

Impact of Flaxseed Supplementation on Thyroid Function, Reproductive Hormones and Kidney Health in Women with Hypothyroidism

Flaxseed
Supplementation
on Thyroid
Function

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ABSTRACT

Objective: To determine the extent of thyroid, reproductive, and renal functions in hypothyroid women after consuming supplements of flaxseeds.

Study Design: Experimental study

Place and Duration of Study: This study was conducted at the Endocrinology and Oncology Center in Thi-qar from 1st April 2024 to 31st January 2025.

Methods: 41 women aged 30-55 were enrolled. They were divided in 4 groups: healthy women without supplements group, hypothyroid women without supplements group, hypothyroid women where flaxseed was added to medication group and healthy woman who consumed only flaxseed group. The duration was 5 weeks, 1 week acclimatization period to the new diet and 4 weeks of daily flaxseed consumption, with a stepwise increase of the flaxseed dosage to a fixed endpoint.

Results: The hypothyroid patients showed a prevalence of thyroid stimulating hormone, blood urea nitrogen, creatinine, and dysfunction of some reproductive hormones. Some renal parameters were evidenced to have decreased to normal values, follicle-stimulating hormone, luteinizing hormone, estrogen, and testosterone were all restored, TSH was normal and flaxseed caused an elevation of T3. The healthy women's parameters were all normal. It is plausible that a positive effect was brought about by the omega-3 fatty acid which assists the conversion of T4 to T3, the antioxidant boosting effect of the lignans and the support of the gut microbiome.

Conclusion: Flaxseed could help reclaim these issues and restore hormones to a more healthy balance. Nevertheless, additional participants, larger samples, and extended studies are necessary to determine the efficacy of the treatment and assess the optimum dosage that can be administered alongside conventional thyroid medication.

Key Words: Creatinine, Estradiol, Flaxseed, Hypothyroidism, Levothyroxine

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INTRODUCTION

When the thyroid is underactive (produces low amount of hormones), it disrupts the normal metabolic processes that happen throughout the body.

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This condition is called hypothyroidism, and it happens to be a fairly common condition in the endocrine system. It happens to about 1 in 300 Americans¹ and affects more women and older people than men. Still the best way to restore hormonal balance and keep your metabolism steady is Levothyroxine, a synthetic version of T4.² More women than men are diagnosed with hypothyroidism in Iraq. In Basra, about 83% of the diagnosed hypothyroidism cases were women. In the Thi-qar Governorate, the results indicate that a little more than 80% of the diagnosed hypothyroidism cases were women.^{3,4} The increased likelihood of developing hypothyroidism is due to the rapid hormonal changes that occur during and after pregnancy, as well as after menopause.⁵ It is essential that we implement better early screening procedures in women to allow quick and efficient diagnosis to avoid negative consequences. More and more people are turning away from traditional treatments and instead using functional foods and medicinal plants to improve their hormonal and metabolic health.⁶⁻⁸

Flaxseed (*Linum usitatissimum* L.) has many good things in it, including omega-3 fatty acid alpha-linolenic acid (ALA) and SDG lignans. The first two are turned into antioxidants in the stomach, but they don't do anything to estrogen. But these last two do help lower inflammation.⁹⁻¹¹ The components, which include phenolic acids, tocopherols, and important minerals, as well as the high fiber content (28-40%)¹²⁻¹⁴, help with digestion, blood sugar control, lipid metabolism, lowering inflammation, and safely improving lipid profiles. Prior research has demonstrated that the phytoestrogenic characteristics of flaxseed may enhance cardiovascular health, lower triglyceride and cholesterol concentrations, and alter reproductive hormones.^{15,16} These advantages indicate that flaxseed may be beneficial for women with hypothyroidism. More research is needed, though, to find out how they affect kidney function and hormones that control reproduction.

The purpose is to examine the impact of 30 days of flaxseed consumption on thyroid function, kidney markers, and reproductive hormones in hypothyroid women, compared with hypothyroid women not receiving the supplement and a group of healthy women.

METHODS

This experimental study was conducted at Endocrinology and Oncology Center in Thi-qar from 1st April 2024 to 31st January 2025 vide letter No. 21772/Approval/SKDFD dated 11th March 2024. Forty-one adult women aged 30-55 were enrolled. Based on their health and the dietary intervention, the participants were arranged into four groups: Control group consisted of twelve healthy women without any medical issues. Hypothyroid group: consisted of eleven women diagnosed with hypothyroidism.

