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Lifestyle modifications among infertile women with poly cystic ovary syndrome

Abstract

Background: The primary causes of the clinical symptoms of PCOS are hyperandrogenism and insulin resistance, which are frequently combined.

Aim: Evaluate the effect of lifestyle modification intervention among hyper-androgenic infertile overweight and obese women.

Subjects and methods design: A quasi-experimental design was used for this study.

Setting: gynecological and infertility outpatient and inpatient clinics and specialized medical center for the treatment of infertility and delayed childbearing.

Sample: A purposive sample of 116 women (Study-control). The first group (study group=58) is the experimental group, which will receive lifestyle modification intervention, and the second group: (control group=58) will take routine care only.

Tools (1): Arabic Structured interviewing questionnaire.

Tool (2): Lifestyle and habits characteristics that divided into: a) data about nutrition habits, and b) Block Adult Physical Activity (PA) Screener

Results: The study also found that 29.3% had had moderate chin and neck hirsutism, pre-intervention, compared to 22.4% post-intervention. Additionally, 72.4% and 69% of the study and control groups had poor habits before the intervention, compared to 70.7% and 31% of them had good habits after the intervention, respectively. No hirsutism was observed in 64.3% before intervention, compared to 92.3% after intervention for good habits women. Moreover, 23.1% of moderate activity of the studied group has had stage III androgenic alopecia levels before intervention compared to 0% after intervention.

Conclusion: Infertile women with poly cystic ovary syndrome, significant improvements in hyperandrogenic symptoms were achieved with lifestyle changes.

Recommendations: Implement research-based nurse information and education programs on the nature, effects, and management of PCOs.

Keywords: lifestyle, modifications, infertile women, poly cystic ovary

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Introduction

Approximately 60% and 100% of PCOS patients have hyperandrogenism, which manifests both clinically (as in the case of hirsutism, alopecia, and acne) and biochemically.[1] Lack of consensus over which androgens to detect, what assays to employ, how to define normal ranges, overlaps between values obtained in controls and PCOS, and access and cost issues for high-quality assays make it difficult to assess biochemical hyperandrogenism. It is defined as a free/total testosterone, androstenedione, and/or DHEA-S level that are higher than the top 95th percentile in 98 healthy, non-hirsute eumenorrheic women.[2–5]

Another significant factor to take into account is the psychological health of the patient due to the impact of PCOS on physical appearance (such as weight gain, acne, and hirsutism). Actively seeking for mental health conditions like depression, anxiety, and self-harm should be a priority.[6–8]

The primary causes of the clinical symptoms of PCOS are hyperandrogenism and insulin resistance, which are frequently combined and made worse by obesity (Figure 1). Women with PCOS have been reported to have intrinsic theca cell malfunction, which results in excessive androgen synthesis and overexpressed luteinizing hormone (LH) receptors that are unaffected by endocrine or paracrine regulation.[9–12]

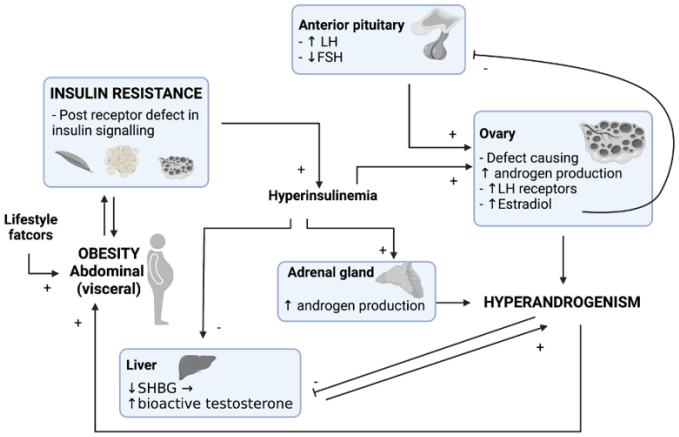

Figure 1 Causes of the clinical symptoms of PCOS.

Additionally, androgens promote lipolysis, which raises the levels of free fatty acids in the blood, which leads to the development

of insulin resistance and the development of abdominal obesity, particularly visceral obesity, which is frequent in women with PCOS. The effects of too much androgen on pertinent tissues; acne, male pattern baldness, and hirsutism are among other signs of hyperandrogenism (Figure 1).[11,13]

Clinical signs of high levels of androgen (Clinical hyperandrogenism) in females are hirsutism, acne, and female pattern hair loss (formerly known as androgenic alopecia).

