

UNIVERSIDADE FEDERAL DE ALFENAS

MARIANA ARAÚJO VIEIRA DO CARMO

**O PAPEL DA ACUPUNTURA NO CUIDADO DA FERTILIDADE FEMININA: UMA
REVISÃO INTEGRATIVA**

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MARIANA ARAÚJO VIEIRA DO CARMO

**O PAPEL DA ACUPUNTURA NO CUIDADO DA FERTILIDADE FEMININA: UMA
REVISÃO INTEGRATIVA**

Trabalho de Conclusão de Curso apresentado como parte dos requisitos para obtenção do título de Especialista em Acupuntura Sistêmica do curso de Pós-graduação *Latu Senso*, pela Universidade Federal de Alfenas. Área de concentração: Acupuntura.

Orientador(a): Prof. Dr. Marcelo Lourenço da Silva.

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O (A) Presidente da banca examinadora abaixo assina a aprovação do Trabalho de Conclusão de Curso apresentado ao Programa de Pós-graduação como parte dos requisitos para a obtenção do título de Especialista em Acupuntura pela Universidade Federal de Alfenas. Área de Concentração: Acupuntura.

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Este trabalho é dedicado à minha mãe, minha amiga e maior incentivadora para conclusão deste curso.

RESUMO

A reserva ovariana diminuída (ROD) constitui um dos principais fatores associados à infertilidade feminina, estando relacionada a alterações hormonais e a desfechos reprodutivos desfavoráveis. Nesse contexto, a acupuntura tem sido investigada como uma abordagem integrativa com potencial para auxiliar a função ovariana e a fertilidade. O objetivo deste estudo foi analisar as evidências científicas acerca do papel da acupuntura no cuidado da fertilidade feminina. Trata-se de uma revisão integrativa da literatura, na qual foram incluídos estudos clínicos e experimentais publicados entre 2017 e 2025, localizados nas bases de dados PubMed, SciELO e ScienceDirect. Os resultados indicam que a acupuntura pode contribuir para a regulação hormonal, melhora da função ovariana e aumento das taxas de gravidez, especialmente quando utilizados protocolos que envolvem pontos como CV4, SP6, LIV3, EX-CA1, ST36 e KI3. Conclui-se que a acupuntura representa uma prática promissora e segura no manejo da infertilidade feminina, podendo atuar como terapia complementar aos tratamentos convencionais.

Palavras-chave: Medicina integrativa. Saúde da mulher. Medicina chinesa. Práticas integrativas.

ABSTRACT

Diminished ovarian reserve (DOR) is one of the main factors associated with female infertility and is related to hormonal imbalance and unfavorable reproductive outcomes. In this context, acupuncture has been investigated as an integrative approach with potential benefits for ovarian function and fertility. This study aimed to analyze the scientific evidence regarding the role of acupuncture in female fertility care. This is an integrative literature review including clinical and experimental studies published between 2017 and 2025, retrieved from PubMed, SciELO, and ScienceDirect databases. The findings suggest that acupuncture may contribute to hormonal regulation, improvement of ovarian function, and increased pregnancy rates, particularly through protocols involving acupoints such as CV4, SP6, LIV3, EX-CA1, ST36, and KI3. In conclusion, acupuncture appears to be a promising and safe complementary therapy in the management of female infertility.

Keywords: Integrative medicine. Women's health. Chinese medicine. Integrative practices.

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INTRODUÇÃO

A infertilidade feminina constitui um relevante problema de saúde pública, com impacto significativo nos âmbitos físico, emocional, social e econômico. Estima-se que uma parcela expressiva das mulheres em idade reprodutiva apresente dificuldades para engravidar, sendo a reserva ovariana diminuída um dos principais fatores associados a esse cenário. Essa condição caracteriza-se pela redução quantitativa e qualitativa dos folículos ovarianos, comprometendo a resposta aos estímulos hormonais e diminuindo as chances de concepção espontânea ou assistida.

Os avanços da medicina reprodutiva possibilitaram o desenvolvimento de diferentes estratégias terapêuticas para o manejo da infertilidade, incluindo tratamentos hormonais, procedimentos cirúrgicos e técnicas de reprodução assistida, como a fertilização in vitro. Entretanto, tais intervenções frequentemente estão associadas a efeitos adversos, custos elevados e impacto negativo sobre a qualidade de vida das pacientes, o que tem estimulado a busca por abordagens complementares e integrativas que possam potencializar os resultados clínicos e minimizar os efeitos indesejáveis.

Nesse contexto, a acupuntura, prática terapêutica milenar integrante da Medicina Tradicional Chinesa, tem ganhado destaque no cuidado à saúde da mulher e, especialmente, no tratamento da infertilidade feminina. Fundamentada na regulação do fluxo de energia vital (Qi) e no equilíbrio dos sistemas orgânicos, a acupuntura tem sido amplamente investigada quanto aos seus possíveis efeitos sobre o eixo hipotálamo-hipófise-ovariano, a perfusão sanguínea ovariana, a modulação neuroendócrina e a redução do estresse oxidativo e inflamatório.

Estudos experimentais e clínicos recentes sugerem que a acupuntura pode contribuir para a melhora dos marcadores da reserva ovariana, para a regulação dos hormônios reprodutivos e para o aumento das taxas de gravidez, tanto em concepções espontâneas quanto em ciclos de reprodução assistida. Apesar desses achados promissores, ainda há heterogeneidade metodológica entre os estudos, o que reforça a necessidade de sistematizar e analisar criticamente as evidências disponíveis.

Diante da relevância clínica do tema e da crescente incorporação das práticas integrativas no cuidado à saúde, este Trabalho de Conclusão de Curso apresenta um manuscrito científico no formato de revisão integrativa, cujo objetivo é analisar o papel da acupuntura no cuidado da fertilidade feminina, com ênfase nos seus efeitos sobre a reserva ovariana e os desfechos reprodutivos. O manuscrito a seguir reúne e discute evidências atuais da literatura, contribuindo para o aprofundamento do conhecimento científico e para a prática clínica baseada em evidências na área da acupuntura.

1 **ARTIGO - The role of acupuncture in female fertility care: an integrative**
2 **review**

3 **The role of acupuncture in female fertility care: an integrative review**

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35 **Abstract**

36 **Background:** Diminished ovarian reserve (DOR) is a major factor in female infertility,
37 often linked to hormonal imbalance and impaired reproductive outcomes. Acupuncture
38 has been investigated as an integrative approach to support ovarian function and fertility.

39 **Materials and Methods:** This integrative literature review analyzed clinical and
40 experimental studies published between 2017 and 2025 in PubMed, SciELO, and
41 ScienceDirect. **Results:** Findings suggest that acupuncture may regulate sex hormones,
42 improve ovarian function, and increase pregnancy rates. These effects have frequently
43 been associated with protocols involving acupoints such as CV4, SP6, LIV3, EX-CA1,
44 ST36, and KI3, which are traditionally related to reproductive health and hormonal
45 balance. **Conclusion:** Overall, the evidence indicates that acupuncture represents a
46 promising tool for improving female fertility, offering benefits without the adverse effects
47 commonly associated with conventional treatments.

48

49 **Keywords:** Integrative medicine; Women's health; Chinese medicine; Integrative
50 practices.

