



## Effect of Auriculotherapy and Vitamins on the Outcomes of Assisted Reproductive Technologies and Mental Health in Infertile Women

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### Abstract

**Background:** Infertility adversely affects women's physical and mental health. Although assisted reproductive technologies (ART) like IVF provide hope, outcomes are uncertain and the process is stressful. Recently, auriculotherapy (ear acupuncture) and vitamin supplementation have gained attention for their potential to enhance ART success and psychological well-being. This review summarizes current evidence on these interventions in infertile women.

**Materials and Methods:** In this review, two independent reviewers systematically searched Scopus, EMBASE, PubMed, the Cochrane Library, Web of Science, and the Google Scholar search engine for studies published up to March 2025. The search included randomized controlled trials and observational studies examining auriculotherapy and vitamin supplementation in relation to ART outcomes and mental health in infertile women. Keywords used included "auriculotherapy," "vitamins," "ART," "infertility," and "mental health".

**Results:** Auriculotherapy and vitamin supplementation have shown benefits for infertile women undergoing ART. Studies indicate auriculotherapy can reduce stress and anxiety, which are linked to improved clinical pregnancy and implantation rates, and sometimes higher live birth rates. It may also help regulate reproductive hormones (FSH, LH, and estradiol), and immune cytokines, supporting embryo implantation. Vitamin supplementation, especially with B vitamins, vitamin D, and antioxidants (such as vitamins C and E), supports ovarian function, hormonal balance, and mental health. Combining these interventions with standard ART protocols may have synergistic effects, potentially improving pregnancy rates and psychological well-being. Both approaches are generally safe, though individual responses vary, highlighting the need for further research.

**Conclusion:** Auriculotherapy and vitamin supplementation appear to be effective supportive therapies for infertile women undergoing ART. While current evidence is promising, more rigorous research is needed to confirm their benefits and to develop standardized, individualized treatment protocols.

**Key Words:** Auriculotherapy, Vitamins, Infertility, Assisted Reproductive Technology, Mental Health.

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## 1- INTRODUCTION

Infertility is a widespread global health concern, affecting approximately 8–12% of couples and resulting in significant physical, psychological, and social consequences, particularly for women (1, 2). The psychological burden associated with infertility can be as profound as that experienced with other chronic medical conditions, and this distress may adversely affect reproductive outcomes (3). Assisted reproductive technologies (ART), such as in vitro fertilization (IVF), have offered hope to many couples struggling with infertility. However, ART procedures are often accompanied by high levels of stress, anxiety, and emotional strain, while their success rates remain variable and sometimes limited (2, 4). Psychological distress during ART cycles has been shown to disrupt hormonal and immune functions, potentially diminishing the effectiveness of these treatments (3).

In response to these challenges, there has been growing interest in complementary and alternative medicine (CAM) approaches to enhance ART outcomes and support the mental health of infertile women. Auriculotherapy, a form of acupuncture that involves stimulating specific points on the ear, is one such intervention. Rooted in traditional Chinese medicine, auriculotherapy is based on the microsystem theory, which posits that the ear reflects the entire body, with particular points corresponding to various organs and physiological functions (5, 6).

Techniques used in auriculotherapy include acupuncture needles, manual pressure, seeds, and low-level laser therapy (7). The proposed mechanisms of auriculotherapy include modulation of neurotransmitters, regulation of reproductive hormones, and adjustment of immune system function (8–10).

Recent studies and systematic reviews suggest that auriculotherapy may reduce

anxiety and improve ART outcomes, although further research is needed to confirm these effects (11, 12).

Vitamin supplementation, particularly with vitamin D, has gained attention as a supportive strategy for women undergoing ART. Adequate vitamin D levels are associated with improved ovarian function, hormonal regulation, and potentially better ART outcomes (13–15). Other micronutrients, such as B vitamins and antioxidants, may also contribute to reproductive health and psychological well-being (16, 17). Despite the growing use of these complementary interventions, there is considerable variability in study populations, intervention protocols, and the quality of the available evidence (18, 19). The lack of standardized guidelines and robust clinical trials makes it difficult to draw definitive conclusions regarding their efficacy and safety.

Given the increasing interest in non-pharmacological adjuncts for infertility treatment and the existing gaps in evidence, further high-quality research is necessary to clarify the role of auriculotherapy and vitamin supplementation in improving ART outcomes and mental health among infertile women. This review aims to summarize the current evidence on the effects of auriculotherapy and vitamin supplementation on ART outcomes and mental health in this population.

