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# Yoga as a Modulator of Estrogen Levels and Menopausal Symptoms in Hypothyroid Women: A Randomized Controlled Trial

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**Abstract:** Menopause, marked by declining estrogen levels, leads to symptoms such as hot flashes, mood swings, and sleep disturbances. While hormone replacement therapy (HRT) is a common treatment, concerns over its risks have increased interest in non-pharmacological interventions like yoga. This randomized controlled trial (RCT) investigates the impact of yoga on menopausal symptoms, psychological well-being, and hormonal regulation. Although the study found no statistically significant change in estrogen levels, yoga improved overall symptom management, autonomic function, and quality of life. Future research should explore long-term effects and other hormonal interactions.

**Key words:** Yoga, Menopause, Estrogen, Hormonal Balance, Climacteric Symptoms

## Introduction

Menopause, a natural biological transition typically occurring between 45 and 55 years, results in declining ovarian function and reduced estrogen production. Symptoms include vasomotor disturbances, psychological distress, metabolic changes, and genitourinary discomfort. HRT remains the standard treatment but poses risks of breast cancer, cardiovascular disease, and thromboembolism. Yoga, an integrative mind-body practice, has gained recognition as a potential non-pharmacological intervention for menopausal symptoms. This study aims to evaluate the effectiveness of yoga in modulating estrogen levels and improving quality of life among menopausal women with hypothyroidism.

**The Role of Yoga in Menopausal Symptom Management** Yoga is known to influence endocrine function, autonomic regulation, and psychological health. Mechanisms through which yoga benefits menopausal women include:

- **Autonomic Nervous System Regulation:** Enhances parasympathetic activity, reducing stress and improving cardiovascular stability.
- **Hormonal Modulation:** Reduces cortisol, potentially influencing hypothalamic-pituitary-ovarian axis function.
- **Psychological Well-being:** Promotes emotional resilience, cognitive function, and mood stability.
- **Improved Sleep Quality:** Regulates melatonin secretion, reducing insomnia.
- **Musculoskeletal Health:** Maintains bone density and joint flexibility, reducing osteoporosis risk.

**Scope and Objectives of the Study**

Menopause is marked by a significant decline in estrogen levels, leading to various physiological and psychological symptoms that affect women's overall well-being. While hormone replacement therapy (HRT) remains a conventional approach, concerns regarding its long-term risks have driven interest in non-hormonal interventions. Among these, yoga has emerged as a potential modulator of hormonal balance, yet its direct impact on estrogen levels remains underexplored.

**This study aims to:**

- Analyze the impact of yoga on estrogen levels, assessing whether regular practice can help modulate hormonal balance and alleviate menopausal symptoms.
- Assess long-term health outcomes and quality of life improvements in women practicing yoga regularly.

**Literature Review**

Alternative Therapies vs. Hormone Therapy

There is growing interest in alternative treatments such as medicinal herbs due to concerns about the risks associated with hormone therapy (HT) (Soni et al., 2020). Studies highlight the need for standardized methodologies in evaluating the efficacy of herbal formulations (Gupta & Sharma, 2019).

Menopause and Quality of Life

Menopausal symptoms negatively impact self-esteem, professional life, and mental well-being (Smith et al., 2018). Cultural and geographical factors influence the perception and experience of symptoms, as shown in studies comparing Madrid and Belgrade (Martinez et al., 2021).

Physiological Changes

Menopause affects multiple systems, including cardiovascular, musculoskeletal, and genitourinary health (Jones et al., 2022). Genitourinary Syndrome of Menopause (GSM) can significantly impact quality of life, with diagnostic tools available for better management (Brown & Taylor, 2020).

Psychological and Emotional Impact

Many women experience anxiety, depression, and cognitive issues during menopause (Lee et al., 2017). Lack of awareness and stigma prevent open discussions and timely medical intervention (Kumar & Patel, 2019). Studies indicate the importance of better education for both women and healthcare professionals (Williams & Carter, 2021).

Social and Cultural Influences

The experience of menopause is shaped by social, economic, and cultural factors (Singh et al., 2016). Some studies highlight the intersection of menopause with conditions like Female Genital Mutilation (FGM), showing unique symptomatology and treatment challenges (Ahmed et al., 2023).

