differentiation: Taixi (KI3) for kidney deficiency type, Fenglong (ST 40) for phlegm and dampness type, Taichong (LR3), Hegu (LI 4) for liver qi stagnation type	-	Increased: high-quality embryo rate, HLA-G NS: fertilization rate, implantation rate, and clinical pregnancy rate (A, B GROUP)	[44]
Randomized controlled trial	52 IVF patients aged between 29 - 45 years	Traditional Chinese acupuncture (TCA) + EA, TCA alone (control), and EA alone (second control)	-	Increased: pregnancy rate	[45]

Retrospective study	1613 patients receiving fresh embryo transfer	Acupuncture treatment just	prior and immediately after ET	TCA and EA: 81.8% NS: Ongoing clinical pregnancy rate and implantation rate	[47]
Randomized controlled trial	140 patients undergoing IVF-ET	acupuncture treatment (CV4 and CV3 EX-CA1, SP6, KI3, SP10, ST36, and LR3)	8 weeks before IVF	A protocol	[172]
Randomized controlled trial	66 patients with infertility of kidney deficiency pattern	EA Sanyinjiao (SP 6). Zigong (EX CA 1), Zhongji (CV 3) and Guanyuan (CV 4)	On the 5th day of menstruation in the IVF cycle	Increased: score of kidney deficiency syndrome, the high-quality oocyte rate, the high-quality embryo rate, and the clinical pregnant rate levels of IGF-1 and IGF-2 in follicular fluid and the serum β -endorphin β -EP	[48]
Randomized controlled trial	157 patients undergoing IVF-ET	Acupuncture based on TCM methods and different times at the different points	Between days 6 and 8 of ovarian stimulation, and twice on the day of embryo transfer, before and after the transfer	Increased: live births and positive pregnancy tests	[36]
Prospective randomized trial	88 patients undergoing IVF-ET	EA was performed four times: six pairs of acupuncture points (LR3, SP6, ST28, EX-CA1, RN6, RN4), and two needles were located bilaterally in all women undergoing EA	Twice a week for 2 weeks, from day 2 of the study to the day before oocyte retrieval	NS: Clinical pregnancy rate Decreased: pulsatility index (PI) of right and left uterine arteries before and after EA	[38]
Case series study	26 Acupuncture group 265 Non-acupuncture group	Acupuncture	Before and after ET (On the day of ET, two 25 minute sessions, one immediately before and one after ET)	Increased: Pregnancy rate	[41]
Retrospective randomized controlled trial	37 patients with implantation failure	TEAS: Transcutaneous electrical acupoint stimulation 6- 8 times per menstrual cycle	One cycle before the preparation of endometrium for ET, and once one week after ET	Increased: biochemical pregnancy rate, clinical pregnancy rate and	[39]

Randomized controlled trial	24 patients undergoing IVF-ET	Acupuncture therapy was carried out 6 times	2 times per week, before COS and 4 times while each patient underwent a COS antagonistic protocol	implantation rate NS: oocyte maturation, fertilization rate, and granulosa-cell Decreased: apoptosis index GDF9, and BMP15 [46]
Randomized controlled trial	50 patients undergoing IVF-ET	Three sessions of acupuncture (A protocol based on the Delphi process)	on days 6, 7, or 8 of gonadotropin stimulation, and approximately 1 hour before ET and within 48 hours after the ET	NS: Pregnancy singleton, twin gestation [40]
Case study	A 39-year-old woman diagnosed with fallopian tube obstruction and DOR and 3-time IVF failure	Electroacupuncture treatment	Three times per week for about 3 months	After 2 months: normal menstrual cycles After 3 months: conceived and gave birth to a healthy boy [87]
Randomized clinical trial	83 patients undergoing IVF	Observation group (40 cases): Acupuncture was given to two acupoint groups: Group 1 included Guanyuan (CV 4), Qihai (CV 6), Zhongji (CV 3), bilateral acupoints Zigong (EX-CA1). Group 2 included Mingmen (GV 4), Yaoyangguan (GV 3), bilateral Shenshu (BL 23) and Ciliao (BL 32). The two groups of acupoints were used alternately and control group (43 cases)	For 30 min once every other day (from the time of ovulation induction until the transplantation day and consisted of 3 courses)	Increased: clinical pregnancy rate, the proportion of type A endometrium Decreased: Gn dosage and Gn stimulation time, serum E2 and P levels on the day of hCG injection [91]
Randomized controlled trial	200 women undergoing IVF-ET	Transcutaneous electrical acupoint stimulation of 20, 30, 40, and 50 mA at acupoints of Guanyuan (RN 4), Zhongji (RN 3), Sanyinjiao (SP 6), Zigong (EX-CA 1), and Taixi (KI 13)	Once a day for 30 min for a treatment period of 10-13 days	Improved: Endometrial thickness Increased: number of ova captured NS: high-quality embryo rate and clinical pregnancy rate [88]
Randomized controlled trial	739 participants	Transcutaneous electrical acupoint stimulation with a frequency of 2 Hz	for 30 min at 24 h before ET and 30 min after ET	Increased: clinical pregnancy rate NS: embryo implantation, [89]