Hypothyroid-flaxseed group: Ten women with hypothyroidism who took flaxseed powder in larger and larger amounts, up to 7 grams per day.

Healthy-flaxseed group: Eight women who did not have thyroid problems made up and took flaxseed at the same times as the hypothyroid-flaxseed group.

To safely and effectively evaluate the effects of flaxseed on thyroid function, it was administered gradually to mitigate the risk of gastrointestinal adverse effects, including bloating and diarrhea, and to observe for possible interactions with levothyroxine.^{17,18} The hypothyroid and hypothyroid-flaxseed groups commenced the trial on an identical stable dosage of levothyroxine, which was maintained consistently throughout the study. Participants were excluded if they had chronic endocrine, renal, or cardiac disease; were pregnant or lactating; were taking medications that could affect thyroid function or lipid metabolism (excluding levothyroxine); or were unable to adhere to the prescribed flaxseed regimen.

Dietary supplementation and intervention protocol:

The strategy for flaxseed supplementation were to take it for 30 days, then slowly stop taking it over the course of a week. Drinking milk or juice with freshly ground flaxseed at least 1.5 hours after taking levothyroxine helped keep the body from absorbing it. Starting with a dose of 2.6 grams, it increased to 7 grams by the 7th day, remaining at that level for all three doses. This process will be designed to minimize negative effects from the seeds while retaining positive effects such as lignans and omega-3 fatty acids, due to the slow introduction to the digestive system. The dose of flaxseed treatment is shown in Table 1.

Biochemical Assessments: Everyone's blood was drawn and analyzed for biochemical markers per the protocol after the 30 day intervention. Blood was drawn following an overnight fast. Thyroid function tests were done and blood levels of TSH, T3, and T4 were analyzed. For the evaluation of renal function blood urea and creatinine levels were assessed. In addition, the reproductive hormones were analyzed, including estrogen, testosterone, FSH, and LH. The assessments were made at the Biochemistry and Physiology Labs of the College of Pharmacy, University of Thi-qar. The results were kept reliable done by the use of internal quality control measures and commercial testing kits. The data was analyzed through SPSS-25. The t-test and analysis of variance (ANOVA) were applied. $P < 0.05$ is considered significant.

RESULTS

The hypothyroid group has higher TSH and significantly lower T3 and T4 compared to control ($P < 0.05$). In hypothyroid women, T3 levels increased and TSH levels decreased in flaxseed consuming group less than those observed. With healthy women, Flaxseed consumed did not disturb the thyroid hormones balance, indicating a modulatory effect and not an adverse effect (Table 2).

Table No. 1: A titrated flaxseed dosage protocol for complementary therapeutic use

Time (day)	Total daily intake (g)	Average amount per Meal (3 meals/day)
Initial	2.6 g	0.87 g
2	3.6 g	1.2 g
3	4.6 g	1.53 g
4	5.1 g	1.7 g
5	6.1 g	2.03 g
6	6.6 g	2.2 g
7+	7.0 g (stable intake dose)	2.33 g

Hypothyroid women showed considerable alterations in levels of reproductive hormones after taking flaxseed supplements. In comparison to the healthy control group, the hypothyroid group had higher levels of FSH

and LH, lower levels of estradiol and higher levels of testosterone ($P<0.05$). In contrast, hypothyroid women consuming flaxseed had levels of FSH and LH which were lower, levels of estradiol which were higher, and levels of testosterone which were lower, to levels seen in normal healthy individuals ($P<0.05$). In healthy women, flaxseed had no significant influence on the levels of gonadotropins, but it did maintain estradiol levels in the normal range, indicating a potential stabilizing effect on this particular hormone. Flaxseed helped to resolve some reproductive hormone imbalances caused by hypothyroidism (Table 3)

There were significant differences in the renal function indices between study groups. Hypothyroidism involves renal function impairment which is shown by the increased BUN and creatinine levels in hypothyroid patients compared to the controls ($P<0.05$). In women with hypothyroidism, BUN and creatinine levels were considerably lower due to flaxseed supplementation compared to levels seen in healthy individuals ($P<0.05$). Flaxseed seems to be protective on the renal markers of healthy women by the absence of any negative effects and the maintenance of all values within the normal physiological ranges after the consumption of flaxseed (Table 4).

