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Effect of acupuncture on primary hypothyroidism and irregular menstruation in infertile women: a randomised controlled study

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Abstract

Introduction. This study aimed to examine the impact of acupuncture and a low-caloric diet on primary hypothyroidism and irregular menstruation in infertile women.

Methods. Sixty infertile women participated in the trial. All women were diagnosed with hypothyroidism, polycystic ovarian syndrome (PCOS), and oligomenorrhea. They were between the ages of 20 and 35, with a BMI between 30 and 34.9 kg/m^2. They were divided at random into two equal groups. For four months, a control group was given thyroxine tablets once daily with a low-calorie diet (1200 kcal/day). The study group was given the same treatment and acupuncture sessions, twice a week for four months. BMI, waist, waist-to-stature ratio (WSR), free thyroxine (FT4), thyroid-stimulating hormone (TSH), luteinising hormone (LH), follicle-stimulating hormone (FSH), LH/FSH ratio, menstrual cycle period, and a health-related quality-of-life questionnaire (PCOSQ) were evaluated for all patients.

Results. There was a significant reduction in waist circumference, WSR, BMI, LH, LH/FSH ratio, TSH, and menstrual cycle period in both groups ($p < 0.05$) and a significant increase ($p < 0.05$) in FT4 and PCOSQ scores. Also, there was a significant increase in FSH in the study group. Compared to the control group, the study group revealed a significant reduction ($p < 0.05$) in waist circumference, WSR, LH, TSH, LH/FSH ratio, menstrual cycle period, and a significant increase in PCOSQ scores and FSH.

Conclusions. Adding acupuncture to a low-caloric diet and medical treatment has an effective role in decreasing abdominal adiposity and improving the hormonal profile and menstrual cycle, which in turn improves reproductive health in infertile women with hypothyroidism.

Key words: hypothyroidism, infertile women, acupuncture, low-caloric diet

Introduction

Primary hypothyroidism is a common endocrine condition characterised by inadequate thyroid hormone production [1]. Hypothyroidism impacts 2–4% of reproductive-age women, which has been linked to infertility and frequent miscarriages [2]. Lack of thyroid secretion makes the basal metabolic rate decrease to 40% below normal [3]. It also affects the menstrual cycle, reproductive system, metabolism, body weight, appetite, body temperature, respiration, activity, and sleep [4].

Hypothyroidism has serious consequences for a woman's reproductive health, including her menstrual cycle, fertility, and estrogen, as well as androgen metabolism. It may result in infertility, anovulatory cycles, miscarriages, delayed anovulatory cycles, and a delayed onset of puberty [5]. Metabolic dysfunction is the root cause of many health issues, including difficulties during pregnancy, metabolic disorders, and elevated risk factors for cardiovascular diseases [6]. Menstrual irregularities are more common in hypothyroid women than euthyroid women, with incidence rates between 25% to 60%. Women with hypothyroidism typically suffer from oligomenorrhea [7]. One of the most prevalent diverse endocrine illnesses is polycystic ovarian syndrome (PCOS), in which hirsutism, oligo-amenorrhea (rare or little menstruation), as well as infertility, are the defining clinical characteristics [8].

PCOS women are 5–10% more likely to have hypothyroidism [9]. In primary hypothyroidism, an increase in thyrotropin-releasing hormone (TRH) causes an increase in prolactin as well as thyroid-stimulating hormone (TSH). Prolactin inhibits ovulation because of a change in the levels of FSH and LH, in addition to an increase in dehydroepiandrosterone from the adrenal gland, which contributes to polycystic ovarian morphology. FSH receptors are affected by elevated TSH. It has also been proposed that hypothyroidism causes an increase in the deposition of collagen in the ovaries, which results in the polycystic morphology of the ovaries depending on the severity and duration of hypothyroidism [10].

Common causes of infertility include thyroid dysfunction, which is easily treated by restoring healthy hormone levels in the thyroid gland. It has been suggested that if elevated prolactin levels are accompanied by elevated TSH, hypothyroidism should be treated first before any other potential causes of hyperprolactinemia are considered [11].