Randomized controlled trial	72 infertile women undergoing IVF	Acupuncture (AG; n = 36): three sessions: The points selected were bilateral H-7, LI-4, GV-20, and ear shenmen for the first session. Bilateral CV-3,4,6, GV-20, LIV-3, ST-30, and SP-8 were selected for the second session. Bilateral LI-4, SP-6,9, and ST-36 were selected for the third session and control group (CG; n = 36): no acupuncture	AG Group: three sessions: first was one week before ET, the second was 30 min before ET, and the third was 30 min after ET	biochemical pregnancy, and live birth rates Increased: Positive Beta HCG, clinical pregnancy, ongoing pregnancy, and live birth rates NS: anxiety scores before ET Decreased: STAI-1 score	[173]
Randomized controlled trial	56 infertile women undergoing ART	Intervention group: Each auriculotherapy session lasted almost 30 min during which the associated points in the ovary, uterine, adrenal, endocrine system, brain, abdomen, pelvis, the immunity system, and the stress and relaxation points were stimulated for 10–15 seconds using Pointer Excel device. At the end of each session for the intervention group, the seeds were placed on specific points of the participant's ears, then they were trained on how to keep pressuring those points (every hour for 1 min) and control group: no treatment	8–10 sessions during the menstrual cycle	Increased: pregnancy rate and clinical pregnancy rate Decreased: score of stress	[86]
Randomized controlled trial	99 infertile patients undergoing IVF-FET	Transplantation-day acupuncture group, And a transplantation cycle acupuncture group Both groups: Zigong (EX-CA 1), Guanyuan (CV 4), Taichong (LR 3), Hegu (LI 4), etc. were selected for acupuncture And a non-acupuncture group	The transplantation-day acupuncture group received acupuncture treatment 1 h before and 30 min after the embryo transfer The transplantation cycle acupuncture group received acupuncture treatment 5 weeks before the FET (once a week, 5 times) and on the day of transplantation	Increased: biochemical pregnancy rate and clinical pregnancy rate in the transplantation cycle acupuncture group	[90]
Randomized controlled trial	90 PCOS women undergoing IVF	Treatment group (PCOS with acupoint application, n = 30): Acupoint application including Fenglong point (ST40), Yinlingquan point (SP9), Zusanli point (ST36), Zhongwan point (CV12), Shenque point (CV8), Guanyuan point (CV4), Tianshu point (ST25), and Daimai point (GB26). 2.1.2. the control group (PCOS without acupoint application, n = 30) and the normal group (non-PCOS, n = 30)	From the day of pituitary downregulation to the day of hCG trigger	Decreased: seven metabolites involving the pathways of pyruvate metabolism, nicotinate, and nicotinamide metabolism, protein digestion and absorption, biosynthesis	[92]

	Randomized controlled trial	1028 infertile women undergoing IVF	The TEAS group: electrical stimulation (2 Hz, 20–25 mA) for 30 min/day to stimulate the following acupoints: Guanyuan (RN4), Zhongji (RN3), bilateral Sanyinjiao (SP6), bilateral Zigong (EX-CA1), bilateral Tianshu (ST25), bilateral Shenshu (BL23), Yaoyangguan (DU3), and Mingmen (DU4) The placebo group: mock stimulation	For three menstrual cycles before the IVF cycle.	is of amino acids, and pyrimidine metabolism Increasing : serum and follicular fluid BDNF expression level, fertilization rates, high-quality embryo rates and higher pregnancy rates per ET Decreased : total dose of gonadotropins	[93]
	Randomized controlled trial	60 cases of elderly women undergoing IVF	The treatment group: routine ovulation induction combined with acupuncture treatment at the points: Zhongwan, Guanyuan (RN4), Baihui, Yintang, bilateral Taixi, Shenshu, Sanyinjiao (SP6), Taichong, Tianshu, Dahe, Zigong (EX-CA1), Ciliao, and unilateral Zhongzhu. The elderly control: routine ovulation induction combined with sham acupuncture	on the day of downregulation, 3 times a week until the day of hCG injection	Increasing : fertilization rate, high-quality embryo rate and cumulative pregnancy rate	[94]
	Retrospective cohort study	299 CET cycles	The Acu-group: acupuncture treatment before CET The acupoints included Guanyuan (RN4), Dahe (KI12), Zigong (EX-CA1), Zusanli (ST36), Sanyinjiao (SP6), Taixi (KI3), Taichong (LR3) and Xuehai (SP10). The control group	Within three months prior to CET	Increasing : live-birth rate and ongoing pregnancy rate	[95]
	Randomized controlled trial	164 patients who intended to undergo frozen-thawed embryo transfer after RIF of IVF-ET	Study group: a combination of GnRHa, HRT and acupuncture on the second day of GnRHa injection at points: Guanyuan (RN4), Qihai (RN6), Zhongji (RN3), bilateral Dahe (KI12), bilateral Shenshu (BL23), bilateral Zusanli (ST36), bilateral Sanyinjiao (SP6), bilateral Taixi (KI3), and bilateral Taichong (LR3) acupoints Control group: conventional HRT	Twice a week for one month	Increased: EMT, linear endometrium, the clinical pregnancy rate and embryo implantation rate	[96]
	Randomized controlled trial	67 patients with POR	Group A: controlled ovarian stimulation and acupuncture three times a week, once every other day at acupoints: DU20 (Baihui), LI4 (Hegu), RN4 (Guanyuan), ST36 (Zusanli), SP6 (Sanyinjiao), LR3 (Taichong), and KI6 (Zhaohai). Group B: controlled ovarian stimulation only	Starting 2 months before the COS cycle and ending on the day of oocytes retrieval, for a total of 8 weeks.	Increased: rates of high-quality embryo, rate of available embryo, the number of high-quality embryo	[97]
Herbal medicine	Randomized controlled trial	180 infertile women undergoing IVF	Intervention group: used diet and lifestyle recommendations based on Iranian traditional medicine	For at least 3 months	Increased: number of ova, mature ovum number, embryo number, embryo quality, fertilization	[138]