51

52 **Introduction**

53 Decreased ovarian reserve (DOR) represents one of the main challenges in
54 contemporary reproductive medicine, characterized by the quantitative and qualitative
55 reduction of ovarian follicles, resulting in compromised fertility and a poor reproductive
56 prognosis (1–3). This condition may be affected by advanced age (4,5), diseases,
57 medications (2), chemotherapy (6–8), and lifestyle factors, such as excessive alcohol
58 consumption and smoking (9,10). The prevalence of DOR increases with age but can also
59 occur in younger women, with global estimates ranging from 19–26% (11) or higher,

60 depending on diagnostic criteria and study population. This reality has led to an increase
61 in the search for fertility treatments and interventions.

62 Conventional infertility treatments include sex hormone therapy, tubal plastic
63 surgery, and assisted reproductive technology (12). These therapies, however, often have
64 significant side effects that can compromise patients' well-being and, paradoxically, affect
65 reproductive outcomes (13). Different procedures and medications used in this context
66 can have effects ranging from nausea and visual disturbances (14) to hyperstimulation
67 syndrome (15) and depression (16).

68 In light of these considerations, acupuncture has emerged as a promising
69 therapeutic modality, based on the principles of Traditional Chinese Medicine (TCM) and
70 supported by growing scientific evidence. The proposed mechanisms of its action include
71 modulation of the neuroendocrine system (17), improvement of ovarian blood perfusion
72 (18), reduction of ovarian oxidative stress (19–21), and regulation of the hypothalamic-
73 pituitary-ovarian axis (22). Experimental and clinical studies suggest that acupuncture
74 can positively influence the levels of reproductive hormones, including follicle-
75 stimulating hormone (FSH), anti-Müllerian hormone (AMH) and estradiol (23–25). The
76 clinical application of acupuncture in the context of assisted reproduction and female
77 fertility has shown varied results, with some studies reporting improvements in ovarian
78 reserve markers (20,23–26), oocyte quality (27), and success rates in spontaneous
79 pregnancy and *in vitro* fertilization (IVF) procedures (28,29). However, methodological
80 heterogeneity among studies and variability in treatment protocols have limited definitive
81 conclusions about its efficacy.

82 Considering the clinical relevance of this issue and the need to synthesize the
83 available evidence, the results of the studies selected for this integrative review are

84 presented below, organized to allow a comprehensive analysis of the effects of
85 acupuncture on decreased ovarian reserve and female fertility.

86

87 **Materials and methods**

88 This is an integrative review of studies evaluating the effect of acupuncture on
89 reduced ovarian reserve and female fertility. The electronic search for articles in English
90 was conducted freely on indexed article platforms, namely: PubMed, SciELO, and
91 ScienceDirect, using the keywords: "Acupuncture AND fertility"; "Acupuncture AND
92 ovarian reserve"; and "Acupuncture AND *in vitro* fertilization."

93 Clinical and preclinical studies published in the last nine years were selected and
94 the inclusion criteria used are described by the acronym PICO, as follows: Population –
95 women or animal models with reduced ovarian reserve and/or women undergoing *in vitro*
96 fertilization; Intervention – acupuncture/electroacupuncture; Comparison – within-group
97 baseline vs. post-intervention; use of placebo and control groups; Outcome –
98 improvement or lack of improvement in ovarian reserve, reproductive hormones and *in*
99 *vitro* fertilization procedures. As an exclusion criterion, articles characterized as review
100 articles, fertility researches conducted with men, or male animal models were not used
101 for this study. Eight studies were included: 3 randomized controlled trial, 3 experimental
102 models, 1 prospective cohort and 1 prospective case series.

103

104 **Results and discussion**

105 Acupuncture and electroacupuncture, as a novel therapies for DOR, have been
106 shown to produce promising findings in different types of studies (Table 1). The results
107 revealed that acupuncture, electroacupuncture or combined interventions were associated
108 with a significant reduction in serum FSH and luteinizing hormone (LH) concentrations,

109 alongside an increase in AMH levels, compared with controls receiving only conventional
110 pharmacological therapy, hormonal treatment, or no intervention (23–25).

111 A decline in ovarian reserve function directly compromises female reproductive
112 capacity, commonly reflected by elevated FSH levels and reduced AMH (30). Since FSH
113 plays a central role in stimulating follicular growth and regulating ovarian hormone
114 production, abnormally high concentrations indicate impaired ovarian responsiveness,
115 disrupted folliculogenesis, and a reduced probability of successful conception (31). As
116 highlight in present review, by lowering FSH levels and reestablishing endocrine balance,
117 acupuncture seems exert a favorable effect on ovarian reserve, supporting adequate
118 follicular development and ovulation. This regulation enhances the synchrony between
119 follicle maturation and endometrial receptivity, ultimately creating more favorable
120 conditions for implantation and pregnancy. Regarding to AMH, it is a reliable biomarker
121 for predicting ovarian response in assisted reproductive technologies, particularly IVF
122 protocols. Serum AMH concentrations demonstrate a positive correlation with the
123 number of oocytes retrieved during controlled ovarian stimulation, with elevated AMH
124 levels typically associated with increased oocyte yield (32). The evidences pointed out
125 herein, suggests that acupuncture interventions may enhance serum AMH levels,
126 potentially translating into improved fertility outcomes.

127 The studies revealed that these integrative practices improved the follicles count
128 (23,24,33) and increased the number of retrieved mature oocytes (27), besides
129 improvement in ovarian function (20). Moreover, has been reported that acupuncture
130 treatment was associated with increased spontaneous pregnancy rates and improved IVF
131 outcomes, with relative increases ranging from 30% to 100% compared with control
132 groups or baseline values after the therapeutic intervention (28,29).

133 As regards the acupoints choice in each of studies, despite the different protocols
134 with varying frequencies of application, it is possible to observe similarity among them,
135 with acupoint that are frequently used. Of the eight studies presented, 75% of them used
136 CV4 at some point during the treatment, while for the acupoints LIV3/LR3 and SP6 the
137 observed frequency was 62.5%, 50% for ST36 and EX-CA1 and 37% for KI3.

138 Guanyuan (CV4) is a key acupoint in TCM frequently applied in fertility-related
139 treatments, is positioned on the conception vessel, approximately one handbreadth below
140 the umbilicus, it is traditionally regarded as essential for tonifying kidney energy,
141 regulating menstrual function, and strengthening reproductive organs, thereby potentially
142 enhancing fertility outcomes (34). CV4, EX-CA1 and SP6 acupoints or their
143 corresponding meridians are anatomically located within the segmental innervation range
144 (T11–L2, S2–S4) of the uterus, ovaries, and fallopian tubes, suggesting a favorable
145 neuroanatomical position that may contribute to its effectiveness in enhancing fertility
146 (34,35). Furthermore, Sanyinjiao (SP6) is the crossing point of the spleen, kidney, and
147 liver meridians and is considered the key point in treating infertility (36) used to enhance
148 pelvic blood flow (37), support ovarian and uterine function, and regulate hormonal
149 balance (38). It is also applied to regulate menstrual cycles, reduce dysmenorrhea (39),
150 and enhance endometrial receptivity and implantation in IVF protocols (36). Acupoint
151 LIV3 (Taichong) has been shown to regulate the flow of Qi and blood, besides to be
152 beneficial in reducing depression and anxiety scores associated with premenstrual tension
153 (40), symptoms that can also affect women trying to get pregnant. In association with
154 another acupoints, ST36 (Zusanli) regulates Qi and blood throughout the body, supporting
155 uterine circulation, maintaining embryo implantation, promoting embryonic growth,
156 relaxing the uterus, and preventing contractions (29,41). In TCM, the kidney plays a
157 central role in reproduction by storing essence and governing growth and development.