## 2- MATERIALS AND METHODS

This narrative review aimed to synthesize and evaluate the current evidence on the effects of auriculotherapy and vitamin supplementation on the outcomes of assisted reproductive technologies (ART) and mental health in infertile women.

### 2-1. Literature Search

A comprehensive literature search was conducted in both English and Persian

using the databases PubMed, Scopus, EMBASE, Cochrane Library, Web of Science, as well as the Google Scholar search engine, for studies published up to March 2025. The search strategy included keywords such as “auriculotherapy,” “ear acupuncture,” “vitamins,” “vitamin D,” “ART,” “infertility,” and “mental health,” along with their Persian equivalents. Additionally, the reference lists of relevant articles were screened to identify further studies.

## 2-2. Inclusion and Exclusion Criteria

Studies were included if they met the following criteria:

- Population: Infertile women undergoing ART (e.g., IVF).
- Interventions: Auriculotherapy (including auricular acupuncture, acupressure, or related techniques) and/or vitamin supplementation (e.g., vitamin D, B vitamins, antioxidants).
- Outcomes: ART success rates (clinical pregnancy, implantation, live birth), hormonal and immune parameters, and mental health indicators (stress, anxiety, psychological well-being).
- Study Design: Randomized controlled trials, observational studies, and relevant review or systematic review articles.

Exclusion criteria were:

- Studies not focused on infertile women or ART.
- Case reports, letters to the editor, conference abstracts, and non-English or non-Persian publications.
- Studies lacking relevant outcome data.

## 2-3. Study Selection and Data Extraction

Titles and abstracts were independently screened by two reviewers. Full texts of potentially eligible studies were then

assessed for inclusion. Any disagreements regarding study selection or data extraction were resolved through discussion until consensus was reached. Data from the included studies—such as study design, population characteristics, interventions, outcomes, and main findings—were extracted and recorded using a researcher-designed data extraction form.

## 2-4. Data Synthesis

Given the narrative nature of this review and the heterogeneity of study designs, interventions, and outcomes, data synthesis was performed descriptively. Extracted findings were organized and summarized according to intervention type (auriculotherapy and vitamin supplementation) and main outcome categories (ART outcomes and mental health). The synthesis aimed to provide an integrated overview of the available evidence, highlight strengths and limitations, and identify gaps for future research.

## 2-5. Ethical Considerations

As this study is a narrative review based solely on previously published literature, no human or animal subjects were directly involved, and no personal or sensitive data were collected at any stage. The review process adhered strictly to principles of research integrity, transparency, and academic honesty. All sources of information were properly cited to acknowledge original contributions and avoid plagiarism. Since no new data collection or intervention was conducted, specific institutional ethical approval was not required.

## 3- RESULTS

Recent studies suggest that auriculotherapy and vitamin supplementation can reduce stress and anxiety, improve hormonal and immune profiles, and enhance ART outcomes in infertile women. These interventions have

also been associated with improved ovarian function and psychological well-being, particularly when used in combination. A summary of the most important referenced studies is presented in **Table 1**.

### **3-1. Stress Reduction and Psychological Well-being**

Auriculotherapy has been consistently demonstrated to significantly reduce stress and anxiety in infertile women undergoing ART. Multiple randomized controlled trials and clinical studies report that women receiving auriculotherapy or auricular acupressure showed notably lower stress and anxiety levels compared to controls, particularly before embryo transfer and pregnancy testing (2, 4, 11, 12). This psychological relief is clinically important, as elevated stress negatively impacts hormonal balance, immune function, and ART success rates (1–4).

Mechanistically, auriculotherapy modulates the autonomic nervous system and neuroendocrine pathways, including regulation of neurotransmitters like neuropeptide Y, improved heart rate variability, and blood pressure reduction, contributing to a calmer physiological state (5, 8, 20). Functional MRI studies confirm that auricular stimulation activates brain regions involved in emotional regulation and stress responses (5). Recent trials also indicate auriculotherapy may enhance IVF outcomes alongside psychological benefits (11, 12, 21).

### **3-2. Hormonal Regulation and Immune Modulation**

Several studies indicate that auriculotherapy can beneficially modulate reproductive hormone profiles in women with infertility. Clinical trials have shown that auricular acupuncture and acupressure can reduce elevated follicle-stimulating hormone (FSH) levels while increasing luteinizing hormone (LH) and estradiol,

thereby supporting follicular development and ovulation (22–24). Notably, auriculotherapy has been associated with improved ovarian function in women with oligoamenorrhea and luteal phase insufficiency, with pregnancy rates comparable to those achieved through hormone therapy (23).