				n rate, overall pregnancy rate, rate of getting spontaneous pregnancy, and chemical pregnancy rate	
Retrospective cohort study	111 PCOS patients undergoing IVF	Bu-Shen-Tian-Jing Formula (BSTJF): <i>Epimedium brevicornum</i> Maxim., <i>Cistanche deserticola</i> Y.C.Ma, <i>A. macrocephala</i> , <i>Ligustrum lucidum</i> W.T.Aiton, <i>R. chingii</i> . <i>C. chinensis</i> , <i>P. corylifolia</i> , <i>A. propinquus</i> , <i>S. miltiorrhiza</i>	For three-month	Increased: retrieved oocytes, fertilized oocytes, clinical cumulative pregnancy rate, live birth rate, and term delivery rate Decreased: AMH levels in the follicular fluids NS: fertilization rate, the hospitalization rate of ovarian hyperstimulation syndrome, and obstetrical or neonatal complications	[118]
Case-control study	40 patients with POR undergoing IVF-ET	Tiaogeng Yijing decoction (<i>R. glutinosa</i> , <i>Gynochthodes officinalis</i> (F.C. How) Razafim. & B. Bremer (ba ji), <i>Dioscorea villosa</i> L. (wild yam), <i>E. ulmoides</i> , <i>A. Sinensis</i> , <i>P. lactiflora</i> , <i>S. miltiorrhiza</i> , <i>S. suberectus</i> , <i>B. chinense</i> , <i>Cyathula</i> sp., <i>C. rotundus</i> , <i>C. chinensis</i> , <i>Polygonatum</i> sp., <i>Codonopsis</i> sp., <i>A. macrocephala</i>) + microstimulation of ovulation	twice a day for 2 weeks starting on the seventh day of their menstrual cycle (continuously for 3 menstrual cycles)	Decreased: serum levels of FSH and E2 Increased: serum AMH levels, the AFC, follicular fluid levels of GDF-9, TGF-β1, and VEGF, and endometrial levels of integrin αVβ3, TGF-β1 and VEGF, pregnancy outcomes NS: MOD or levels of LH, LIF, and G-CSF	[174]
Case-control study	247 women having received IVF-	Chinese herbal medicine Gutai Decoction (GTD) (<i>C. pilosula</i> , <i>R. glutinosa</i> ,	For 4 weeks 20–80 mg per day after	Decreased: abortion rate	[175]

	ET and with β -human chorionic gonadotropin (β -HCG) > 25 IU/L on the 14th day after transferring	<i>P. lactiflora</i> , <i>D. batatas</i> , <i>Cornus florida</i> L. (flowering dogwood), <i>E. ulmoides</i> , <i>C. chinensis</i> , <i>L. barbarum</i> , <i>Glycyrrhiza glabra</i> L. (Liquorice), <i>T. chinensis</i>)	transferring and if necessary, the treatment was supplemented with Progynova 2 –4 mg per day, with the medication withdrawn gradually from the 9th week of pregnancy till stopped		
Randomized controlled trial	66 infertile patients who had Kidney-yin Deficiency syndrome and undergoing IVF-ET	Besides gonadotropin (Gn) therapy in both groups, the treatment group received Erzhi Tiangui Granule (ETG) (<i>L. lucidum</i> , <i>E. prostrata</i> , <i>L. barbarum</i> , <i>C. chinensis</i> , <i>A. sinensis</i> , <i>P. lactiflora</i> , <i>L. striatum</i> , <i>R. glutinosa</i> , <i>C. rotundus</i> , and <i>G. glabra</i>) Control The control group received placebo granules	For 3 menstrual cycles before IVF	Decreased : dosage and duration of Gn improved: quality oocyte and embryo rates, and clinical pregnancy rate AND DNA methyltransferases (DNMT) 1 protein expression in endometrium NS: fertilization rate, retrieved oocytes	[106]
Randomized controlled trial	82 infertility patients which who failed in the first IVF-ET	Jingqian Granules (<i>Bupleurum falcatum</i> L. (Thorow-wax), <i>A. macrocephala</i> , <i>A. sinensis</i> , <i>P. lactiflora</i> , <i>C. tinctorius</i> , and <i>Corydalis</i> sp.), Jinghou Zengzhi Granules (containing <i>C. pilosula</i> , <i>A. macrocephala</i> , <i>P. cocos</i> , <i>A. sinensis</i> , <i>R. glutinosa</i> root, <i>E. ulmoides</i> , and <i>C. officinalis</i>), and Cu Huangti Granules (containing <i>C. pilosula</i> , <i>A. macrocephala</i> , <i>Coix lacryma-jobi</i> L. (Job's tears), <i>R. glutinosa</i> , <i>Dioscorea polystachya</i> Turcz. (shan yao, Chinese yam), and <i>C. chinensis</i>) the control group received GnRH-a	-	NS: retrieved oocytes and high-quality embryo Improved: embryo implantation rate and pregnancy rate	[176]
Randomized controlled trial	433 patients undergoing IVF-ET	Chinese herb interventions in two stages: 1th 1st stage contain two treatments: 1. modified Erzhi pill and Siwu decoction, which consists of <i>L. lucidum</i> , <i>E. prostrata</i> , <i>L. barbarum</i> , <i>C. chinensis</i> , <i>R. glutinosa</i> , <i>C. officinalis</i> , <i>A. sinensis</i> , <i>P. lactiflora</i> , Placenta Hominis and <i>D. oppositifolia</i> . <i>P. lactiflora</i> was removed and <i>A. Macrocephala</i> added for spleen deficiency and loose stools. <i>A. membranaceus</i> was added for Qi deficiency. <i>S. baicalensis</i> and <i>R. glutinosa</i> 2. modified Erxianchuyun decoction and Siwu decoction, which consists of <i>C. orchoides</i> , <i>Epimedium brevicornu</i> Maxim. (Epimedium), <i>G. officinalis</i> , <i>C. chinensis</i> , Flouritum, <i>R. glutinosa</i> , <i>A. sinensis</i> and <i>L. striatum</i> . <i>A. Macrocephala</i> , <i>R. glutinosa</i> and <i>Glehnia littoralis</i> F.Schmidt ex Miq. (Bei Sha Shen, American silvertop.) were added for dry throat and constipation. <i>S. baicalensis</i> was added for red tongue, yellow fur and excessive heat. <i>C. rotundus</i> and <i>Z. jujuba</i> were added for nervousness, anxiety, insomnia and vagueness 2th stage:	1th 1st stage: for 1th 1st treatment: from the third day of menstruation , morning and evening for 5 consecutive days For 2th 2nd treatment: from the eighth day of menstruation morning and evening for 5 consecutive days 2th 2nd stage: morning and evening for 5	Increased: Endometrial thickness, rates of normal fertility, high-quality embryos, biochemical and clinical pregnancy rate NS: number of acquired eggs	[107]