158 KI3 (Taixi), recognized as the source point of the kidney channel, is considered essential
159 for nourishing both kidney Yin and Yang. By tonifying kidney function, this acupoint
160 helps regulate the uterus, harmonize the flow of Qi and blood within the reproductive
161 system, and indirectly support blood production (42). In light of these considerations,
162 these combined or isolate acupoints contribute to improved female fertility and for the
163 pregnancy maintenance.

164 Taken as a whole, acupuncture exerts therapeutic effects on female infertility
165 through multiple biological pathways. Evidence shows that it restores reproductive
166 endocrine balance by reducing excessive secretion of FSH and LH while increasing
167 estrogen and progesterone levels. In addition, acupuncture improves ovarian function by
168 protecting granulosa cells from apoptosis through modulation of apoptosis-related
169 proteins (\uparrow BCL-2, \downarrow BAX), reduces ovarian inflammation via downregulation of NGF,
170 CRF, and ET-1, and enhances ovarian blood flow, collectively creating a more favorable
171 microenvironment for follicular growth. Furthermore, acupuncture contributes to embryo
172 implantation by promoting maternal immune tolerance, facilitating trophoblast invasion,
173 stimulating angiogenesis, and supporting embryonic development within the
174 endometrium via IGF-1 signaling. Together, these mechanisms suggest that acupuncture,
175 through the main acupoints highlighted in this review, not only regulates endocrine
176 function and ovarian health but also optimizes the uterine environment for implantation,
177 which may explain its observed benefits in conditions such as DOR and in improving IVF
178 outcomes (43).

179 Moreover, acupuncture may modulate hypothalamic activity, promoting the
180 release of endogenous opioids. These neurochemical mediators regulate the stress
181 response and contribute to improved function of the hypothalamic–pituitary–ovarian
182 (HPO) axis, which plays a central role in ovulation and fertility (43).

Table 1. Characteristics and main findings of the studies included in the review

Author; Year; Country	Sampling model and study design	Intervention	Main measurements	Main results
Güven, Cayir and Borekci; 2020; Turkey.(29)	Randomized controlled trial with 72 infertile women undergoing IVF: - **Ac group (AG; n = 36) - Control group (CG; n = 36).	Three sessions of acupuncture, before and after embryo transfer. - <u>1st session</u> : bilateral H-7, LI-4, GV-20, ear shenmen; - <u>2nd session</u> : Bilateral CV-3,4,6, GV-20, LIV-3, ST-30, and SP-8 - <u>3rd session</u> : Bilateral LI-4, SP-6,9, and ST-36.	Beta-HCG levels	↑ in the pregnancy rates: 63.9% in AG <i>versus</i> 33.3% in CG (p= 0.009). ↑ ongoing pregnancy and live birth rates in AG (p < 0.05).
Dandan et al.; 2025; China. (20)	Experimental model with 40 Female Sprague-Dawley rats of chemotherapy-induced ovarian dysfunction: - Normal control (N= 10), - Premature ovarian failure model (N= 10), - Progynova treatment (N= 10), - Acupuncture treatment (N= 10).	Animal acupoints: Guanyuan (RN4), bilateral Shenshu (BL23), bilateral Taichong (LR3), and Zigong (EX-CA1). 30 minutes for session; once daily for 28 days.	Ovary pathomorphology; stress oxidative levels, metabolomics and proteomics analyses.	Acupuncture treatment: - ↑ numbers of healthy follicles and decreased; - ↓ apoptosis inhibition of granulosa cells in the ovarian tissue; - delay in the progression of follicular damage; - ↑ superoxide dismutase and glutathione peroxidase activities;

				- regulation of ovarian function ovarian function through PPAR signaling pathway related proteins
Dong et al.; 2019; China. (23)	Randomized controlled trial with 100 poor ovarian response women undergoing IVF-embryo transplantation - Control - Medication - Acupuncture - Acupuncture + medication (combined treatment)	- Control: Without intervention - Medication: Climen (estradiol valerate and cyproterone acetate), for 21 days, for 3 menstrual cycles. - Acupuncture: CV4 and bilateral KI3, SP6) and LR3 from day 8 to 15 of menstruation (follicular phase), once daily, for 3 menstrual cycles. - Acupuncture + medication: association of the two interventions	#FSH, LH, E2 and AMH levels, antral follicles count (AFC), pregnancy indexes and administration of dosage and days of gonadotropin (Gn).	- Medication, Acupuncture and Combined treatment: ↓FSH, LH, E2 and ↑AMH, AFC vs. baseline and control. - Combined treatment: more high- quality embryos vs. Medication (p<0.05). - Combined Treatment ↓FSH, LH, E2 and ↑AFC vs. Acupuncture. - Combined Treatment ↓ LH, Gn dose and days vs. Medication
Kim et al.; 2021; Korea.(27)	Randomized controlled trial with women diagnosed with poor ovarian response: - *IVF (N= 10) - *IVF + **Ac (N = 8)	*IVF + **Ac: 16 acupuncture sessions every 2 days (+1), at points CV3, CV4, EX-CA1, SP6, KI3, SP10, ST36, and LR3, plus 30-min infrared abdominal irradiation, for ~2 months before ovulation induction.	#FSH, LH, E2, TSH, PRL and AMH levels, antral follicle count and number of fertilized oocytes.	- IVF + Ac: ↑ number of retrieved mature oocytes in women (>37 years- old) and in those undergoing more than one controlled ovarian hyperstimulation cycle vs. IVF.

<p>Mao; 2017; Denmark. (28)</p>	<p>Prospective case studies with women with ⁺DOR and low AMH who had unsuccessful *IVF (N= 20)</p>	<p>Treatment for three menstrual cycles, 6 sessions per 28-day cycle:</p> <ul style="list-style-type: none"> - Phase 1 (d1–3): No acupuncture if no imbalance. - Phase 2 (d4–7): GV20, ST36, SP6; electroacupuncture (EA) at ST29 and EX-CA1. If blood stagnation: add BL32, LR8, GB34. 1 session. - Phase 3 (d8–13): GV20, ST36, SP6, LI4, LR3; EA at ST29 and EX-CA1. ≥ 2 sessions (more if cycle >28 days). At embryo transfer: same points as Phase 3 + CV3, HT7, KI3, no EA. - Phase 4 (d14–17): Same as Phase 3 + HT7, KI3. 1 session. Quick puncture at BL23 and BL32 (applied in Phases 2–4). 	<p>Pregnancy success</p>	<p>17 cases got pregnant by *IVF and 3 naturally.</p>
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		- Phase 5 (d18–28): BL18, BL20, BL23, BL32, SP6, LU7, KI8; quick puncture at ST36 before prone position. 2 sessions.		
Xiong et al.; 2021; China (26)	Prospective cohort study with 57 women < 40 years old, with ⁺ DOR: - Electro-acupuncture (EA) (N= 29) - Medication group: Chinese herbs with or without hormone replacement therapy (N= 28)	<p><u>EA group:</u></p> <ul style="list-style-type: none"> - Prescription A: BL33 - Prescription B: ST25, EX-CA1 and CV4. <p>Two acupuncture prescriptions applied alternately. Each session lasted 20 min; 5 sessions/week for 4 weeks, then 3 sessions/week for 8 weeks, totaling 44 sessions.</p> <p><u>Medication group:</u></p> <ul style="list-style-type: none"> - herbal decoctions (individual formulae) twice a day with or without progesterone capsules (200 mg) and progynova (1 mg) once a day, for 12 weeks. 	#FSH, LH, E2	Regular FSH levels = 51.3% (EA) <i>versus</i> 32.1% (medication group) at week 12 and 51.3% vs 25.0% , respectively, at week 24.