Established hypothyroidism is treated with hormone therapy using thyroxine. In addition to improving fertility, it also regulates the menstrual cycle and prolactin levels. Therefore, following 6 weeks to 1 year of medication, 76.6% of infertile women having hypothyroidism conceived with simple oral treatment [11]. More modalities need to be investigated to determine their effectiveness in improving outcomes in reproductive women with hypothyroidism and irregular menstruation.

Numerous research studies have looked at how losing weight affects the thyroid. Serum T3 concentrations have been shown to drop in lean and normal-weight people who follow a calorie-restricted diet [12]. Furthermore, both TSH and

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T3 levels in obese people were found to be lower after weight loss [13–15].

The World Health Organization (WHO) recommends acupuncture as a successful modality to treat more than forty medical conditions and to enhance endocrine function and general health [16]. It has been reported that acupuncture can be used to treat hypothyroidism by regulating energy levels and restoring hormonal balance [17]. The TSH levels of women with subclinical hypothyroidism have balanced after receiving acupuncture, and their overall quality of life (QoL) has improved [18]. Acupuncture's effectiveness on PCOS patients has been the subject of numerous studies; however, a recent systematic review has reported that there is not enough data to recommend acupuncture for PCOS-related ovulation problems [19]. To the authors' knowledge, there is little knowledge of the influence of acupuncture on the anthropometric measurements as well as hormonal profile in infertile women with hypothyroidism.

Therefore, this research was carried out to examine the impact of acupuncture on thyroid hormones, reproductive hormones, period of menstruation, as well as health-related QoL (HRQoL) among infertile women having PCOS. It was hypothesised that acupuncture would improve the hormone profiles, menstruation, and HRQoL in infertile women with primary hypothyroidism.

Subjects and methods

Participants

A randomised controlled pre-post design was performed. Sixty hypothyroid infertile women took part in the research. Participants were chosen from the Out Clinic at the National Nutritional Institute. Female participants ranged in age from 20 to 35 years with a BMI between 30 to 34.9 kg/m^2. All women were diagnosed with primary hypothyroidism; their TSH was > 4.0 mu/L and free tetraiodothyronine (FT4) was < 0.8 ng/dL. Also, they experienced oligomenorrhea (menstrual periods more than 35 days) and PCOS, which was confirmed by the presence of antral follicular excess on ultrasonography with > 12 follicles between 2–9 mm for each ovary and/or an ovarian volume greater than 10 ml according to the Rotterdam consensus (2003) and an androgen excess as determined by the PCOS society (2006) [20]. Also, their luteinising/follicular stimulating hormone (LH/FSH) ratio was above 1 and after at least one year of regular, unprotected sexual intercourse, no females became pregnant.

Women were excluded if they had a history of previous neurological disorders, previous thyroidectomy, surgical removal of the uterus, and presence of haemorrhage, carcinoma, metal implants, endometriosis, uterine fibroids, primary ovary insufficiency, fallopian tube damage or blockage, pelvic adhesion, autoimmune disorders, implantation failure, and infections, or currently using immune suppressant drugs.

Randomisation

Sample size calculation was performed using an epi calculator (12) with a two-sided significance level (1-alpha) = 95, power (1-beta, % chance of detecting) = 80, a ratio of sample size, unexposed/exposed = 1, percent of unexposed with outcome = 5, odds ratio = 9, risk/prevalence ratio = 6.4, and a risk/prevalence difference = 27. This gave a total sample size of 60. A total of 79 patients were enrolled, taking into account a 20% drop rate. Nineteen patients were excluded from this study; two did not meet inclusion criteria, two refused to participate, and 15 did not complete the treatment because of personal reasons resulting in 60 patients completing the study (Figure 1).

Randomisation was carried out for a single-blinded randomised clinical trial (1:1). A random project was done via computer-generated chance numbers. The randomised portion succession, enrolling participants, and allocating them to interventions was conducted by a researcher. Sixty infertile women were assigned randomly to the control or acupuncture groups. The control group were given thyroxine tablets once daily and a low-caloric diet (1200 kcal) throughout a period of four months. However, the acupuncture group