		Wenshenantai decoction (for warming the kidneys and preventing miscarriage), which consists of <i>R. glutinosa</i> , <i>C. chinensis</i> , <i>D. asperoides</i> , <i>E. ulmoides</i> , <i>T. chinensis</i> , <i>M. officinalis</i> , <i>L. barbarum</i> , <i>S. miltiorrhiza</i> , <i>S. baicalensis</i> , <i>A. membranaceus</i> , and <i>A. sinensis</i>	consecutive days, after which they took the same decoction, but without the <i>S. miltiorrhiza</i> , for a further 7-10 days		
Randomized controlled trial	368 infertility women patients (infertility due to tubal factor and/or male factor) undergoing COH of ART	intervention group: CMHSTBNA (Chinese medical herbs for Shen tonifying, blood nourishing, and activating) Control group: Both underwent COH	From the menstrual period day 2 -3 of COH to the day of oocytes retrieved	Increased: endometrial thickness, good-quality embryo rate, and the frozen rate NS: On the day of hCG, serum levels of estradiol (E2), progesterone (P), LH, the medication days and dosage of Gn, the number of oocytes retrieved, the fertilization rate, and the cleavage rate	[177]
Retrospective before-after study	31 patients failed to ICSI	Herbal An herbal medicine containing <i>A. sinensis</i> , <i>R. glutinosa</i> , <i>P. asiatica</i> , <i>Lonicera japonica</i> Thunb. (Japanese honeysuckle), <i>C. tinctorius</i> , <i>P. ginseng</i> , and <i>Cucurbita moschata</i> Duchesne (Canada pumpkin)	Before breakfast and dinner from the start of menstrual cycle in the ovum pickup cycle	NS: number of recovered and mature oocytes, morphology and physical qualities, rates of fertilization Increased: oocyte development and pregnancy	[178]
Randomized controlled trial	219 patients undergoing IVF-ET	Bushen Yutai Recipe: 1. Bushen recipe: <i>R. glutinosa</i> , <i>L. lucidum</i> , <i>C. chinensis</i> , <i>Psoralea corylifolia</i> L. (Babchi), <i>O. japonicus</i> , 2. Yiqi recipe: <i>A. membranaceus</i> , <i>C. pilosula</i> Huoxue recipe: <i>A. sinensis</i> , <i>S. miltiorrhiza</i> , <i>C. rotundus</i>	During mild ovarian stimulation IVF treatment	Increased: E2 on the human chorionic gonadotropin (hCG) triggering day, fertilization rate, fresh embryo transfer rate and number of high-quality embryos, endometrial receptivity	[179]

					gene expression, vascular endothelial growth factor (VEGF) on the day of fresh embryo transfer, E2, hCG, IL-8, IL-6, LIF, VEGF, H0XA10, Fresh embryo transfer rate, NS: Clinical pregnancy rate, implantation rate, miscarriage rate	
Paired clinical study (before-after intervention)	19 women with POR undergoing ART cycles	<i>Foeniculum vulgare</i> Mill. (Fennel) fruit decoction 10 g per night	2 months		Increased: serum LH level, LH/FSH, the number of follicles and ovules, endometrial thickness, and ovarian volume Decreased: number of required days for induction	[180]
Randomized controlled trial	80 DOR patients undergoing IVF	Erzhi Tiangui granules 9 gram, twice daily Erzhi Tiangui granules contains: <i>L. lucidum</i> (Nv Zhen Zi), <i>E. prostrata</i> (mohanlian), <i>C. chinensis</i> (tusizi), <i>Mespilus germanica</i> L. (gouqizi), <i>R. glutinosa</i> (shudihuang), <i>A. sinensis</i> (danggui), <i>P. lactiflora</i> (baishao), <i>L. striatum</i> (chuanxiong), <i>C. rotundus</i> (xiangfu), <i>G. glabra</i> (zhigancao)	From the 5th day of menstruation until the hCG injection day		Upregulated: miR-214-3p Downregulated: let-7e-5p and miR-140-3p Increased: fertilization rate	[116]
A multicenter, randomized, double-blind, placebo-controlled trial	480 women with expected POR of advanced age (≥ 35 years old)	Erzhi Tiangui (EZTG) formula, in the form of granules with 10 herbal ingredients including: <i>Cuscuta chinensis</i> (Tu Si Zi), <i>Ligustrum lucidum</i> (Nv Zhen Zi), <i>Herba Ecliptae</i> (Mo Han Lian), <i>Fructus Lycii</i> (Gou Qi Zi), <i>Angelica sinensis</i> (Dang Gui), <i>Radix Rehmanniae</i> Preparata (Shu Di Huang), <i>Ligusticum wallichii</i> (Chuan Xiong), <i>Paeonia lactiflora</i> (Bai Shao), <i>Rhizoma cyperi</i> (Xiang Fu), <i>Radix Glycyrrhizae</i> Preparata (Zhi Gan Cao).	3 bags each time, 3 times a day, orally, administered after being dissolved in warm water. Participants were required to take the EZTG from day 2 or 3 of the previous cycle that precedes the IVF cycle to the day of the trigger		Increased: quantity and quality of oocytes	[123]
Prospective, multicenter,	278 poor ovarian response	Ding Kun Dan (DKD) group (7 g of DKD containing <i>P. ginseng</i> , <i>Phalaenopsis cornu-cervi</i> (Breda) Blume & Rehb.f., <i>Crocus sativus</i> L., <i>P. lactiflora</i> , <i>R. glutinosa</i> , <i>A.</i>	Receiving DKD from the first day		Increased: ongoing pregnancy	[119]