Liu et. al; 2025; China (24)	Experimental model with 36 healthy female Sprague-Dawley rats aged 8 weeks: - Blank group (N= 12) - Model group (N = 12) - Acupuncture group (N= 12)	- Blank group: NaCl 0.9% by gavage for 14 days - Model group: Tripterygium wilfordii 75 mg/kg·d-1 by gavage for 14 days - Acupuncture group: Tripterygium wilfordii 75 mg/kg·d-1 by gavage for 14 days + GV20, CV4, KO4, SP6 acupoints.	#FSH, LH, E2 and AMH levels and ovarian tissue morphology	<u>AMH and E2 levels and Primary follicle number (p<0.05):</u> ↑Acupuncture vs ↓Model group <u>FSH (p<0.05) and LH levels (p<0.01):</u> ↓Acupuncture vs ↑Model group
Zhang et. al; 2018; China. (33)	Experimental model with 45 female C57/BL6 mice - Control group (N= 15) - Model group (N = 15) - Electro-acupuncture (EA) group (N= 15)	- Control group: NaCl 0.9% intraperitoneally - Model group: 75mg/kg cyclophosphamide intraperitoneally - EA group: 75mg/kg cyclophosphamide intraperitoneally + CV4 and bilateral ST 36; 30min a day for 7 days.	#FSH, LH, E2 and AMH levels, fertility preservation and ovarian tissue morphology	<u>AMH and E2 levels, litter sizes and Primordial follicle number (p<0.05):</u> ↑EA vs ↓Model group <u>FSH and LH levels (p<0.05):</u> ↓EA vs ↑Model group

Note: *IVF: in vitro fertilization; **Ac: acupuncture; +DOR: diminished ovary reserve; #FSH: Serum folliclestimulating hormone; LH: luteinizing hormone; E2: estradiol; TSH: thyroidstimulating hormone; AMH: Anti-Müllerian hormone; PRL: prolactin.

184 **Conclusions**

185 In conclusion, acupuncture and related therapy, specially protocols with CV4,
186 SP6, LIV3, EX-CA1, ST36 and KI3 acupoints, emerge as a promising integrative practice
187 for the management of DOR and female infertility. By promoting hormonal balance,
188 supporting reproductive health and enhancing ovarian function and pregnant rates, they
189 offer a safe and complementary therapeutic approach that may improve fertility outcomes
190 and overall well-being. Nevertheless, despite these encouraging findings, further clinical
191 studies with standardized protocols and more homogeneous samples are needed to
192 strengthen the evidence and confirm its effectiveness.

193

194 **References**

- 195 1. Jirge PR. Poor ovarian reserve. *J Hum Reprod Sci* [Internet]. 2016 Apr;9(2):63–
196 9. Available from: <https://journals.lww.com/01363858-201609020-00002>
- 197 2. Zhu Q, Li Y, Ma J, Ma H, Liang X. Potential factors result in diminished ovarian
198 reserve: a comprehensive review. *J Ovarian Res* [Internet]. 2023 Oct
199 25;16(1):208. Available from:
200 <https://ovarianresearch.biomedcentral.com/articles/10.1186/s13048-023-01296-x>
- 201 3. Anwar S, Shamsher S, Saifullah S, Javed A, Bhattani KE, Ahmad S. Prevalence
202 of Diminished Ovarian Reserve in Sub-fertile Women Under 40 years of Age.
203 *Ann Punjab Med Coll* [Internet]. 2023 Dec 31;17(4):427–30. Available from:
204 <https://japmcfmu.com/index.php/apmc/article/view/1228>
- 205 4. Jaswa EG, McCulloch CE, Simbulan R, Cedars MI, Rosen MP. Diminished
206 ovarian reserve is associated with reduced euploid rates via preimplantation
207 genetic testing for aneuploidy independently from age: evidence for concomitant
208 reduction in oocyte quality with quantity. *Fertil Steril* [Internet]. 2021
209 Apr;115(4):966–73. Available from:
210 <https://linkinghub.elsevier.com/retrieve/pii/S0015028220326236>
- 211 5. Smits MAJ, Schomakers B V, van Weeghel M, Wever EJM, Wüst RCI, Dijk F,
212 et al. Human ovarian aging is characterized by oxidative damage and
213 mitochondrial dysfunction. *Hum Reprod* [Internet]. 2023 Nov 2;38(11):2208–20.
214 Available from: <https://academic.oup.com/humrep/article/38/11/2208/7260911>
- 215 6. Spears N, Lopes F, Stefansdottir A, Rossi V, De Felici M, Anderson RA, et al.

- 184 Ovarian damage from chemotherapy and current approaches to its protection.
185 Hum Reprod Update [Internet]. 2019 Nov 5;25(6):673–93. Available from:
186 <https://academic.oup.com/humupd/article/25/6/673/5585503>
- 187 7. Bedoschi G, Navarro PA, Oktay K. Chemotherapy-Induced Damage to Ovary:
188 Mechanisms and Clinical Impact. *Futur Oncol* [Internet]. 2016 Oct
189 31;12(20):2333–44. Available from:
190 <https://www.tandfonline.com/doi/full/10.2217/fon-2016-0176>
- 191 8. Zhang S, Liu Q, Chang M, Pan Y, Yahaya BH, Liu Y, et al. Chemotherapy
192 impairs ovarian function through excessive ROS-induced ferroptosis. *Cell Death*
193 *Dis* [Internet]. 2023 May 24;14(5):340. Available from:
194 <https://www.nature.com/articles/s41419-023-05859-0>
- 195 9. Hawkins Bressler L, Bernardi LA, De Chavez PJD, Baird DD, Carnethon MR,
196 Marsh EE. Alcohol, cigarette smoking, and ovarian reserve in reproductive-age
197 African-American women. *Am J Obstet Gynecol* [Internet]. 2016
198 Dec;215(6):758.e1-758.e9. Available from:
199 <https://linkinghub.elsevier.com/retrieve/pii/S000293781630446X>
- 200 10. de Angelis C, Nardone A, Garifalos F, Pivonello C, Sansone A, Conforti A, et al.
201 Smoke, alcohol and drug addiction and female fertility. *Reprod Biol Endocrinol*
202 [Internet]. 2020 Dec 12;18(1):21. Available from:
203 <https://rbej.biomedcentral.com/articles/10.1186/s12958-020-0567-7>
- 204 11. Ghasemi-Tehrani H, Askari G, Allameh FZ, Vajdi M, Amiri Khosroshahi R,
205 Talebi S, et al. Healthy eating index and risk of diminished ovarian reserve: a
206 case–control study. *Sci Rep* [Internet]. 2024 Jul 23;14(1):16861. Available from:
207 <https://www.nature.com/articles/s41598-024-67734-y>
- 208 12. Feng J, Wang J, Zhang Y, Zhang Y, Jia L, Zhang D, et al. The Efficacy of
209 Complementary and Alternative Medicine in the Treatment of Female Infertility.
210 Tamagno G, editor. *Evidence-Based Complement Altern Med* [Internet]. 2021
211 Apr 23;2021:1–21. Available from:
212 <https://www.hindawi.com/journals/ecam/2021/6634309/>
- 213 13. Liew FF, Dutta S, Sengupta P. Fertility treatment-induced oxidative stress and
214 reproductive disorders. *J Integr Sci Technol*. 2024;12(3):1–16.
- 215 14. Derman SG, Adashi EY. Adverse Effects of Fertility Drugs. *Drug Saf* [Internet].
216 1994 Dec;11(6):408–21. Available from:
217 <http://link.springer.com/10.2165/00002018-199411060-00003>
- 218 15. Rashidi M, Najmi Z, Mobasser A. Advantages of Recombinant Follicle-
219 Stimulating Hormone over Human Menopausal Gonadotropin in Intrauterine
220 Insemination: A Randomized Clinical Trial in Polycystic Ovary Syndrome-
221 Associated Infertility. *Gynecol Obstet Invest* [Internet]. 2016;81(2):118–23.
222 Available from: <https://karger.com/article/doi/10.1159/000435773>