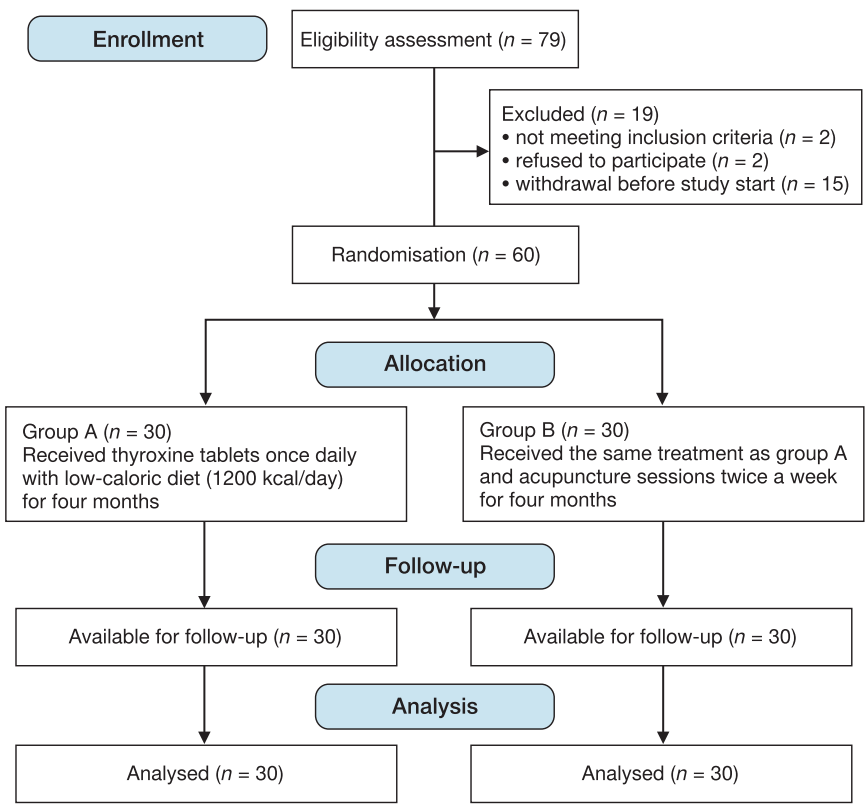

Figure 1. Flowchart for participant recruitment and allocation

was given a similar diet regime as well as acupuncture sessions twice a week throughout a period of four months. At the beginning of this trial, each participant provided written consent. Each patient was instructed about the assessment and treatment procedures to gain their cooperation during the treatment. All evaluations were conducted at the beginning and end of the treatment. The study lasted from August 2020 to February 2023.

Assessment

Anthropometric measurements

Height and weight were measured for each patient. The BMI was computed by dividing weight by the square of their height: BMI = weight/height square (kg/m^2).

At the level of the waistline, the waist circumference has been measured using a measuring tape.

Also, the waist-to-stature ratio (WSR) was determined by dividing the patient's waist circumference by their height; both were measured in the same units (cm). WSR was used as an indicator of obesity-associated cardiovascular disease. It is a measurement of body fat distribution and thus is associated with abdominal obesity [21].

Assessment of thyroid and reproductive hormone

At 9 a.m., 3 cm^3 of venous blood was withdrawn from each female. Samples were kept in an icebox until analysis [22]. The testing procedures for TSH, FT4, FSH, and LH were conducted using enzyme-linked immunosorbent analysis (ELISA). A minimum of one antibody with a particular antigen-specificity was used in ELISA. A matching antibody ELISA kit (LH, FSH, T4, or TSH ELISA) was linked with the sample's antigen. An enzyme and the antibody were connected. The final step was adding a material that contained the enzyme's substrate. The ensuing reaction created a discernible signal that was used to measure the hormone content within the serum [23].

Assessment of HRQoL

The polycystic ovarian syndrome questionnaire (PCOSQ) was used to assess HRQoL. The PCOSQ is a valid instrument for measuring the HRQoL of females with PCOS [24]. Twenty-six questions on health and health-related topics were included in the survey, including ones about emotions, body hair, weight, infertility troubles, as well as menstrual irregularities. There were seven grading statements to rate each question. The maximum impairment was represented by choice 1, while the minimum impairment was represented by option 7. A thorough explanation of the questionnaire and an appropriate window of time to record the answers were given to each patient. Each question required the patient to tick the box next to the rating that best described how they felt [25].

Intervention

Medical treatment

Each woman received thyroxine tablets (levothyroxine dosed based on body weight) once per day, which was prescribed by their physician. Levothyroxine was usually taken 30–60 min before breakfast because calcium and food can inhibit the absorption of levothyroxine [26].