randomized controlled trial	(POR) patients	<i>sinensis</i> , <i>S. baicalensis</i> , <i>C. rotundus</i> , <i>L. striatum</i> , <i>Leonurus cardiaca</i> L., <i>Corydalis yanhusuo</i> (Y.H.Chou & Chun C.Hsu) W.T.Wang ex Z.Y.Su & C.Y.Wu twice a day (morning and evening)) followed by IVF/ICSI-ET, or immediate IVF/ICSI-ET group	of menstruation for three consecutive months before the IVF/ICSI cycle	rate, biochemical pregnancy rate, clinical pregnancy rate, and high quality embryo rate Decreased: : Gn duration NS: total dosage of Gn, number of retrieved oocytes, cycle cancellation rate, E2 level, and P level on hCG trigger days	
Double-blind, randomized, placebo-controlled trial	80 older patients with poor ovarian response infertility of kidney-qi deficiency type, who underwent IVF-ET	Randomly divided into older treatment group started taking Guilu Erxian ointment (containing <i>P. cornu-cervi</i> , Carapax et Plastrum Chrysemys, <i>L. barbarum</i> & <i>P. ginseng</i>) and older placebo group, and another 39 young healthy women who underwent IVF-ET or ICSI due to male factors were selected as the normal control group	From the third day of menstruation until IVF surgery	Increased: number of oocytes retrieved, 2PN fertilization, high-quality embryos, the total number of available embryos, and estrogen on HCG day NS: clinical pregnancy rate of fresh embryos and frozen embryos	[120]
Double-blind, multicenter, placebo-controlled, randomized trial	2265 patients: 1,131 to the Zishen Yutai Pill and 1,134 to placebo	5 g of the Zishen Yutai Pill (containing <i>C. sinensis</i> , <i>Amomum spp.</i> , <i>R. glutinosa</i> , <i>P. ginseng</i> , <i>T. chinensis</i> , <i>Fallopia multiflora</i> (Thunb.) Haraldson, <i>Artemisia argyi</i> H.Lév. & Vaniot, <i>Morinda officinalis</i> F.C.How, <i>A. macrocephala</i> , <i>C. pilosula</i> , <i>Cornu cervi degelatinatum</i> , <i>L. barbarum</i> , <i>D. inermis</i> , <i>E. ulmoides</i>) or placebo orally	three times per day during the study	Increased: live birth rate after fresh embryo transfer, implantation rate, biochemical pregnancy rate, and clinical pregnancy rate NS: rates of pregnancy loss, maternal, or neonatal complications	[117]
Randomized, double-blind controlled trial	95 women undergoing IVF: three groups, including 34	Treatment group was given Qi-Zi-Yu-Si decoction (<i>Rehmannia R. glutinosa</i> 15 g, staghorn cream 15 g, <i>C. istanche deserticola</i> 12 g, <i>Curcuma spp.</i> Yujin 12 g, <i>E. clipta prostrata alba</i> 12 g, <i>Lycium barbarum</i> 9 g, <i>L. ligustrum lucidum</i> 9 g, <i>Morus alba</i> L. Mulberry 9 g, <i>Rubus</i>	From the beginning of the day of treatment to the day of	Improved: The syndrome score of kidney qi	[122]

	cases in the treatment group (the senile patients with kidney qi deficiency after the intervention of Chinese medicine), 31 cases in the experiment group (the senile patients with kidney qi deficiency of no intervention of Chinese medicine), and 30 cases in the control group (young women with infertility due to male factor)	<i>idaeus</i> Raspberry <i>L.</i> 9 g, <i>C. uscuta chinensis</i> 9 g, <i>Nuphar lutea</i> (L.) Sm. Whole lotus 9 g, <i>Rosa laevigata</i> Michx. <i>Rosa laevigata</i> 9 g, and <i>Radix Glycyrrhizae G. glabra</i> 6 g) on the day of HCG downregulation	hCG (The duration of administration of traditional Chinese medicine was about 24–26 days); take one dose daily, decocted in water, 30 to 60 minutes before breakfast and dinner	deficiency syndrome in the treatment group Increased: available embryo rate and implantation rate	
Randomized, controlled trial	97 patients with repeated controlled ovarian stimulation (COS): including 35 in the control group, 29 in the placebo group, and 33 in the Bushen-Tiaojing-Fang (BSTJF) group	69 patients with repeated COS were randomly divided into the placebo group and the BSTJF (consists consisting of <i>R. glutiosa</i> Radix Rehmanniae Preparata (Shu-di) 20 g, <i>C. officinalis</i> Cornus officinalis (Shan-Zhu-yu) 15 g, <i>D. oppositifolia</i> Rhizoma Dioscoreae (Shan-yao) 12 g, <i>L. barbarum</i> Fructus Lycii (Gou-Qizi) 12 g, <i>C. chinensis</i> Semen Cuscutae (Tu-Si-zi) 12 g, <i>Raspberry R. idaeus</i> (Fu-Pen-zi) 10 g, <i>Cistanche C. deserticola</i> (Rou-Cong-rong) 10 g, Placenta Homini (Zi-He-che) 10 g, <i>L. lucidum</i> Fructus <i>Ligustri Lucidi</i> (Nv-Zheng-zi) 9 g, <i>Radix A. angelicae Sinensis</i> (Dang-gui) 9 g, and <i>P. lactiflora</i> Radix Paeoniae Alba (Bai-shao) 9 g) group	For 3 months before the next COS cycle	Increased: high-grade embryo rate, antioxidant enzyme activity in BSTJF group	[121]
Prospective randomized open-label controlled trial	64 patients women with larger serum Advanced glycation end-products (AGE) associated with insulin resistance and aging	The Hishi group received Hishi the aqueous extract of <i>Trapa natans</i> var. <i>bispinosa</i> (Roxb.) Makino peel (100 mg/day) until late pregnancy or failure. The control group received no extract	underwent 1 cycle of conventional infertility treatment	Increased: live birth rate, oocyte developmental potential, improved endometrial receptivity in natural cycles Decreased: AGE in serum and FF	[105]
A prospective cohort study	315 women undergoing 520 ART cycles	Patients according to the normal consumption of soybeans (<i>Glycine max</i> (L.) Merr.) foods (serving per day) in participants were divided into four groups: G1 (0 mg/d isoflavones), G2 (1 mg/d isoflavones) G3 (3.3 mg/d isoflavones) G4 (12.1 mg/d isoflavones)	From 2007 to 2013	Increased: Clinical pregnancy rate, LBR, fertilization rate NS: Peak estradiol levels of E2, endometrial thickness, or yield of MII oocytes, embryo quality, and cleavage rate	[103]