- 184 16. Freeman MP, Toth TL, Cohen LS. Assisted reproduction and risk of depressive
185 relapse: considerations for treatment. *Ann Clin Psychiatry* [Internet]. 2013
186 Nov;25(4):283–8. Available from:
187 <http://www.ncbi.nlm.nih.gov/pubmed/24199219>
- 188 17. Cui J, Song W, Jin Y, Xu H, Fan K, Lin D, et al. Research Progress on the
189 Mechanism of the Acupuncture Regulating Neuro-Endocrine-Immune Network
190 System. *Vet Sci* [Internet]. 2021 Jul 30;8(8):149. Available from:
191 <https://www.mdpi.com/2306-7381/8/8/149>
- 192 18. Stener-Victorin E, Kobayashi R, Kurosawa M. Ovarian blood flow responses to
193 electro-acupuncture stimulation at different frequencies and intensities in
194 anaesthetized rats. *Auton Neurosci* [Internet]. 2003 Oct;108(1–2):50–6.
195 Available from: <https://linkinghub.elsevier.com/retrieve/pii/S1566070203001942>
- 196 19. Santos ELW, Dias BHM, Andrade ACR de, Pascoal AMH, Vasconcelos Filho
197 FE de, Medeiros F das C, et al. Effects of acupuncture and electroacupuncture on
198 estradiol-induced inflammation and oxidative stress in health rodents. *Acta Cir
199 Bras* [Internet]. 2013 Aug;28(8):582–8. Available from:
200 [http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0102-
201 86502013000800005&lng=en&tlng=en](http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0102-86502013000800005&lng=en&tlng=en)
- 202 20. Dandan W, Shanshan L, Ranpei Z, Zongqing H, Fan Q, Wenwen Q, et al.
203 Acupuncture modulates ovarian senescence through metabolic reprogramming: A
204 multi-omics investigation in chemotherapy - induced POF model. *Exp Gerontol*
205 [Internet]. 2025 Oct;209:112815. Available from:
206 <https://linkinghub.elsevier.com/retrieve/pii/S0531556525001445>
- 207 21. Chen Y, Zhao R, Li X, Luan Y, Xing L, Zhang X, et al. Preventive
208 Electroacupuncture Alleviates Oxidative Stress and Inflammation via
209 Keap1/Nrf2/HO-1 Pathway in Rats with Cyclophosphamide-Induced Premature
210 Ovarian Insufficiency. Liao Z, editor. *Biomed Res Int* [Internet]. 2022 Jan
211 25;2022(1). Available from:
212 <https://onlinelibrary.wiley.com/doi/10.1155/2022/6718592>
- 213 22. Chen B-Y. Acupuncture normalizes dysfunction of hypothalamic-pituitary-
214 ovarian axis. *Acupunct Electrother Res* [Internet]. 1997 Jan 1;22(2):97–108.
215 Available from:
216 <https://journals.sagepub.com/doi/full/10.3727/036012997816356734>
- 217 23. Dong X-L, Ran J-K, Zhang H-J, Chen K, Li H-X. Acupuncture combined with
218 medication improves endocrine hormone levels and ovarian reserve function in
219 poor ovarian response patients undergoing in vitro fertilization-embryo
220 transplantation. *Acupunct Res*. 2019;
- 221 24. Liu Y, Yang W, Yuan R, Li Z, Wang T, Yang B, et al. Exploring the Mechanism
222 of Acupuncture in Improving Ovarian Function in Rats with Poor Ovarian
223 Response Using High-Throughput Sequencing. *Comb Chem High Throughput*

- 184 Screen. 2025;28(8):1443–57.
- 185 25. Zhang H, Qin F, Liu A, Sun Q, Wang Q, Xie S, et al. Electro-acupuncture
186 attenuates the mice premature ovarian failure via mediating PI3K/AKT/mTOR
187 pathway. *Life Sci* [Internet]. 2019 Jan;217:169–75. Available from:
188 <https://linkinghub.elsevier.com/retrieve/pii/S002432051830780X>
- 189 26. Xiong Z, Wang Y, Liu X, Yu S, Li Y, Liu X, et al. Acupuncture versus oral
190 medicine for women with diminished ovarian reserve: A cohort study. *World J*
191 *Acupunct - Moxibustion* [Internet]. 2021 Jul;31(3):176–80. Available from:
192 <https://linkinghub.elsevier.com/retrieve/pii/S1003525721000568>
- 193 27. Kim J, Lee H, Choi T-Y, Kim J Il, Kang B-K, Lee MS, et al. Acupuncture for
194 Poor Ovarian Response: A Randomized Controlled Trial. *J Clin Med* [Internet].
195 2021 May 18;10(10):2182. Available from: [https://www.mdpi.com/2077-](https://www.mdpi.com/2077-0383/10/10/2182)
196 [0383/10/10/2182](https://www.mdpi.com/2077-0383/10/10/2182)
- 197 28. Mao Q hui. Acupuncture for the treatment of diminished ovary reserve. *World J*
198 *Acupunct - Moxibustion* [Internet]. 2017;27(3):69–74. Available from:
199 [http://dx.doi.org/10.1016/S1003-5257\(17\)30143-5](http://dx.doi.org/10.1016/S1003-5257(17)30143-5)
- 200 29. Guven PG, Cayir Y, Borekci B. Effectiveness of acupuncture on pregnancy
201 success rates for women undergoing in vitro fertilization: A randomized
202 controlled trial. *Taiwan J Obstet Gynecol* [Internet]. 2020 Mar;59(2):282–6.
203 Available from: <https://linkinghub.elsevier.com/retrieve/pii/S1028455920300188>
- 204 30. Harris BS, Jukic AM, Truong T, Nagle CT, Erkanli A, Steiner AZ. Markers of
205 ovarian reserve as predictors of future fertility. *Fertil Steril* [Internet]. 2023
206 Jan;119(1):99–106. Available from:
207 <https://linkinghub.elsevier.com/retrieve/pii/S0015028222019641>
- 208 31. Deadmond A, Koch CA, Parry JP. Ovarian Reserve Testing [Internet]. *Endotext*.
209 2000. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/23262930>
- 210 32. Bedenk J, Vrtačnik-Bokal E, Virant-Klun I. The role of anti-Müllerian hormone
211 (AMH) in ovarian disease and infertility. *J Assist Reprod Genet* [Internet]. 2020
212 Jan 21;37(1):89–100. Available from: [http://link.springer.com/10.1007/s10815-](http://link.springer.com/10.1007/s10815-019-01622-7)
213 [019-01622-7](http://link.springer.com/10.1007/s10815-019-01622-7)
- 214 33. Zhang H, Qin F, Liu A, Sun Q, Wang Q, Xie S, et al. Electro-acupuncture
215 attenuates the mice premature ovarian failure via mediating PI3K/AKT/mTOR
216 pathway. *Life Sci* [Internet]. 2019;217:169–75. Available from:
217 <https://doi.org/10.1016/j.lfs.2018.11.059>
- 218 34. Li YT, Li CL, Yang H, Huang L, Liu JJ, Zheng XY, et al. Correlation between
219 acupuncture dose and pregnancy outcomes in women with polycystic ovary
220 syndrome undergoing in vitro fertilization-embryo transfer: a systematic review.
221 *BMC Complement Med Ther* [Internet]. 2024 Nov 26;24(1):407. Available from:
222 <https://bmccomplementalmed.biomedcentral.com/articles/10.1186/s12906->