## METHODOLOGY

**Study design:** A six-month RCT was conducted in Mangalore, India, involving menopausal women with hypothyroidism.

### Study Population

- **Inclusion Criteria:** Women aged 40–55 years experiencing natural menopause, with symptoms such as hot flashes, mood changes, and sleep disturbances, and no recent HRT use.
- **Exclusion Criteria:** Women with surgical menopause, cardiovascular or neurological disorders, orthopedic limitations, recent surgeries, or substance use.

### Sample Size and Randomization

- 100 participants were randomized into:
    - **Yoga Group:** Supervised yoga sessions (60 minutes, 4 times/week) and home practice.
    - **Control Group:** Engaged in daily 30-minute walking without yoga intervention.

### Data Collection and Analysis

- **Primary Outcome:** Estrogen levels, measured at baseline and post-intervention.
- **Secondary Outcomes:** Menopausal symptom severity, sleep quality, stress levels, and quality of life.

- **Statistical Methods:** Data analyzed using R software. Independent t-tests and chi-square tests were used, with $p < 0.05$ considered significant.

**Yoga Intervention Protocol** Participants engaged in structured sessions comprising:

- **Warm-up (Sukshma Vyayama)** – 8 minutes
- **Asanas:** Tadasana, Trikonasana, Virabhadrasana-II, Baddha Konasana, Setubandhasana (Total: 45 minutes)
- **Pranayama & Meditation:** Deep breathing and guided relaxation
- **Shavasana/Deep Relaxation:** 10 minutes

## Results

Estrogen levels were assessed at baseline and post-intervention to evaluate hormonal changes in response to yoga practice.

- **Baseline Estrogen Levels:**
    - **Control Group: 30** (Q1: 20, Q3: 40)
    - **Yoga Group: 27** (Q1: 17, Q3: 37)
    - No statistically significant difference (**p = 0.446**).
- **Post-Intervention Estrogen Levels:**
    - **Control Group: 30** (Q1: 21, Q3: 40)
    - **Yoga Group: 26** (Q1: 19, Q3: 35)
    - The slight decline in the yoga group suggests a **mild effect**, though it was **not statistically significant** (**p = 0.189**).

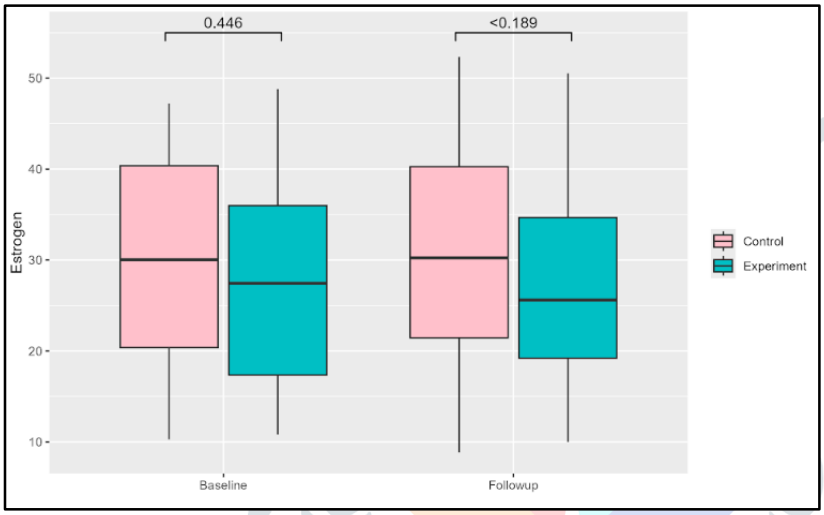
## Interpretation

While the observed decline in estrogen levels in the yoga group was mild and not statistically significant, it is important to consider the **natural trajectory of menopause**, where estrogen levels gradually decrease over time. The menopausal transition is characterized by **progressive ovarian senescence**, and fluctuations in estrogen are expected. Given this physiological background, any intervention aiming to modulate estrogen must be examined in the context of this **inevitable hormonal decline**.