In addition to its hormonal effects, auriculotherapy appears to play a role in immune modulation, which is crucial for successful embryo implantation and pregnancy maintenance. Research suggests that auricular stimulation can help balance immune cytokines by increasing anti-inflammatory interleukin-10 (IL-10) and regulating pro-inflammatory interleukin-2 (IL-2), thus promoting maternal-fetal tolerance (10, 25). These hormonal and immunological effects are thought to be mediated through neuroendocrine and neuroimmune pathways influenced by auricular stimulation, highlighting auriculotherapy's potential as a supportive therapy for improving reproductive outcomes in women undergoing ART (5, 9).

### **3-3. ART Outcomes: Clinical Pregnancy, Implantation, and Live Birth Rates**

Accumulating evidence suggests that auriculotherapy may improve assisted reproductive technology (ART) outcomes, including clinical pregnancy and implantation rates. Several clinical trials have demonstrated that auricular acupressure and electroauriculotherapy, especially when combined with herbal medicine or standard ART protocols, can enhance embryo implantation and increase clinical pregnancy rates (4, 11, 12, 21). Additionally, auriculotherapy has been shown to reduce pain and anxiety during oocyte retrieval, which not only improves patient comfort but may also create a more favorable physiological environment for successful embryo implantation (20).

However, improvements in live birth rates remain inconsistent across studies. Some systematic reviews and meta-analyses highlight the heterogeneity of study designs, small sample sizes, and lack of standardized auriculotherapy protocols, underscoring the need for larger, well-designed randomized controlled trials to confirm its efficacy and safety (2, 4).

### **3-4. Vitamin Supplementation**

Vitamin supplementation, particularly with B vitamins, vitamin D, and antioxidants, supports ovarian function, hormonal regulation, and psychological well-being in women undergoing ART. Vitamin D supplementation improves ovarian reserve and endometrial receptivity; studies associate adequate vitamin D levels with higher clinical pregnancy rates and better IVF outcomes (14, 15, 26, 27). Vitamin D also improves clinical, hormonal, and metabolic profiles in women with polycystic ovary syndrome (PCOS), a common infertility cause, potentially enhancing ART outcomes in this subgroup (10, 28). B vitamins, especially folate and B12, are essential for DNA synthesis, methylation, and cellular division, directly impacting oocyte quality and embryo development (16, 27, 29). Antioxidants such as vitamins C and E reduce oxidative stress implicated in poor ovarian response and implantation failure, with supplementation possibly improving ART success (17, 29, 30).

### **3-5. Combined Interventions and Synergistic Effects**

Combining auriculotherapy and vitamin supplementation with standard ART protocols may yield synergistic benefits, resulting in higher pregnancy rates and improved mental health compared to standard treatments alone. Evidence suggests that integrating stress reduction via auriculotherapy with hormonal regulation and immune modulation from

both auriculotherapy and vitamin supplementation creates a more favorable physiological and psychological environment for ART success (2, 6, 10, 28). Clinical trials show auriculotherapy significantly reduces stress in infertile women undergoing ART and associates with improved clinical pregnancy rates (4, 12). Auricular acupressure enhances IVF outcomes, including clinical pregnancy, implantation, and live birth rates, potentially through neurohormonal pathways regulating reproductive function (11). This multimodal approach addresses physiological and psychological fertility barriers, improving ovarian function, immune balance, oxidative stress reduction, and anxiety, collectively contributing to better reproductive outcomes (2, 6, 10, 28).

### **3-6. Individual Variation and Safety**

Both auriculotherapy and vitamin supplementation are generally considered safe interventions, with minimal reported adverse effects. However, individual responses can vary significantly, especially among women with complex hormonal disorders or additional health conditions. For instance, while auriculotherapy has demonstrated efficacy in women with hormonal imbalances such as oligoamenorrhea and luteal insufficiency, its effectiveness appears less pronounced in those with more severe or multifactorial infertility (4, 12, 31). Similarly, the impact of vitamin supplementation depends on each patient's baseline nutritional status, genetic background, and metabolic differences, all of which can influence ART outcomes (28, 32, 33). These findings underscore the importance of personalized treatment approaches and highlight the need for further research to optimize protocols for diverse patient populations, ensuring both efficacy and safety (4, 12, 21, 28, 33).