Treatment options for PCOS underlined are pharmacological, surgical intervention, and non-pharmacological interventions (Lifestyle interventions).

Pharmacological treatment:

a) Anti-androgen: The most popular antiandrogens include flutamide, finasteride, spironolactone, and cyproterone acetate. As a result, all of the suggested medications have an antiandrogenic impact, although it's common practice to ignore any potential adverse effects of the various treatments.[14]

b) Glucocorticoids: Additionally, it is employed, and glucocorticoids have been used in patients with adrenal hyperandrogenism to reduce adrenal androgen output. They can aid in preventing and managing hirsutism and enabling ovulatory cycles in patients with classic congenital adrenal hyperplasia when their usage is best justified.[15]

c) Gonadotropin-releasing hormone agonist (GnRHa): Used for women who have COCP resistance and severe insulin resistance. It improves hirsutism, inhibits pituitary hormones and increases estradiol output while decreasing androgen.[16]

Treatment for hirsutism:

a) **Direct hair removal therapy** For many years, the standard method was to get rid of extra hair in PCOS. It operates by inserting a small needle with an electrical current into the hair follicle. Although laser treatment is more expensive, less uncomfortable, and produces results much more quickly, the adverse effects are more severe.[15]

b) **Eflornithine hydrochloride** It is an inhibitor of the enzyme ornithine decarboxylase in human skin and has been approved for topical application in hirsutism.[17]

c) Treatment for acne: Oral contraceptives and antiandrogen medications can be used alone or in conjunction with traditional topical acne treatments, including retinoids, antibiotics, and benzoyl peroxide, to treat acne. In 50%–90% of affected patients, the counts of inflammatory acne decline by 30%–60%. Patients who have deep-seated acne or have relapsed on isotretinoin benefit the most from OCPs.[15]

Surgical treatment

a) Laparoscopic ovarian drilling

b) Bariatric surgery

c) Assisted Reproductive Technology

Non-pharmacological interventions (Lifestyle interventions)

The most recent worldwide guidelines on PCOS from 2018 propose lifestyle management through food adjustments, exercise, behavioral modification, or a combination of these as the first-line treatment for PCOS symptoms. Losing weight can help with all symptoms of PCOS.[18,19]

The majority of PCOS patients said that they rarely obtain lifestyle recommendations from their therapists, although the majority of physicians support lifestyle changes for the management of PCOS.[20–25] So, this study will be conducted to evaluate the effect of lifestyle modifications on hyper-androgenic symptoms among infertile obese and overweight women, and therefore, enhance fertility and alleviate infertility.

Aim of the study

This study was conducted to evaluate the effect of lifestyle modification intervention among hyper-androgenic infertile overweight and obese women.

Study hypotheses

Hyper-Androgenic infertile overweight and obese women who will receive lifestyle modification interventions will experience an improvement and decrease hyper-androgenic symptoms.

Subject and methods

Research design A quasi-experimental design was used for this study.

Study setting

The study was conducted at gynecological and infertility outpatient and inpatient clinics and specialized medical center for the treatment of infertility and delayed childbearing affiliated with Beni-Suef University Hospital.

Sample

Sample type and size A purposive sample of infertile overweight with PCO women who attended the previously mentioned sitting will be selected, and fulfilled the following criteria:

- Women are medically diagnosed PCOs.
- At reproductive age (18-40 years).
- Body mass index >25kg/m^2 (overweight and obese women).

Sample size

The sample size was estimated to be 116 women (Study-control), Women with PCO will be divided into two equal groups: The first group (study group) is the experimental group, which will receive lifestyle modification intervention, and their number is 58 women, and the second group: (control group) will take routine care only, and their number is 58 women. Patients will be interviewed 2 times (first time before interventions and second time after interventions) to collect needed data at the outpatient of the gynecological and infertility clinics and followed up weekly by phone.

Tools of data collection Two main tools were utilized in collecting data:

Tool (1) Arabic Structured interviewing questionnaire adapted from Mostafa et al.,[26] divided into two parts**: a)** Basic data and sociodemographic characteristics. **b)** Features of hyper-androgenism included questions about hirsutism, acne, and androgen-related alopecia.