Prospective cohort study	239 women who underwent 347 IVF cycles.	Normal soybeans food consumption (serving per day) according to the questionnaire based study divided into four groups: 1. 0 (n=16), 2. 0 (n=15), 3. 0.2 (0.1-0.4) and 4. 0.2 (0.1-0.5)	Between 2007 and 2012	Improved: association of urinary BPA concentration with live birth rates	[104]
Randomized controlled trial	150 patients with PCOS undergoing IVF-ET	The ZSYTP group: received 5 g of Zishen Yutai pills 3 times daily The metformin group The combination group (ZSYTP combined with metformin)	3 month, suspended during menstruation	Decreased: BMI, FPG, FIN, HOMA-IR, LH, E2, FSH, T levels, TCM syndrome scores, Gn dosage and duration and abortion rate Increased: numbers of obtained eggs, high-quality embryos, eggs obtained through IVF-ET, average transferred embryos, clinical pregnancy rate, and embryo implantation rate	[125]
Randomized controlled trial	60 poor ovarian responders patients received IVF-ET	Group 1: Cai's Prescription (comprise of 11 herbs: Fuling (<i>Poria cocos</i> (Schw.) Wolf.), Shengdihuang (<i>Rehmannia glutinosa</i> (Gaertn.) Libosch. ex Fisch & C.A. Mey), Shudihuang (<i>R. glutinosa</i>), Nvzhenzi, Xian-mao, Xianlingpi, Bajitian, Roucongrong, Lujiaoshuang, Zishiying, and Ziheche) (150 ml) orally twice a day 1 h after breakfast and dinner. Group 2: control group: received nothing	3 month except menstrual period	Increased: number of high quality embryo Decreased: ARHGAP 4, (a member of GTPase-activating protein)	[126]
Retrospective study	15044 FET cycles	Zishen Yutai Pills Group: patients who used Zishen Yutai Pills 5g, 3 times per Day (On the day of embryo transfer in FET cycles until the 14th day after ET) Non- Zishen Yutai Pills Group: patients who did not use them	For 3 months	Increased: live birth rate	[186]
Randomized controlled trial	880 women undergoing FET cycle	ZYP group: patients who used Zishen Yutai Pills 5g, 3 times per day Placebo group: patients who did not use them	-	Increased: live birth rates	[188,189]
Randomized controlled trial	84 infertile women who were candidates for ICSI	Evening Primrose Oil supplementation group: given evening primrose seed oil supplements from day 1-2 of the ART cycle at a dosage of 1000 mg every eight hours The placebo group	For two weeks	Increased: incidence of pregnancy and implantation rates	[128]
Randomized controlled trial	120 DOR patients undergoing IVF-ET	EZTGF group: received Er Zhi Tian Gui formula (containing <i>C. chinensis</i> , <i>Eclipta prostrata</i> (L.), <i>L. barbarum</i> , <i>A. sinensis</i> , <i>R. glutinosa</i> , <i>Ligusticum chuanxiong</i> Hort, <i>P. lactiflora</i> , <i>C. rotundus</i> and <i>G. uralensis</i>) Placebo group:	starting on days 2-3 of the preceding menstrual cycle and continuing until the trigger day	Increased: The number (especially at the cleavage stage) and rate of high-quality embryos	[124]