Low-caloric diet

Each patient in both groups followed a low-caloric diet regime consisting of 1200 kcal/day throughout a period of four months. Every participant in the trial was given a detailed description of the low-calorie diet regime, including a list of foods to be avoided and those to be eaten at a higher frequency. Each patient was given a weekly menu designed to facilitate the regimen suggested for them.

According to the recommendations of medical professionals, who advised getting 55% of daily calories from carbohydrates, 15% from protein, and 30% from fats, the low-calorie diet plan was developed [27].

Application of acupuncture

Each woman in the study group was given acupuncture sessions. Sixteen needles were inserted in the following points: DU20, ST9, LI4, RN6, RN4, SP9, ST36, SP6, KI3, LR2, GB20, DU14, BL15, BL20, BL23, and DU4. The anatomical locations of these points are represented in Table 1 [17].

Table 1. Anatomical location of acupuncture points

Point	Location
DU20 (BaiHui)	Lies on the head's central line, up from the tops of the ears, where they meet in the midline.
GB20 (FengChi)	Lies in a hollow between the upper trapezius and sternocleidomastoid muscles.
DU14 (DaZhui)	Is centred just below the spinous process of the seventh cervical vertebra, indicating a midline position.
ST9 (RenYing)	Lies on the anterior edge of the sternocleidomastoid muscle in the neck, laterally to the Adam's apple.
LI4 (HeGu)	Lies in the middle of the 2nd metacarpal bone along the radial side.
BL15 (XinShu)	Lies on the bladder meridian, at the level of the T5 vertebra's inferior border of the spinous process.
BL20 (PiShu)	Lies 1.5 cun laterally of the lower margin of the spinous process of the T11 vertebra.
BL23 (ShenShu)	Lies lateral from the spinous process of the L2 vertebra on the meridian of the kidneys.
DU4 (MingMen)	Lies beneath the L2 vertebra's spinous process.
RN6 (QiHai)	Lies 1.5 cun underneath the umbilicus in the lower abdomen.
RN4 (QuanYuan)	Lies 3 cun inferior to the umbilical on the median line of the belly.
SP9 (YinLingQuan)	Lies on the tibia's lower medial condyle.
ST36 (ZuSanLi)	Lies 3 cun underneath the patella's inferior border.
SP6 (SanYinJiao)	Lies just above the ankle on the inside of the leg.
KI3 (TaiXi)	Lies behind the medial malleolus.
LR2 (TaiChong)	Lies between the 1st and 2nd metatarsophalangeal joints on the top of each foot.

A size 0.25 × 25 mm fine, sterile needles were used only once. After local skin cleaning with 70% alcohol, they were inserted at different depths (0.2–5 cm) depending on the location and fat buildup. Each woman in the study group assumed a supine position for the acupoints DU20, ST9, LI4, RN6, RN4, SP9, ST36, SP6, KI3, and LR2 and prone position for the acupoints GB20, DU14, BL15, BL20, BL23, and DU4. Needles were left in place for 20 min with 1 min of very light stimulation applied to each spot. Thirty-two acupuncture sessions overall, each lasting 40–45 min, were administered to all patients over the course of four months, two sessions each week.

Data analysis

Version 20.0 (Armonk, NY: IBM Corp) of the SPSS statistical tool was used to examine the data. We checked for distributional normality using the Kolmogorov–Smirnov test. For normally distributed data, comparisons between and within groups were performed using the paired and unpaired *t*-tests, respectively. For data that was not regularly distributed, the Wilcoxon test and the Mann–Whitney test were used to make comparisons within and between groups, respectively. The level of significance was set at < 0.05.

Results

Table 2 represents the mean ± *SD* of the infertile women's baseline characteristics in diet and acupuncture groups, as well as a comparison between groups before treatment. The ages of both groups did not differ substantially using an unpaired *t*-test ($p = 0.51$), weights ($p = 0.28$), heights ($p = 0.79$), and BMI ($p = 0.37$).

According to a paired *t*-test, both the diet and acupuncture groups experienced a substantial decline ($p = 0.00$) in BMI accompanied by a percentage change equal to 6.86% and 13.68%, respectively, and in waist circumference with a percentage of change equal to 3.86% and 8.51% respectively, as well as in WSR accompanied by a percentage change equal to 4.8% and 8.3%, respectively.