Hirsutism The presence of terminal hair (hairs that would grow >5mm in length if left unmolested, are typically pigmented, and are medullated) was evaluated in the nine primarily masculine body areas (androgen-dependent), including the upper lip, chin and neck, upper

chest (excluding the nipples), upper abdomen (above the umbilicus), lower abdomen, thighs (front and/or back), upper back, lower back, and upper arms.[27]

Acne vulgaris By applying the Global Acne Grading System (GAGS), the severity of acne was evaluated. Six regional sub-scores are added together to create the overall score. The factor was multiplied by the grade for each sub-region to determine its score, and the sum of all the sub-regions with acne was used to determine the overall score.[28]

Androgenic alopecia The occurrence of androgenic alopecia, which causes diffuse hair thinning over the center scalp but typically leaves the frontal hairline intact, was evaluated in all patients.[29] The head hair was visually scored from one (minor thinning not noticeable) to two (hair loss with visible scalp) to three (severe hair loss with baldness).[27]

Tool (2) Lifestyle and habits characteristics that divided into:

Part I Data about nutrition habits It includes data about food and soft drinks. The responses of the women were measured on five points, ranging from (0=daily, 1=4-5 per week, 2= 2-3 times a week, 3=once, and 4=rarely). The total score was adopted from[30] and assessed by summation of sub-scores as follows:

- Poor habits if score < 60% of total scores that mean (0-21.5).
- Good habits if score ≥ 60 % of the total score, that means (21.6-36).

Part II: The Block Adult Physical Activity (PA) Screener was the predictor for physical activity. This tool assessed the frequency and duration of job-related, daily life, and leisure activities. It was developed using data from a large United States representative sample of men and women.[31] The responses of the women towards the nine items were measured on five points, ranging from 1 to 5, and the total score was adopted from[31] and assessed by summation of sub-scores as follows:

- Mild physical activity (sedentary life) if score is < 25% of total score that mean (9-15).
- Moderate physical activity if score is 25%-50% of the total score, that means (16-30).
- Vigorous physical activity if score is 50%-75% of the total score, that means (30-45).

Ethical considerations

Official approval will be obtained from ethical and research counsels that were approved by the Faculty of Nursing, Menoufia University Counsel. Informed oral consent was obtained from all women after an explanation of the nature and purpose of the study.

Pilot study

The pilot study was carried out on 10% of the total study sample (10 women) to evaluate the applicability, efficiency, clarity of tools, and assessment of the feasibility of fieldwork, besides detecting any possible obstacles that might face the researcher and interfere with data collection.

Field work:

Preparatory and data gathering phase Review of current and past, national and international related literature concerning the subjects of the study, using textbooks, articles, journals, and websites. Interviewing and assessment phase (pre-test) (for the study and control group). In the beginning, the researchers assess the baseline measures related to hyper-androgenism (hirsutism, acne, alopecia) of the studied infertile overweight and obese women for two weeks. Oral consent was obtained from all participants. Full general and clinical assessment for anthropometrics measurement body mass index, the hirsutism score, androgenic alopecia, and acne grade were performed by the investigator. Based on the analysis of the data obtained from the assessment phase, and review of the related literature, the researcher obtained women at gynecological and infertility outpatient clinics and specialized medical centers for the treatment of infertility and delayed childbearing.

Program implementation for the study group only The lifestyle modification intervention was implemented in the training halls in the study settings. The study participants were provided with a lifestyle change program through three educational sessions with duration of approximately 60 minutes for each session. Arabic booklet was designed and distributed by the researcher based on a literature review.

Evaluation phase (Follow-up schedule and outcomes evaluation) Arabic card was constructed by the researcher to assess the outcome measures. Follow-up card examination documented assessment signs of hyperandrogenism (Hirsutism, Acne, and Androgenic alopecia). The evaluation (posttest) was carried out two weeks to one month after the completion of the program for both the control and study groups. The control group received only routine care during the intervention period, and they were given the educational booklet after the posttest for ethical aspects.

Statistical analysis: Data was entered and analyzed using SPSS (version 25). Graphics were done using the excel program as well as the SPSS package. The level of significance was set at a P value of <0.05 for all significant tests.