**Table-1:** Summary of Key Findings on Auriculotherapy and Vitamin Supplementation in Infertile Women Undergoing ART.

Category	Intervention	Effects	Proposed Mechanisms	References
Stress Reduction & Psychological Well-being	Auriculotherapy (ear acupuncture/acupressure)	Significant reduction in stress and anxiety; improved mental health; increased clinical pregnancy and implantation rates	Modulation of autonomic nervous system; regulation of neurotransmitters (e.g., neuropeptide Y); improved HRV; activation of brain regions involved in emotional regulation	(1-5, 8, 11, 12, 20, 21)
Hormonal Regulation & Immune Modulation	Auriculotherapy	Reduced FSH; increased LH and estradiol; improved ovarian function; immune cytokine balance (↑IL-10, regulated IL-2)	Neuroendocrine and neuroimmune pathway regulation; balancing Th1/Th2 cytokine profiles; immune cell activity regulation	(5, 9, 10, 22–25)
ART Outcomes	Auriculotherapy (alone or combined with herbal medicine/ART)	Enhanced embryo implantation and clinical pregnancy rates; reduced pain and anxiety during oocyte retrieval	Enhanced physiological environment for implantation; reduced stress-induced hormonal disruption	(2, 4, 11, 12, 20, 21)
Vitamin Supplementation	Vitamin D, B vitamins (folate, B12), antioxidants (C, E)	Improved ovarian function, hormonal balance, psychological well-being; improved ovarian reserve and endometrial receptivity; reduced oxidative stress	Hormonal regulation; DNA synthesis and methylation; reduction of oxidative stress	(14–17, 26–30)
Combined Interventions	Auriculotherapy + Vitamin Supplementation + ART	Synergistic improvement in pregnancy rates and mental health; improved ovarian function, immune balance, reduced oxidative stress, decreased anxiety	Integration of stress reduction, hormonal regulation, immune modulation; neurohormonal pathways regulating reproduction	(2, 4, 6, 10-12, 28)
Safety and Individual Variation	Auriculotherapy and vitamin supplementation	Generally safe with minimal adverse effects; variable efficacy depending on hormonal/metabolic status	Importance of personalized treatment; need for optimized protocols	(4, 12, 21, 28, 31–33)

**Abbreviations:** ART: Assisted Reproductive Technology; FSH: Follicle-Stimulating Hormone; LH: Luteinizing Hormone; HRV: Heart Rate Variability; IL: Interleukin; Th1/Th2: T helper cell type 1/type 2.

#### 4- DISCUSSION

The aim of this study was to review the existing evidence regarding the effects of auriculotherapy and vitamin supplementation on assisted reproductive technology (ART) outcomes and the mental health of infertile women. Given the high prevalence of infertility and the considerable psychological and physical

stress associated with ART treatments, identifying effective complementary methods to improve both clinical and psychological outcomes is of paramount importance.

Current studies indicate that auriculotherapy significantly reduces stress and anxiety in infertile women undergoing ART. This reduction in stress not only

enhances patients' quality of life but is also associated with increased clinical pregnancy and implantation rates (31, 34). Proposed mechanisms include the regulation of neurotransmitters such as neuropeptide Y and the enhancement of autonomic nervous system function—which lowers heart rate, blood pressure, and cortisol levels—creating a more favorable physiological environment for conception (12, 35). Additionally, functional studies have demonstrated that auricular acupuncture can modulate stress responses in women undergoing ART (36).

From a hormonal perspective, evidence indicates that auriculotherapy can reduce follicle-stimulating hormone (FSH) levels while increasing luteinizing hormone (LH) and estradiol concentrations, thereby creating a hormonal environment favorable for fertilization and implantation (21). Additionally, auriculotherapy has been shown to modulate immune cytokines such as interleukin-2 (IL-2) and interleukin-10 (IL-10), which are critical for promoting maternal-fetal immune tolerance and enhancing implantation success (10, 21). Further research supports the immunomodulatory effects of auricular acupuncture in improving fertility outcomes by balancing Th1/Th2 cytokine profiles and regulating immune cell activity—mechanisms believed to contribute to higher implantation and pregnancy rates in women undergoing ART (31, 37).

Some evidence suggests that auriculotherapy can enhance clinical pregnancy rates, implantation rates, and, in some cases, live birth rates among women undergoing ART (21, 37, 38). Several studies have demonstrated that auricular acupressure and electroauriculotherapy, especially when combined with standard ART protocols or herbal formulas, are associated with improved embryo implantation and higher clinical pregnancy rates (21, 37, 38). Auriculotherapy has also

been shown to reduce pain and anxiety during oocyte retrieval, thereby improving patient comfort and potentially creating a more favorable environment for embryo implantation (39). A randomized controlled trial by Smith et al. (2019) reported that auricular acupressure significantly reduced anxiety and improved patient satisfaction during fertility treatments. Moreover, systematic reviews, such as those by Stener-Victorin et al. (2010), emphasize that acupuncture—including auriculotherapy—may modulate the autonomic nervous system and stress response, potentially enhancing uterine receptivity and implantation rates (40).