	Randomized controlled trial	120 DOR patients undergoing IVF-ET	EZTGF group: received Er Zhi Tian Gui formula (containing <i>C. chinensis</i> , <i>Eclipta prostrata</i> (L.), <i>L. barbarum</i> , <i>A. sinensis</i> , <i>R. glutinosa</i> , <i>Ligusticum chuanxiong</i> Hort, <i>P. lactiflora</i> , <i>C. rotundus</i> and <i>G. uralensis</i>) Placebo group:	starting on days 2–3 of the preceding menstrual cycle and continuing until the trigger day	Increased: The number (especially at the cleavage stage) and rate of high-quality embryos	[124]
	Retrospective cohort study	1474 DOR patients who underwent IVF/ICSI	Group pretreated with Kuntai capsules composed of <i>R. glutinosa</i> , <i>C. chinensis</i> , <i>P. lactiflora</i> , <i>S. baicalensis</i> , and <i>P. cocos</i> . taken orally, with 4 capsules each time, 3 times a day Group not pretreated with Kuntai capsules	on the third day of menstruation and continued until the day of egg retrieval	Decreased: The number of retrieved eggs, normal fertilized eggs & failure rate for egg retrieval Increased: the embryo utilization rate	[127]
Phytochemicals	Randomized controlled trial	213 infertile patients undergoing IVF-ET	Intervention group: progesterone 50 mg IM daily + soybeans isoflavones 1,500 mg tablet daily containing isoflavones 40%–45% by weight of genestein, 40%–45% diadzein, and 10%–20% glycitein) Placebo group: progesterone 50 mg IM daily + placebo	For the luteal phase starting from the evening of oocyte retrieval till either a serum pregnancy test result was negative	Increased: implantation rate, clinical PR, ongoing pregnancy /delivered rate	[141]
	Randomized controlled trial	150 infertile women with PCOS undergoing IVF treatment	Berberine group (at a dosage of 3×500 mg daily), metformin group (at a dosage of 3×500 mg daily) and placebo tablets (orally administered as one tablet three times daily)	or embryonic heartbeat sonographically confirmed 3 months before ovarian stimulation	Increased: LBR with fewer gastrointestinal adverse events and pregnancy rate Decreased: incidence of severe ovarian hyperstimulation syndrome, BMI, lipid parameters, and total FSH requirement	[140]
	Prospective cohort study	60 women undergoing IVF with single frozen embryo transfer (SET/FET)	Dietary phytoestrogens: Concentrations of two phytoestrogens (daidzein and genistein) in follicular fluid (FF) and urine (U)	Between 2018 and 2019	higher FF phytoestrogen concentrations were significantly associated with Increased: higher serum estradiol, enhanced probability of implantation, CPR, and LBR higher urine phytoestrogen	[142]

					concentrations improved oocyte maturation and fertilization potential and increased probability of CP, and LB	
Yoga	Case study	a patient case of two unsuccessful IVF attempts	Daily integrated Yoga Prana Vidya (YPV) healings	After 3 weeks	After 3rd attempt of IVF: successful pregnancy with confirming two fetuses	[155]
	prospective study	49 infertile women who were undergoing IVF	Yoga along with IVF	6 weeks	Improved: fertility-specific quality of life	[153]
	A pilot study	143 consecutive women undergoing IVF	Hatha-yoga	Twice a week for 3 months	Decreased: distress	[185]
Massage	Retrospective observational study	267 IVF patients	Deep relaxation massage on an oscillating (vibrating) device	30-min	Increased: pregnancy rates, ongoing pregnancies, and birth rates	[152]
	Case report	A paraplegic patient	Prostatic massage	NM	Triplet pregnancy achieved	[151]
Ayurveda	Case report	A 35-year-old female with chief complaints of long-standing unexplained infertility	Nitya virechana (~daily therapeutic purgation) by Eranda sneha (~castor oil). Eranda sneha maintains Agni (~digestive power) and normalizes Vata dosha by Vata anulomana karma (~carminatives) It also affects the psychological status of the patient by Medhya (~intellect power) and Smritikara (~improving memory) properties	For three cycles	Achieved urine pregnancy and delivered a healthy male baby	[157]

Table 2. Preclinical studies on the effects of complementary and integrative medicine (herbal medicine) on reproductive assisted technologies outcomes

Category	Type of study	Subject	Intervention	Duration of intervention	Outcomes	Author/Ref.
Herbal medicine	Experimental	24 male Sprague Dawley rats	Eight groups of three rats (n = 3): control, cyclophosphamide (CP) only (200 mg/kg), <i>Aquilaria malaccensis</i> Lam. <i>Aquilaria malaccensis</i> (AM) only (100 mg/kg, 300 mg/kg, and 500 mg/kg), and CP + AM (100 mg/kg, 300 mg/kg and 500 mg/kg)	63 days	Increased: fertilization rate, early cleavage rate and embryo quality in AM leave extract at 100 mg/kg/day to normal rats and CP-exposed rats	[183]
	Experimental study	102 aging female mice (36 weeks of age) + 15 female ICR mice (8 weeks of age) for fertility evaluation	After 63 days of treatment and sperm from caudal epididymis were taken for IVF with oocytes from untreated female Control group without Hochuekkito (HET) (n = 30), low dose HET (100 mg/kg/day)-treated group (n = 24), and high dose HET (1000 mg/kg/day)-treated group (n = 24) (Five gram of HET extract was produced from 4.0 g <i>Astragali Radix</i> (dried roots of <i>Astragalus membranaceus</i> Bunge), 4.0 g <i>Attractylodes lanceae</i> Rhizoma (rhizome of <i>Atractylodes lanceae</i> De Candolle, Compositae), 4.0 g Ginseng Radix (dried roots of <i>Panax ginseng</i> C.A. Meyer), 3 g <i>Angelica Radix</i> (dried roots of <i>Angelica acutiloba</i> Kitagawa, Umbelliferae), 2.0 g Bupleuri Radix (dried roots of <i>Bupleurum falcatum</i> L.), 2.0 g Zizyphi Fructus (dried fruits of <i>Zizyphus Z. jujuba</i> Miller var. <i>inermis</i> Rehder), 2.0 g Aurantii Bobilis Pericarpium (dried pericarps of ripe fruits of <i>Citrus unshu</i> Markovich), 1.5 g Glycyrrhizae radix (dried roots of <i>Glycyrrhiza uralensis</i> Fisch et DC.), 1.0 g Cimicifugae Rhizoma (dried rhizome of rhizomes of <i>Actaea simplex</i> (DC.) Wormsk. ex Prantl/ <i>Cimicifuga simplex</i> , <i>Alnus hirsuta</i> (Spach) Rupr./Turczaninow), and 0.5 g Zingiberis Rhizoma (rhizomes of <i>Zingiber officinale</i> Roscoe))	For 12 weeks	Decreased: ovarian inflammatory markers, interleukin 6 (IL-6), IL-1 β , tumor necrosis factor (TNF)- α , and interferon-gamma (IFN- γ), rates of oocytes maturation and fertilization and the cumulus-cell expression of TNF- α -induced protein 6 and epidermal growth factor receptor NS: live offspring rate	[139]
	Experimental	60 male and 10 female adult NMRI mice	Sixty adult male NMRI mice were randomly divided into six groups: Group I (Control group), received intraperitoneal (IP) 0.2 ml/kg of 0.9% saline water as placebo Group II (Nicotine-treated group), treated with 2.5mg/kg bwt/day of nicotine dissolved in 0.9% saline water via the i.p. route (nicotine treated positive control) Group III (silymarin (SIL)100-treated group), without exposure to nicotine Group IV (SIL200-treated group), without exposure to nicotine Group V (SIL100 plus Nicotine-treated group), the mice of this group at first were treated with SIL (as in Group- III), and then received nicotine (as in Group- II) Group VI (SIL200 plus Nicotine-treated group) Ten female mice: PMSG and HCG for ovulation stimulation for the IVF process	For 28 consecutive days once daily	Increased: number of abnormal sperm morphology after nicotine exposure, Silymarin treatment: sperm count, sperm percentage, and the progressive sperm motility Decreased: number of two-cell embryos and blastocyst-derived embryo	[102]
	Experimental study	32 female NMIR mice	Control The control group receiving no treatment (group I); PCOS group injected with estradiol valerate once daily for 21 days (group II); and experimental groups receiving either 100 mg/kg (group III) or 150 mg/kg (group IV) licorice by gavage along with estradiol valerate	For 3 weeks once daily	Increased: testosterone and estradiol E2 levels, number of healthy follicles (primary, preantral follicles), corpus luteum, fertilization rate, and blastocyst stage embryos Decreased: number of atretic follicles (primary, preantral, cystic follicles)	[100]
	in vitro	Cumulus-oocyte complexes (COCs) of gilt (female pig)	60 mg/L <i>Reynoutria sachalinensis</i> (F.Schmidt) Nakai (Giant knotweed) aqueous extract (RSAE) in IVM of oocytes	In IVM culture	Increased: intracellular glutathione levels NS: maturation rates or reactive oxygen species	[98]