Results

Table 1 presented hirsutism in infertile overweight and obese women with polycystic ovary syndrome. Results showed that 26% of the study group had severe level upper lips, pre-intervention, compared to 13.8%, and 48.3% had no visible terminal hair post intervention. The study also found that 29.3% had had moderate chin and neck hirsutism, pre-intervention, compared to 22.4% post-intervention. The study found no significant differences between the control and intervention groups in hair growth before, during, and after the intervention.

Table 2 shows the appearance of face acne resistant to treatment among the studied infertile overweight and obese women with polycystic ovary syndrome. It reveals that 51.6% of the study group had clear skin with no inflammatory or non-inflammatory lesions on the forehead before the intervention, compared to 94.8% of them after the intervention. In addition, 24.1% of the study had mild severity, some non-inflammatory lesions with no more than a few inflammatory lesions (pustules only on the neck and upper chest before the intervention), compared to 10.3% of them had clear skin with no inflammatory or non-inflammatory lesions after the intervention. No statistically significant differences between control groups before and after intervention.

Table 3 shows the androgenic alopecia and other co-morbidities among the studied infertile overweight and obese women with polycystic ovary syndrome. It shows that before the intervention, 89.7% and 91.4% of the study group and control groups, respectively, had no DM. In contrast, both before and after the intervention,

there was no HTN in either the study group or the control groups. Additionally, before the intervention, 75.9% and 79.3% of the study and control groups, respectively, had no dyslipidemia; after the intervention, these percentages increased to 75.9% and 79.3%.

Table 4 shows the total lifestyle and daily habit levels (diet and physical activity) among the studied infertile overweight and obese women with polycystic ovary syndrome. It reveals that 72.4% and 69% of the study and control groups had poor habits before the intervention, compared to 70.7% and 31% of them had good habits after the intervention, respectively. Moreover, that 82% and 79% of the study and control groups had mild physical activity before the intervention. Compared to 62%, 21% of the study and control group after intervention had moderate physical activity.

Figure 2 presented relationship between hyper-androgenic features and lifestyle dietary habits among the study group of infertile overweight and obese women. It showed that about 14.3% of good nutrition habits of the studied group have had stage III androgenic alopecia levels before intervention compared to 0% after intervention. Also, severe acne was observed in 100% before intervention, compared to 50% after intervention for poor habits women. No hirsutism was observed in 64.3% before intervention, compared to 92.3% after intervention for good habits women.

Figure 3 showed relationship between hyper-androgenic features and physical activity levels among the study group of infertile overweight and obese women. It showed that 23.1% of moderate activity of the studied group has had stage III androgenic alopecia levels before intervention compared to 0% after intervention. Severe acne was observed in 25% of the studied group before intervention, compared to 50% after intervention for moderate activity women. No hirsutism was observed in 11.5% of the studied group of women before intervention, compared to 23.1% after intervention for moderate activity women (Table 1-4) (Figure 2&3).

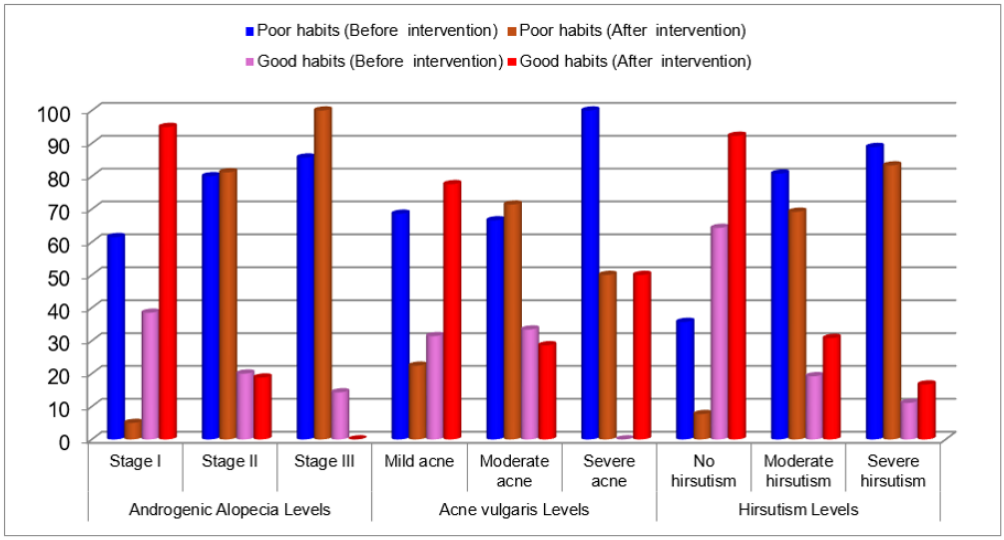

Figure 2 Relationship between hyper-androgenic features and lifestyle dietary habits among the studied group of infertile overweight and obese women.