- 184 024-04695-9
- 185 35. Wu J, Ning Y, Ye Y, Liu Y, Tang M, Hu S, et al. Effects of Acupuncture on
186 Endometrium and Pregnancy Outcomes in Patients with Polycystic Ovarian
187 Syndrome Undergoing in vitro Fertilization-Embryo Transfer: A Randomized
188 Clinical Trial. *Chin J Integr Med* [Internet]. 2022 Aug 13;28(8):736–42.
189 Available from: <https://link.springer.com/10.1007/s11655-022-3498-z>
- 190 36. Westergaard LG, Mao Q, Krogslund M, Sandrini S, Lenz S, Grinsted J.
191 Acupuncture on the day of embryo transfer significantly improves the
192 reproductive outcome in infertile women: a prospective, randomized trial. *Fertil*
193 *Steril* [Internet]. 2006 May;85(5):1341–6. Available from:
194 <https://linkinghub.elsevier.com/retrieve/pii/S0015028206002123>
- 195 37. Yu Y-P, Ma L-X, Ma Y-X, Ma Y-X, Liu Y-Q, Liu C-Z, et al. Immediate Effect
196 of Acupuncture at Sanyinjiao (SP6) and Xuanzhong (GB39) on Uterine Arterial
197 Blood Flow in Primary Dysmenorrhea. *J Altern Complement Med* [Internet].
198 2010 Oct;16(10):1073–8. Available from:
199 <http://www.liebertpub.com/doi/10.1089/acm.2009.0326>
- 200 38. Wang R-R, Su M-H, Liu L-Y, Lai Y-Y, Guo X-L, Gan D, et al. Systematic
201 review of acupuncture to improve ovarian function in women with poor ovarian
202 response. *Front Endocrinol (Lausanne)* [Internet]. 2023 Mar 13;14. Available
203 from: <https://www.frontiersin.org/articles/10.3389/fendo.2023.1028853/full>
- 204 39. Wong CL, Lai KY, Tse HM. Effects of SP6 acupressure on pain and menstrual
205 distress in young women with dysmenorrhea. *Complement Ther Clin Pract*
206 [Internet]. 2010 May;16(2):64–9. Available from:
207 <https://linkinghub.elsevier.com/retrieve/pii/S1744388109001054>
- 208 40. Bazarganipour F, Taghavi S-A, Allan H, Beheshti F, Khalili A, Miri F, et al. The
209 effect of applying pressure to the LIV3 and LI4 on the symptoms of premenstrual
210 syndrome: A randomized clinical trial. *Complement Ther Med* [Internet]. 2017
211 Apr;31:65–70. Available from:
212 <https://linkinghub.elsevier.com/retrieve/pii/S0965229917301206>
- 213 41. Zheng CH, Zhang J, Wu J, Zhang MM. The effect of transcutaneous electrical
214 acupoint stimulation on pregnancy rates in women undergoing in vitro
215 fertilization: a study protocol for a randomized controlled trial. *Trials* [Internet].
216 2014 Dec 9;15(1):162. Available from:
217 <https://trialsjournal.biomedcentral.com/articles/10.1186/1745-6215-15-162>
- 218 42. Hullender Rubin L, Cantor D, Marx BL. Recurrent Pregnancy Loss and
219 Traditional Chinese Medicine. *Med Acupunct* [Internet]. 2013 Jun;25(3):232–7.
220 Available from: <http://www.liebertpub.com/doi/10.1089/acu.2012.0911>
- 221 43. Xu J, Zhao A, Xin P, Geng J, Wang B, Xia T. Acupuncture for Female Infertility:
222 Discussion on Action Mechanism and Application. Hu M, editor. Evidence-

184 Based Complement Altern Med [Internet]. 2022 Jul 4;2022:1–17. Available
185 from: <https://www.hindawi.com/journals/ecam/2022/3854117/>

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3 CONSIDERAÇÕES FINAIS

A presente revisão integrativa permitiu analisar, de forma sistematizada, as evidências científicas disponíveis acerca do papel da acupuntura no cuidado da fertilidade feminina, com ênfase na reserva ovariana diminuída e nos desfechos reprodutivos. Os estudos incluídos indicam que a acupuntura, isoladamente ou associada a outras terapias, apresenta efeitos positivos sobre a regulação hormonal, a função ovariana e as taxas de gravidez, tanto em concepções espontâneas quanto em procedimentos de reprodução assistida.

Os achados demonstram que a acupuntura pode contribuir para a redução dos níveis séricos de hormônio folículo-estimulante e hormônio luteinizante, bem como para o aumento do hormônio anti-Mülleriano, refletindo melhora nos marcadores da reserva ovariana. Além disso, evidências experimentais apontam efeitos benéficos sobre a morfologia ovariana, a preservação folicular, a redução do estresse oxidativo e da inflamação, bem como a proteção das células da granulosa, aspectos fundamentais para a manutenção da capacidade reprodutiva feminina.

Do ponto de vista da Medicina Tradicional Chinesa, a utilização recorrente de pontos como CV4, SP6, LIV3, EX-CA1, ST36 e KI3 reforça a importância da tonificação do rim, da regulação do Qi e do sangue e do equilíbrio dos sistemas envolvidos na reprodução. Sob a ótica biomédica, os mecanismos propostos incluem a modulação do eixo hipotálamo-hipófise-ovariano, a melhora da perfusão sanguínea uterina e ovariana e a regulação neuroendócrina e imunológica, o que contribui para um ambiente mais favorável à ovulação, à implantação embrionária e à manutenção da gestação.

Apesar dos resultados promissores, observa-se heterogeneidade metodológica entre os estudos analisados, especialmente no que se refere aos protocolos de acupuntura, à frequência das sessões, à seleção dos pontos e ao tamanho das amostras. Essas limitações reforçam a necessidade de novos ensaios clínicos randomizados, com maior rigor metodológico e padronização dos tratamentos, a fim de fortalecer o nível de evidência científica e permitir conclusões mais consistentes.