Table No. 2: Thyroid hormone modulation for study groups

Study groups	TSH (mU/L)	T3 (nmol/L)	T4 (nmol/L)
Control group (n=12)	1.62±0.34 ^a	2.01±0.26 ^b	109.42±10.36 ^c
Healthy-flaxseed group (n=11)	2.93±0.51 ^c	1.73±0.27 ^b	95.53±15.11 ^b
Hypothyroid group (n=8)	3.11±0.57 ^c	0.96±0.15 ^a	79.29±12.97 ^a
Hypothyroid-flaxseed group (n=10)	2.52±0.48 ^b	2.42±0.37 ^c	97.98±15.10 ^b

Statistically significant variations ($p<0.05$) found when distinct superscript letters (a, b, c) are present within a row

Table No. 3: Reproductive hormone level across study groups

Study Groups	FSH (ng/mL)	LH (ng/mL)	Estradiol (pg/mL)	Testosterone (ng/mL)
Control group (n=12)	9.6±1.8 ^a	4.9±1.01 ^a	72.4±8.2 ^c	22.4±2.8 ^a
Healthy-flaxseed group (n=11)	9.2±2.01 ^a	4.7±1.1 ^a	74.1±7.6 ^c	25.9±3.1 ^b
Hypothyroid group (n=8)	14.8±2.1 ^c	7.2±1.4 ^c	46.3±6.1 ^a	36.8±3.4 ^c
Hypothyroid-flaxseed group (n=10)	11.9±2.4 ^b	5.8±1.2 ^b	63.5±7.3 ^b	27.4±3.5 ^b

Statistically significant variations ($p<0.05$) exist when distinct superscript letters (a, b, c) are present within a row

Table No. 4: Renal function indicators across study groups

Parameter	Control group (n=12)	Healthy-flaxseed group (n=11)	Hypothyroid group (n=8)	Hypothyroid-flaxseed group (n=10)
BUN (mg/dL)	16.8±1.1 ^a	18.9±1.3 ^a	27.4±1.2 ^c	21.6±1.4 ^b
Creatinine (mg/dL)	0.75±0.08 ^a	0.71±0.06 ^a	0.92±0.10 ^b	0.68±0.07 ^a

Statistically significant variations ($p<0.05$) found when distinct superscript letters (a, b, c) are existing within a row

DISCUSSION

This study investigated the effects of hypothyroidism and flaxseed supplementation on thyroid and reproductive hormones, as well as kidney function in women. Hypothyroidism in females was associated with disturbances in thyroid, reproductive, and renal functions. Signs of impaired endocrine and ovarian function included low T3 and T4 levels, elevated testosterone, reduced estradiol and increased FSH and LH, along with other reproductive hormone irregularities.^{19,20}

A lack of thyroid hormone is linked to less blood flow to the kidneys and less glomerular filtration. This is backed up by the higher kidney markers.²¹ Adding flaxseed to the diet helped fix these problems: T3 levels went up, TSH levels got better, and reproductive hormones got back to normal levels. This improvement is probably because omega-3 helps the body turn T4 into T3, lignan helps receptors become more sensitive,

antioxidants work, and the gut bacteria helps hormones break down.^{22,23} The lowered BUN and creatinine levels show the renal protection attributed to the microcirculation and glomerular function enhancing effects of ALA and the antioxidant activity of SDG.²⁴ The results also show that flaxseed kept all the hormone and kidney markers in healthy women within the normal range, indicating that it kept the regulatory system intact and it did no harm to the women. These results support the idea that flaxseed could be a useful addition to a diet for improving the balance of hormones and kidneys, especially in women with hypothyroidism.

CONCLUSION

Flaxseed supplements assisted women with hypothyroidism improve their thyroid, reproductive, and kidney functioning by bringing hormone and renal indicators back to normal levels. It was safe and helped

healthy women stay stable because it kept all of their levels in the usual range. These results indicate that flaxseed may serve as an effective adjunctive technique for aiding hypothyroid women in sustaining healthy endocrine and renal systems.

Author's Contribution:

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Drafting or Revising Critically:	Amal H. Anatheil, Wafa S. Abdulredha
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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