Using an unpaired *t*-test, we found no statistically substantial differences in BMI ($p = 0.15$), while it revealed a substantial decline in the waist circumference ($p = 0.01$) and WSR ($p = 0.00$) between groups after treatment in favour of the acupuncture group (Table 3).

Wilcoxon test revealed a substantial decline ($p = 0.00$) in TSH in the diet and acupuncture groups accompanied by a percentage change equal to 33.5% and 51.4%, respectively. Also, it revealed a highly substantial improvement

Table 2. Baseline characteristics for the infertile women

Variable	Diet group ($n = 30$) mean ± *SD*	Acupuncture group ($n = 30$) mean ± *SD*	*t*-value	*p*-value
Age (years)	26.9 ± 4.7	27.7 ± 5.14	0.654	0.51^{NS}
Weight (kg)	90.86 ± 14.09	94.65 ± 12.65	–1.10	0.28^{NS}
Height (cm)	164.60 ± 4.16	164.93 ± 5.41	–0.27	0.79^{NS}
BMI (kg/m^2)	33.37 ± 4.62	34.35 ± 3.76	–0.90	0.37^{NS}

BMI – body mass index, ^{NS} non-significant

Table. 3 Comparison of the anthropometric measurements in the diet and acupuncture groups

Variable		Diet group ($n = 30$)	Acupuncture group ($n = 30$)	MD	*p*-value
BMI	before (mean ± *SD*)	33.37 ± 4.62	34.35 ± 3.76	–0.90	0.3^{NS}
	after (mean ± *SD*)	31.08 ± 3.98	29.65 ± 3.59	1.47	0.15^{NS}
	MD	2.29	4.70		
	percent of change	6.86	13.68		
	p-value	0.00*	0.00*		
Waist circumference	before (mean ± *SD*)	101.78 ± 10.07	99.67 ± 10.16	2.12	0.42^{NS}
	after (mean ± *SD*)	97.85 ± 3.98	91.18 ± 9.86	6.7	0.01*
	MD	3.93	8.49		
	percent of change	3.86	8.51		
	p-value	0.00*	0.00*		
WSR	before (mean ± *SD*)	0.62 ± 0.06	0.60 ± 0.05	0.0146	0.30^{NS}
	after (mean ± *SD*)	0.59 ± 0.06	0.55 ± 0.05	0.0410	0.00*
	MD	0.03	0.05		
	percent of change	4.8	8.3		
	p-value	0.00*	0.00*		

BMI – body mass index, WSR – waist-stature ratio, ^{NS} non-significant, * significant at $p < 0.05$

Table 4. Comparison of thyroid hormone levels in the diet and acupuncture groups

Variable		Diet group (n = 30)	Acupuncture group (n = 30)	MD	p-value
TSH	before (mean ± *SD*)	4.41 ± (2.7–7.7)	5.08 ± (3.8–9.7)	–1.39	0.13^{NS}
	after (mean ± *SD*)	2.93 ± (1.9–5.7)	1.94 ± (0.87–3.32)	0.99	0.03*
	MD	1.48	3.86		
	percent of change	33.5	51.4		
	p-value	0.00*	0.00*		
FT4	before (mean ± *SD*)	0.91 ± (0.7–1.11)	0.81 ± (0.66–1.13)	0.101	0.35^{NS}
	after (mean ± *SD*)	1.1 ± (1.1–1.5)	1.36 ± (0.97–1.5)	–0.26	0.082^{NS}
	MD	–0.04	–0.13		
	percent of change	5.1	13.4		
	p-value	0.00*	0.00*		

TSH – thyroid-stimulating hormone, FT4 – free thyroxine, ^{NS} non-significant, * significant at $p < 0.05$

Table 5. Comparison of reproductive hormones, PCOSQ, and menstrual cycle period in the diet and acupuncture groups