Diante do exposto, conclui-se que a acupuntura se apresenta como uma prática integrativa segura e potencialmente eficaz no manejo da infertilidade feminina, podendo atuar como terapia complementar aos tratamentos convencionais. Sua incorporação no cuidado à saúde da mulher pode contribuir não apenas para a melhora dos desfechos reprodutivos, mas também para a promoção do bem-estar físico e emocional das pacientes, ampliando as possibilidades terapêuticas no campo da medicina reprodutiva.

REFERENCIAS

Jirge PR. Poor ovarian reserve. *J Hum Reprod Sci* [Internet]. 2016 Apr;9(2):63–9. Available from: <https://journals.lww.com/01363858-201609020-00002>

Zhu Q, Li Y, Ma J, Ma H, Liang X. Potential factors result in diminished ovarian reserve: a comprehensive review. *J Ovarian Res* [Internet]. 2023 Oct 25;16(1):208. Available from: <https://ovarianresearch.biomedcentral.com/articles/10.1186/s13048-023-01296-x>

Anwar S, Shamsheer S, Saifullah S, Javed A, Bhattani KE, Ahmad S. Prevalence of Diminished Ovarian Reserve in Sub-fertile Women Under 40 years of Age. *Ann Punjab Med Coll* [Internet]. 2023 Dec 31;17(4):427–30. Available from: <https://japmcfmu.com/index.php/apmc/article/view/1228>

Jaswa EG, McCulloch CE, Simbulan R, Cedars MI, Rosen MP. Diminished ovarian reserve is associated with reduced euploid rates via preimplantation genetic testing for aneuploidy independently from age: evidence for concomitant reduction in oocyte quality with quantity. *Fertil Steril* [Internet]. 2021 Apr;115(4):966–73. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0015028220326236>

Smits MAJ, Schomakers B V, van Weeghel M, Wever EJM, Wüst RCI, Dijk F, et al. Human ovarian aging is characterized by oxidative damage and mitochondrial dysfunction. *Hum Reprod* [Internet]. 2023 Nov 2;38(11):2208–20. Available from: <https://academic.oup.com/humrep/article/38/11/2208/7260911>

Spears N, Lopes F, Stefansdottir A, Rossi V, De Felici M, Anderson RA, et al. Ovarian damage from chemotherapy and current approaches to its protection. *Hum Reprod Update* [Internet]. 2019 Nov 5;25(6):673–93. Available from: <https://academic.oup.com/humupd/article/25/6/673/5585503>

Bedoschi G, Navarro PA, Oktay K. Chemotherapy-Induced Damage to Ovary: Mechanisms and Clinical Impact. *Futur Oncol* [Internet]. 2016 Oct 31;12(20):2333–44. Available from: <https://www.tandfonline.com/doi/full/10.2217/fon-2016-0176>

Zhang S, Liu Q, Chang M, Pan Y, Yahaya BH, Liu Y, et al. Chemotherapy impairs ovarian function through excessive ROS-induced ferroptosis. *Cell Death Dis* [Internet]. 2023 May 24;14(5):340. Available from: <https://www.nature.com/articles/s41419-023-05859-0>

Hawkins Bressler L, Bernardi LA, De Chavez PJD, Baird DD, Carnethon MR, Marsh EE. Alcohol, cigarette smoking, and ovarian reserve in reproductive-age African-American women. *Am J Obstet Gynecol* [Internet]. 2016 Dec;215(6):758.e1-758.e9. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S000293781630446X>

de Angelis C, Nardone A, Garifalos F, Pivonello C, Sansone A, Conforti A, et al. Smoke, alcohol and drug addiction and female fertility. *Reprod Biol Endocrinol* [Internet]. 2020 Dec 12;18(1):21. Available from: <https://rbej.biomedcentral.com/articles/10.1186/s12958-020-0567-7>

Ghasemi-Tehrani H, Askari G, Allameh FZ, Vajdi M, Amiri Khosroshahi R, Talebi S, et al. Healthy eating index and risk of diminished ovarian reserve: a case–control study. *Sci Rep* [Internet]. 2024 Jul 23;14(1):16861. Available from: <https://www.nature.com/articles/s41598-024-67734-y>

Feng J, Wang J, Zhang Y, Zhang Y, Jia L, Zhang D, et al. The Efficacy of Complementary and Alternative Medicine in the Treatment of Female Infertility. Tamagno G, editor. *Evidence-Based Complement Altern Med* [Internet]. 2021 Apr 23;2021:1–21. Available from: <https://www.hindawi.com/journals/ecam/2021/6634309/>

Liew FF, Dutta S, Sengupta P. Fertility treatment-induced oxidative stress and reproductive disorders. *J Integr Sci Technol*. 2024;12(3):1–16.

Derman SG, Adashi EY. Adverse Effects of Fertility Drugs. *Drug Saf* [Internet]. 1994 Dec;11(6):408–21. Available from: <http://link.springer.com/10.2165/00002018-199411060-00003>

Rashidi M, Najmi Z, Mobasseri A. Advantages of Recombinant Follicle-Stimulating Hormone over Human Menopausal Gonadotropin in Intrauterine Insemination: A Randomized Clinical Trial in Polycystic Ovary Syndrome-Associated Infertility. *Gynecol Obstet Invest* [Internet]. 2016;81(2):118–23. Available from: <https://karger.com/article/doi/10.1159/000435773>

Freeman MP, Toth TL, Cohen LS. Assisted reproduction and risk of depressive relapse: considerations for treatment. *Ann Clin Psychiatry* [Internet]. 2013 Nov;25(4):283–8. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/24199219>

Cui J, Song W, Jin Y, Xu H, Fan K, Lin D, et al. Research Progress on the Mechanism of the Acupuncture Regulating Neuro-Endocrine-Immune Network System. *Vet Sci* [Internet]. 2021 Jul 30;8(8):149. Available from: <https://www.mdpi.com/2306-7381/8/8/149>

Stener-Victorin E, Kobayashi R, Kurosawa M. Ovarian blood flow responses to electro-acupuncture stimulation at different frequencies and intensities in anaesthetized rats. *Auton Neurosci* [Internet]. 2003 Oct;108(1–2):50–6. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S1566070203001942>

Santos ELW, Dias BHM, Andrade ACR de, Pascoal AMH, Vasconcelos Filho FE de, Medeiros F das C, et al. Effects of acupuncture and electroacupuncture on estradiol-induced inflammation and oxidative stress in health rodents. *Acta Cir Bras* [Internet]. 2013 Aug;28(8):582–8. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0102-86502013000800005&lng=en&tlng=en

Dandan W, Shanshan L, Ranpei Z, Zongqing H, Fan Q, Wenwen Q, et al. Acupuncture modulates ovarian senescence through metabolic reprogramming: A multi-omics investigation in chemotherapy - induced POF model. *Exp Gerontol* [Internet]. 2025 Oct;209:112815. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0531556525001445>

Chen Y, Zhao R, Li X, Luan Y, Xing L, Zhang X, et al. Preventive Electroacupuncture Alleviates Oxidative Stress and Inflammation via Keap1/Nrf2/HO-1 Pathway in Rats with Cyclophosphamide-Induced Premature Ovarian Insufficiency. Liao Z, editor. *Biomed Res Int* [Internet]. 2022 Jan 25;2022(1). Available from: <https://onlinelibrary.wiley.com/doi/10.1155/2022/6718592>