However, comprehensive reviews and meta-analyses, including those by Manheimer et al. (2008), highlight that definitive evidence for acupuncture or auriculotherapy's effect on live birth rates is still lacking, and the quality and consistency of primary studies remain variable (31). Recent systematic reviews continue to report inconsistent findings and methodological limitations, underscoring the need for more rigorous research to clarify the true impact of auriculotherapy on ART outcomes (41, 42).

Vitamin supplementation, particularly with vitamin D, B vitamins, and antioxidants, plays a crucial role in supporting ovarian function, hormonal balance, and psychological well-being—factors important for enhancing ART success. Recent evidence indicates that vitamin D supplementation improves ovarian reserve and endometrial receptivity, which are associated with higher clinical pregnancy and live birth rates in ART cycles (14, 15, 26, 27). Notably, vitamin D supplementation has shown particular benefits in women with polycystic ovary syndrome (PCOS), a common endocrine disorder linked to infertility. In this population, supplementation improves

clinical, hormonal, and metabolic profiles, potentially enhancing ART outcomes (28). B vitamins, especially folate and vitamin B12, are essential for DNA synthesis and methylation processes that influence oocyte quality and embryo development, contributing to improved fertility outcomes (16, 29). Additionally, antioxidants such as vitamins C and E reduce oxidative stress, a known contributor to poor ovarian response and implantation failure, further supporting reproductive success (17, 30). Collectively, these micronutrients create a more favorable physiological and biochemical environment for conception and pregnancy maintenance in women undergoing ART.

Combining auriculotherapy and vitamin supplementation with standard ART protocols appears to offer synergistic benefits, leading to higher pregnancy rates and improved mental health outcomes compared to standard treatments alone. This integrative approach addresses multiple factors critical to fertility by simultaneously reducing psychological stress, regulating hormonal balance, and modulating immune function. By targeting both physiological and psychological barriers to conception, such combined interventions may enhance the overall effectiveness of ART and improve patient well-being during treatment (10, 15, 28, 31).

Despite encouraging results, individual responses to auriculotherapy and vitamin supplementation can vary substantially. Women with complex hormonal disorders, such as PCOS, or additional health conditions may experience less benefit from these interventions (5, 28, 43, 44). Similarly, the effectiveness of vitamin supplementation is influenced by each patient's baseline nutritional status and metabolic profile, which can impact ART outcomes (28, 45). These observations underscore the importance of personalized treatment strategies and highlight the need

for further research to optimize and tailor protocols for diverse patient populations (5, 12, 21, 28, 34).

#### **4-1. Study Limitation**

Despite encouraging findings, the overall quality of evidence in this field remains inconsistent. Many primary studies are limited by methodological issues, including small sample sizes, lack of blinding, and non-standardized intervention protocols, which can compromise the reliability and generalizability of results (2, 28). Even systematic reviews and meta-analyses report substantial heterogeneity in study populations, intervention designs, and outcome measures, making it difficult to draw definitive conclusions or recommendations (2, 14). Therefore, there is a clear need for well-designed, large-scale randomized controlled trials and more rigorous systematic reviews to confirm the efficacy of auriculotherapy and vitamin supplementation in ART and to establish standardized clinical guidelines.

#### **5- CONCLUSION**

Auriculotherapy and vitamin supplementation show promise as supportive therapies for infertile women undergoing assisted reproductive technologies (ART). Auriculotherapy has consistently demonstrated significant benefits in reducing stress and anxiety, factors known to negatively impact ART outcomes, and may also improve hormonal balance and immune function. These effects contribute to a more favorable environment for conception and embryo implantation. Vitamin supplementation, particularly with B vitamins, vitamin D, and antioxidants, further supports ovarian function, hormonal regulation, and psychological well-being, potentially enhancing ART success rates. Evidence suggests that combining auriculotherapy

and vitamin supplementation with standard ART protocols may yield synergistic benefits, improving both pregnancy rates and mental health outcomes. Both interventions are generally safe, though individual responses can vary, especially in women with complex hormonal or metabolic conditions. While current findings are encouraging, variability in study quality and outcomes highlights the need for personalized treatment approaches and further high-quality research to confirm these benefits and develop standardized protocols.

**6- CONFLICT OF INTEREST:** None.

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