Variable		Diet group (n = 30)	Acupuncture group (n = 30)	MD	p-value
LH	before (mean ± *SD*)	11.82 ± 4.11	11.81 ± 3.84	0.01	1.00^{NS}
	after (mean ± *SD*)	10.06 ± 3.27	5.37 ± 1.77	4.69	0.00*
	MD	1.76	6.44		
	percent of change	14.89	54.5		
	p-value	0.00*	0.00*		
FSH	before (mean ± *SD*)	5.52 ± 1.64	5.29 ± 1.38	0.227	0.56^{NS}
	after (mean ± *SD*)	5.47 ± 1.40	6.51 ± 2.07	–1.04	0.03*
	MD	0.05	1.22		
	percent of change	0.9	23		
	p-value	0.84^{NS}	0.00*		
LH/FSH	before (mean ± *SD*)	2.23 ± 0.85	2.24 ± 0.50	–0.0108	0.95^{NS}
	after (mean ± *SD*)	1.89 ± 0.63	0.86 ± 0.21	–1.037	0.00*
	MD	0.34	1.38		
	percent of change	15.24	61.6		
	p-value	0.02*	0.00*		
PCOSQ	before (mean ± *SD*)	57.50 ± 13.06	54.70 ± 16.78	2.8	0.47^{NS}
	after (mean ± *SD*)	88.60 ± 15.03	142.93 ± 11.86	–54.33	0.00*
	MD	–31.10	–88.16		
	percent of change	96.5	161		
	p-value	0.00*	0.00*		
Menstrual cycle period	before (mean ± *SD*)	46.2 ± 11.50	48.4 ± 11.60	–2.2	0.46^{NS}
	after (mean ± *SD*)	40.2 ± 9.90	30.4 ± 6.22	9.8	0.00*
	MD	6.00	18.00		
	percent of change	12.98	37.19		
	p-value	0.00*	0.00*		

LH – luteinising hormone, FSH – follicle-stimulating hormone, PCOSQ – polycystic ovarian syndrome questionnaire, ^{NS} non-significant
* significant at $p < 0.05$

(p = 0.00) in the FT4 hormone with a percentage of change equal to 5.1% and 13.4% in the diet and acupuncture groups, respectively. Mann–Whitney test revealed a substantial decline in TSH (p = 0.03) among the groups after treatment, favouring those who were given acupuncture; however, it showed no substantial difference in FT4 (p = 0.082) after treatment, as shown in Table 4.

The percentage of patients with a normal TSH after treatment was 43.3% for the diet group and 70% for the acupuncture group, while the percentage of patients with a normal FT4 was 53% and 80% for the diet and acupuncture groups, respectively.

Table 5 represents the mean values of reproductive hormones, PCOSQ, and menstrual cycle period for diet and acupuncture groups pre- and post-treatment. The diet group revealed a substantial decline (p = 0.00) in LH, the LH/FSH ratio, and the period of the menstrual cycle with a percentage of change equal to 14.89%, 15.24%, and 12.98%, respectively. It also revealed a substantial improvement (p = 0.00) in PCOSQ scores with a percentage of change of 96.50% with no substantial change (p = 0.84) in FSH. The acupuncture group revealed a substantial decline (p = 0.00) in LH, the LH/FSH ratio, and the period of the menstrual cycle with a percentage of change equal to 54.50%, 61.60%, and 37.19%, respectively. It also revealed a substantial improvement (p = 0.00) in FSH and PCOSQ scores with a percentage of change of 23% and 161%, respectively.

Unpaired t-tests revealed a substantial decline (p = 0.00) in LH, the LH/FSH ratio, and the period of the menstrual cycle, as well as a substantial improvement in FSH (p = 0.03) and PCOSQ questionnaire scores (p = 0.00) between groups post-treatment favouring those who underwent acupuncture.

The percentage of females with a LH/FSH ratio of less than 1 after treatment was 36.6% and 90% for the diet and acupuncture groups, respectively. The percentage of women with a menstrual cycle of less than 35 days was 36.6% and 86% for the diet and acupuncture groups, respectively.

Discussion

Androgen metabolism, menstrual function, and fertility are all severely impacted by hypothyroidism. Puberty may be delayed, irregular menstruation may occur, cycles may be anovulatory, pregnancies may end in miscarriage, and infertility may result [5]. Pregnancy difficulties, metabolic disorders, and elevated risks of cardiovascular disease are all associated with metabolic dysfunction [6].