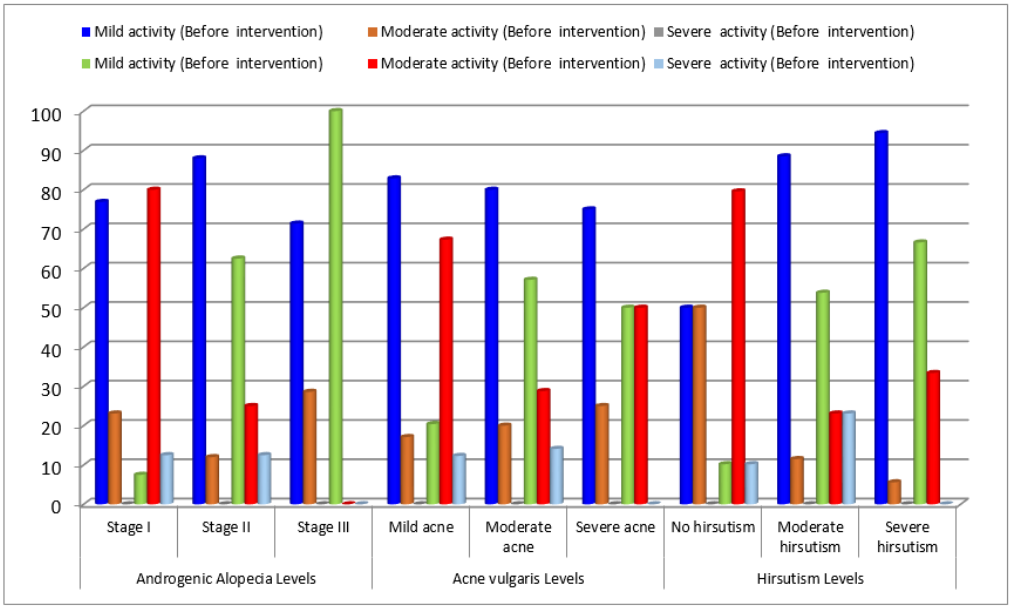

Figure 3 Relationship between hyper-androgenic features and lifestyle physical activity levels among the studied group of infertile overweight and obese women.

Citation: Abd-ELghafar FH, Hassan HE, Ali EK. Lifestyle modifications among infertile women with poly cystic ovary syndrome. *Nurse Care Open Acces J.* 2026;12(1):1–10. DOI: 10.15406/ncoaj.2026.12.00332

Table1 Hirsutism among the studied infertile overweight and obese women with polycystic ovary syndrome (n = 116)

Variables	Before the intervention				χ^2	After the intervention				χ^2
	Study n=58		Control n=58		P –value	Study n=58		Control n=58		P –value
	No.	%	No.	%		No.	%	No.	%	
Upper lip										
- No terminal hair is visible	12	20.6%	25	43.1%	20.18	28	**48.3%**	25	43.1%	≤ 0.001**
- Moderate	31	53.4%	19	32.8%	≤ 0.001**	22	37.9%	19	32.8%	
- Severe	15	**26%**	14	24.1%		8	**13.8%**	14	24.1%	
Chin and neck										
- No terminal hair is visible	15	25.8%	10	17.2%	27.80	27	46.6%	13	22.4%	12.76
- Moderate	17	**29.3%**	34	58.6%	≤ 0.001**	13	**22.4%**	31	53.4%	<0.05*
- Severe	26	44.8%	14	24.1%		18	31.0%	14	24.1%	
Upper chest excluding nipples										
- No terminal hair is visible	39	67.2%	44	75.8%	19.59	45	77.6%	44	75.8%	11.69
- Moderate	17	29.3%	14	24.2%	≤ 0.001**	13	22.4%	14	24.2%	< 0.05 ns
- Severe	2	3.4%	0	0.0%		0	0.0%	0	0.0%	
Upper abdomen (above the umbilicus), lower abdomen										
- No terminal hair is visible	25	43.1%	10	17.2%	76.13	34	58.6%	10	17.2%	60.70
- Moderate	30	51.7%	40	69.1%	≤ 0.001**	15	25.8%	40	69.1%	≤ 0.001**
- Severe	3	5.2%	8	13.7%		9	15.5%	8	13.7%	
Thighs (front and/or back)										
- No terminal hair is visible	39	67.2%	38	65.5%	17.27	45	75.6%	38	65.5%	15.92
- Moderate	14	24.1%	18	31%	≤ 0.001**	11	18.9%	18	31%	≤ 0.001**
- Severe	5	8.7%	2	3.5%		2	3.5%	2	3.5%	
Upper back, lower back, and upper arms										
- No terminal hair is visible	44	75.9%	42	72.4%	28.00	50	86.2%	42	72.4%	≤ 0.001**
- Moderate	11	18.9%	10	17.2%	≤ 0.001**	7	12%	10	17.2%	
- Severe	3	5.2%	6	10.4%		1	1.8%	6	10.4%	
- Extensive hair growth is visible	0	0.0%	0	0.0%		0	0.0%	0	0.0%	