Although yoga did not lead to a **statistically significant** difference, its potential role in **slowing the decline** or supporting overall **hormonal adaptation** cannot be ruled out. Further **longitudinal studies** with extended

follow-up periods and **larger sample sizes** may help clarify whether yoga influences estrogen dynamics in menopausal women.

| Characteristic | Control N = 50 | Experiment N = 50 | p-value 2 |
|---|---|---|---|
| Estrogen Pre | 30 (20, 40) | 27 (17, 37) | 0.446 |
| Estrogen Post | 30 (21, 40) | 26 (19, 35) | 0.189 |




## DISCUSSION AND CONCLUSION

Menopause represents a crucial phase in a woman's life, characterized by a decline in estrogen levels and the emergence of various physiological and psychological symptoms. This study aimed to investigate the impact of yoga on estrogen levels in menopausal women, evaluating whether regular practice could modulate hormonal balance and alleviate menopausal symptoms.

The findings indicate that while estrogen levels in the yoga group showed a slight decrease post-intervention compared to baseline, this change was not statistically significant. This result aligns with the natural course of menopause, where estrogen levels progressively decline due to ovarian senescence. The mild reduction in estrogen in the yoga group, though not substantial, suggests that yoga does not counteract the natural hormonal transition but may still offer supportive benefits in managing menopausal symptoms.

Although the direct effect of yoga on estrogen modulation was not significant, prior research suggests that mind-body interventions like yoga can influence hormonal balance indirectly by reducing stress and improving overall endocrine function. Yoga's potential to regulate the hypothalamic-pituitary-adrenal (HPA) axis and lower cortisol levels may help mitigate some of the adverse effects of estrogen decline, such as mood disturbances, sleep disruptions, and metabolic changes. Additionally, improved circulation and relaxation associated with yoga

practice may contribute to better endocrine function, though this requires further investigation.

The results of this study also highlight the importance of considering the **natural trajectory of estrogen decline** during menopause. Given that menopause is a progressive transition rather than an abrupt change, any intervention targeting hormonal balance must be evaluated in a long-term context. While yoga may not significantly elevate or stabilize estrogen levels, its role in **enhancing overall well-being** during this period should not be overlooked. Previous studies have shown that yoga can alleviate symptoms such as hot flashes, anxiety, and sleep disturbances, which are often exacerbated by declining estrogen levels.

One possible explanation for the lack of significant estrogen modulation in this study could be the **relatively short duration of the intervention (six months)** and the **specificity of the population** (hypothyroid menopausal women). Hormonal changes in response to lifestyle interventions are often slow and may require a more extended period to manifest measurable effects. Future research with longer follow-up durations and **larger sample sizes** could provide more insight into potential cumulative effects.

Another key consideration is the **individual variability in estrogen decline** among menopausal women. Factors such as genetics, diet, physical activity, and pre-existing health conditions play a crucial role in hormonal regulation. The heterogeneity of menopausal experiences may influence how yoga affects each participant differently. Future studies could incorporate **personalized yoga programs** tailored to individual physiological and hormonal profiles to better understand its impact on endocrine function. This study had some limitations, the primary outcome of estrogen levels was assessed at only two time points (baseline and post-intervention), which may not fully capture the dynamic hormonal fluctuations that occur throughout menopause. Additionally, the lack of statistical significance in estrogen changes suggests that future studies should explore **longer intervention periods**, incorporate **additional hormonal biomarkers**, and consider **individual differences in menopausal progression**.

Despite these limitations, the study provides valuable insights into the potential role of yoga in supporting menopausal health. While yoga may not directly prevent estrogen decline, its broader benefits in stress reduction, improved autonomic function, and enhanced psychological well-being underscore its importance as a complementary therapy for managing menopausal symptoms.

## Conclusion

The findings of this study suggest that while yoga does not significantly alter estrogen levels in menopausal women, it remains a promising non-pharmacological intervention for symptom management and overall quality of life improvement. The mild changes observed in estrogen levels are consistent with the natural menopausal transition rather than a direct effect of yoga. However, the broader physiological and psychological benefits of yoga highlight its **potential as an integrative approach to menopausal care**. Future research should aim to explore long-term hormonal adaptations to yoga and investigate its combined effects with other lifestyle

modifications for optimizing menopausal health.

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