Chen B-Y. Acupuncture normalizes dysfunction of hypothalamic-pituitary-ovarian axis. *Acupunct Electrother Res* [Internet]. 1997 Jan 1;22(2):97–108. Available from: <https://journals.sagepub.com/doi/full/10.3727/036012997816356734>

Dong X-L, Ran J-K, Zhang H-J, Chen K, Li H-X. Acupuncture combined with medication improves endocrine hormone levels and ovarian reserve function in poor ovarian response patients undergoing in vitro fertilization-embryo transplantation. *Acupunct Res*. 2019;

Liu Y, Yang W, Yuan R, Li Z, Wang T, Yang B, et al. Exploring the Mechanism of Acupuncture in Improving Ovarian Function in Rats with Poor Ovarian Response Using High-Throughput Sequencing. *Comb Chem High Throughput Screen*. 2025;28(8):1443–57.

Zhang H, Qin F, Liu A, Sun Q, Wang Q, Xie S, et al. Electro-acupuncture attenuates the mice premature ovarian failure via mediating PI3K/AKT/mTOR pathway. *Life Sci [Internet]*. 2019 Jan;217:169–75. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S002432051830780X>

Xiong Z, Wang Y, Liu X, Yu S, Li Y, Liu X, et al. Acupuncture versus oral medicine for women with diminished ovarian reserve: A cohort study. *World J Acupunct - Moxibustion [Internet]*. 2021 Jul;31(3):176–80. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S1003525721000568>

Kim J, Lee H, Choi T-Y, Kim J II, Kang B-K, Lee MS, et al. Acupuncture for Poor Ovarian Response: A Randomized Controlled Trial. *J Clin Med [Internet]*. 2021 May 18;10(10):2182. Available from: <https://www.mdpi.com/2077-0383/10/10/2182>

Mao Q hui. Acupuncture for the treatment of diminished ovary reserve. *World J Acupunct - Moxibustion [Internet]*. 2017;27(3):69–74. Available from: [http://dx.doi.org/10.1016/S1003-5257\(17\)30143-5](http://dx.doi.org/10.1016/S1003-5257(17)30143-5)

Guven PG, Cayir Y, Borekci B. Effectiveness of acupuncture on pregnancy success rates for women undergoing in vitro fertilization: A randomized controlled trial. *Taiwan J Obstet Gynecol [Internet]*. 2020 Mar;59(2):282–6. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S1028455920300188>

Harris BS, Jukic AM, Truong T, Nagle CT, Erkanli A, Steiner AZ. Markers of ovarian reserve as predictors of future fertility. *Fertil Steril [Internet]*. 2023 Jan;119(1):99–106. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0015028222019641>

Deadmond A, Koch CA, Parry JP. Ovarian Reserve Testing [Internet]. *Endotext*. 2000. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/23262930>

Bedenk J, Vrtačnik-Bokal E, Virant-Klun I. The role of anti-Müllerian hormone (AMH) in ovarian disease and infertility. *J Assist Reprod Genet [Internet]*. 2020 Jan 21;37(1):89–100. Available from: <http://link.springer.com/10.1007/s10815-019-01622-7>

Zhang H, Qin F, Liu A, Sun Q, Wang Q, Xie S, et al. Electro-acupuncture attenuates the mice premature ovarian failure via mediating PI3K/AKT/mTOR

pathway. *Life Sci* [Internet]. 2019;217:169–75. Available from: <https://doi.org/10.1016/j.lfs.2018.11.059>

Li YT, Li CL, Yang H, Huang L, Liu JJ, Zheng XY, et al. Correlation between acupuncture dose and pregnancy outcomes in women with polycystic ovary syndrome undergoing in vitro fertilization-embryo transfer: a systematic review. *BMC Complement Med Ther* [Internet]. 2024 Nov 26;24(1):407. Available from: <https://bmccomplementalmed.biomedcentral.com/articles/10.1186/s12906-024-04695-9>

Wu J, Ning Y, Ye Y, Liu Y, Tang M, Hu S, et al. Effects of Acupuncture on Endometrium and Pregnancy Outcomes in Patients with Polycystic Ovarian Syndrome Undergoing in vitro Fertilization-Embryo Transfer: A Randomized Clinical Trial. *Chin J Integr Med* [Internet]. 2022 Aug 13;28(8):736–42. Available from: <https://link.springer.com/10.1007/s11655-022-3498-z>

Westergaard LG, Mao Q, Kroglund M, Sandrini S, Lenz S, Grinsted J. Acupuncture on the day of embryo transfer significantly improves the reproductive outcome in infertile women: a prospective, randomized trial. *Fertil Steril* [Internet]. 2006 May;85(5):1341–6. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0015028206002123>

Yu Y-P, Ma L-X, Ma Y-X, Ma Y-X, Liu Y-Q, Liu C-Z, et al. Immediate Effect of Acupuncture at Sanyinjiao (SP6) and Xuanzhong (GB39) on Uterine Arterial Blood Flow in Primary Dysmenorrhea. *J Altern Complement Med* [Internet]. 2010 Oct;16(10):1073–8. Available from: <http://www.liebertpub.com/doi/10.1089/acm.2009.0326>

Wang R-R, Su M-H, Liu L-Y, Lai Y-Y, Guo X-L, Gan D, et al. Systematic review of acupuncture to improve ovarian function in women with poor ovarian response. *Front Endocrinol (Lausanne)* [Internet]. 2023 Mar 13;14. Available from: <https://www.frontiersin.org/articles/10.3389/fendo.2023.1028853/full>

Wong CL, Lai KY, Tse HM. Effects of SP6 acupressure on pain and menstrual distress in young women with dysmenorrhea. *Complement Ther Clin Pract* [Internet]. 2010 May;16(2):64–9. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S1744388109001054>

Bazarganipour F, Taghavi S-A, Allan H, Beheshti F, Khalili A, Miri F, et al. The effect of applying pressure to the LIV3 and LI4 on the symptoms of premenstrual syndrome: A randomized clinical trial. *Complement Ther Med* [Internet]. 2017 Apr;31:65–70. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0965229917301206>

Zheng CH, Zhang J, Wu J, Zhang MM. The effect of transcutaneous electrical acupoint stimulation on pregnancy rates in women undergoing in vitro fertilization: a study protocol for a randomized controlled trial. *Trials* [Internet]. 2014 Dec 9;15(1):162. Available from: <https://trialsjournal.biomedcentral.com/articles/10.1186/1745-6215-15-162>

Hullender Rubin L, Cantor D, Marx BL. Recurrent Pregnancy Loss and Traditional Chinese Medicine. *Med Acupunct* [Internet]. 2013 Jun;25(3):232–7. Available from: <http://www.liebertpub.com/doi/10.1089/acu.2012.0911>

Xu J, Zhao A, Xin P, Geng J, Wang B, Xia T. Acupuncture for Female Infertility: Discussion on Action Mechanism and Application. Hu M, editor. *Evidence-Based Complement Altern Med* [Internet]. 2022 Jul 4;2022:1–17. Available from: <https://www.hindawi.com/journals/ecam/2022/3854117/>