The results revealed that the diet and acupuncture groups revealed a substantial decline in BMI, waist circumference, WSR, TSH, LH, LH/FSH ratio, and menstrual cycle period and a substantial improvement in FT4 and PCOSQ scores. Also, results revealed a substantial improvement in FSH for the acupuncture group only. Contrasted to the diet group, the acupuncture group revealed a substantial decline in waist, WSR, TSH, LH, LH/FSH ratio, and menstrual cycle frequency and a substantial improvement in FSH and PCOSQ scores, without a substantial difference in BMI and FT4.

Weight loss with a low-calorie diet improved health and anthropometric measurements such as BMI, weight, waist, and hip circumference, correlating with a prior study's findings [28]. Also, a diet program for 4 weeks has shown a decrease in the levels of FT4, TSH, and FT3 in obese patients [27–29]. In addition, a low-calorie diet was linked to improved levels of FSH, LH, BMI, weight, waist circumference, and inflammatory cytokines among obese PCOS women [30].

In addition, menstruation regularity and ovarian function have both been shown to improve with calorie restriction as well as weight loss. After 24 weeks on an energy-restricted diet, 80% of women who had previously experienced irregular periods reported having regular periods. This outcome indicated that a greater decrease in BMI was associated with better menstrual regularities [31].

According to previous studies, acupuncture has shown improvement in FSH and LH levels, anxiety, mental tension, and menopausal symptoms in patients with premature ovarian failure [32]. Moreover, acupuncture has improved the QoL and balanced TSH levels in female participants with subclinical hypothyroidism [18].

In addition, previous studies have examined the effect of acupuncture as well as fire cupping when treating hypothyroidism. They have reported improvement in TSH, decreased drug dosages, and BMI [33].

The impacts of acupuncture in euthyroid PCOS women have been the subject of numerous research efforts. They have reported improvement in the LH/FSH ratio, ovulation rate, clinical pregnancy rate (CPR), and BMI in response to combining acupuncture with other medications [34]. Also, true acupuncture has shown a decrease in intermenstrual days in PCOS patients compared with sham acupuncture [35]. Additionally, acupuncture has improved the HRQoL, depression, and anxiety of PCOS patients [36]. The impact of acupuncture may be brought about by enhancing chemical and muscular signals, which then trigger key brain components to be released, regulating the female reproductive axis [37].

Hypothyroidism was described as a kidney Yin and Yang deficiency. Effects of acupuncture may include warming the meridians, clearing obstructions, replenishing Yang Qi, tonifying the kidney and spleen, clearing phlegm, lifting the clear Yang, warming the kidney Yang, and balancing the Yin and Yang [17]. It has been reported that acupuncture could treat hypothyroidism by regulating energy levels, restoring hormonal balance, calming emotions, and managing sleep, mood, and menstruation issues [17]. Acupuncture is a safe and affordable integrative therapy or alternative medicine that is appropriate for treating thyroid disease [38].

These results prove the effectiveness of combining acupuncture with a low-calorie diet regimen and thyroxine medication for infertile women having hypothyroidism. As a result, acupuncture is highly effective in treating primary hypothyroidism in women who are unable to conceive.

Limitations

There are some limitations to consider in this study. For example, the mechanism underlying the improvement of thyroid and reproductive hormones in infertile hypothyroid women is still unknown. Also, pregnancy outcomes and size of follicles in PCOS patients have not been monitored, which needs further studies. Furthermore, more research is required to determine the long-term impact of acupuncture on hormone profiles in hypothyroid patients with infertility. Moreover, a comparative study of the impact of laser acupuncture and needle acupuncture on infertile hypothyroid patients is warranted.

Conclusions

Acupuncture sessions, in addition to a low-caloric diet program and medical treatment, produce more improvement in decreasing abdominal adiposity and hormonal variables

and are more effective in improving menstrual cycle and HRQoL variables than low-caloric diet and medical treatment alone in hypothyroid infertile women.

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Ethical approval

The research related to human use has complied with all the relevant national regulations and institutional policies, has followed the tenets of the Declaration of Helsinki, and has been approved by the Faculty of Physical Therapy, Cairo University (approval No.: P.T.REC/012/002825). Study identifier: NCT05804149 on ClinicalTrials.gov.

Informed consent

Informed consent has been obtained from all individuals included in this study.

Disclosure statement

No author has any financial interest or received any financial benefit from this research.

Conflict of interest

The authors state no conflict of interest.

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