in vitro	immature oocytes on NMRI mice fertilized by the sperm of male mice and investigated after 24 and 48 hours after IVF	Control group: only water and food Sham group: 200 ml of distilled water The three experimental groups: daily injection of 100, 200, and 500 µL of <i>G. glabra</i>	For 7 days before ovulation induction with PMSG	Increased: number of follicles number of 2 and 4-cell embryos	[99]
in vitro	Ovine oocytes	isoflavone compounds (genistein, biochanin A, formononetin) at five concentrations (0, 2.5, 5, 10, 25 mg/mL repeated four times	-	Decreased: the highest concentration (25 mg/mL) of all three isoflavones extract, genistein: cleavage rate, blastocyst rate, and blastocyst efficiency (blastocysts produced per 100 oocytes); biochanin A: cleavage rate and blastocyst efficiency, embryo TCC at the hatched blastocyst stage formononetin: blastocyst rate and blastocyst efficiency. NS: at lower concentrations (2.5, 5, and 10 mg/ml/h) cleavage rate and embryo development or on embryo total cell counts (TCC)	[143]
In vitro	porcine embryo	Asiatic acid in 0, 1, 10 & 100 µM concentration for 7 days	During the in vitro culture	Increased: Rates of blastocyst and hatching formation of the parthenogenetic embryos in 10 µM. Blastocyst diameter and total cell number. Improved: developmental competence in porcine embryos derived from parthenogenetic activation, somatic cell nuclear transfer, and IVF	[144]

Abbreviations: AFC: Antral Follicle Count, AMH: Anti Mullerian hormone, ART: Assisted reproduction technique, BMI: body mass index CD: Cycle Day, CET: cryo-thawed embryo transfer COH: controlled ovarian hyperstimulation, COS: controlled ovarian stimulation, CPR: Clinical Pregnancy Rate, DOR: Diminished Ovarian Reserve, E2: Estradiol, EA: Electro-acupuncture, EMT: Endometrial thickness, ER: Endometrial receptivity, ET: Embryo transfer, FET: Frozen-thawed embryo transfer, FF: Follicular fluid, FIN: fasting insulin FPG: fasting plasma glucose, FSH: follicle-stimulating hormone GDF9: growth differentiation factor-9, Gn: Gonadotropin, GV 20: A point at the vertex of the head, is commonly utilized in acupuncture for infertility, hCG: Human chorionic gonadotropin, HOMA-IR: homeostatic model assessment of insulin resistance, Hz: Hertz, ICSI: intracytoplasmic sperm injection, IR: Implantation Rate, IVM: in vitro maturation, IVM: In vitro maturation culture, KLB: Blood stasis (blood stagnation), LBR: Live Birth Rate, LH: luteinizing hormone, NPY: Neuropeptide Y, NS: Non-significant, P: Progesterone, PCB: Paracervical block (as an analgesic method during oocyte aspiration in IVF treatment), PCOS-IR: Polycystic ovary syndrome - Insulin resistance, POR: Poor ovarian response, PPI: present pain intensity, PRI: pain-rated index, RIF: Recurrent Implantation Failure, STAI-I: State anxiety scale, T: Testosterone TCEA: Transcutaneous electrical acupoint, TCM: Traditional Chinese Medicine, TCRP: Transcervical resection (as the optimal treatment of endometrial polyps), TEAS: Transcutaneous electrical acupoint stimulation, TMD: Total mood disturbance, TVOR: trans-vaginal oocyte retrieval, VAS: Visual analogue scale, VEGF: Vascular endothelial growth factor

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