NB: ns non-statistically significant (p≥0.05) * statistically significant (p≤0.05) **highly statistically significant (p≤0.001)

Table 2 Appearance of face acne resistant to treatment among the studied infertile overweight and obese women with polycystic ovary syndrome (n = 116)

Variables	Before the intervention				χ^2	After the intervention				χ^2
	Study n=58		Control n=58		P – value	Study n=58		Control n=58		P–value
	N	%	N	%		N	%	N	%	
Forehead										
- Clear skin with no inflammatory or non-inflammatory lesions	30	51.6%	45	77.5%	**0.00**	55	94.8%	45	77.5%	**0.20**
- Almost clear; rare noninflammatory lesions with more than one small inflammatory lesion	15	26%	10	17.2%	**>0.05 ns**	3	5.2%	10	17.2%	**>0.05 ns**
- Mild severity; some non-inflammatory lesions with no more than a few inflammatory lesions (papules/pustules only	13	22.4%	3	5.2%		0	0.0	3	5.2%	
Right and left cheek										
- Clear skin with no inflammatory or non-inflammatory lesions	23	40%	28	48.2%	**0.00**	44	75.9%	28	48.2%	**1.16**
- Almost clear; rare noninflammatory lesions with more than one small inflammatory lesion	25	43%	22	38%	**>0.05 ns**	11	19.0%	22	38%	**>0.05 ns**
- Mild severity; some non-inflammatory lesions with no more than a few inflammatory lesions (papules/pustules only	10	17%	8	13.8%		3	5.1%	8	13.8%	

Citation: Abd-ELghafar FH, Hassan HE, Ali EK. Lifestyle modifications among infertile women with poly cystic ovary syndrome. *Nurse Care Open Acces J.* 2026;12(1):1–10. DOI: 10.15406/ncoaj.2026.12.00332

- Table 2 Continued....

Nose										
- Clear skin with no inflammatory or non-inflammatory lesions	44	75.9%	46	79.3%	**0.00**	54	93.1%	46	79.3%	**4.64**
- Almost clear; rare noninflammatory lesions with more than one small inflammatory lesion	14	24.1%	12	20.7%	**>0.05 ns**	4	6.9%	12	20.7%	≤ **0.05***
- Mild severity; some non-inflammatory lesions with no more than a few inflammatory lesions (papules/pustules only	0	0.0%	0	0.0%		0	0.0%	0	0.0%	
Chin										
- Clear skin with no inflammatory or non-inflammatory lesions	38	65.5%	33	57%	**a**	44	75.9%	33	57%	**a**
- Almost clear; rare noninflammatory lesions with more than one small inflammatory lesion	12	20.5%	15	25.8%	**a**	10	17.2 %	15	25.8%	**a**
- Mild severity; some non-inflammatory lesions with no more than a few inflammatory lesions (papules/pustules only	8	14%	10	17.2%		4	6.9 %	10	17.2%	
Neck and upper chest										
- Clear skin with no inflammatory or non-inflammatory lesions	26	44.8%	33	57%	**0.00**	44	75.9%	33	57%	**8.02**
- Almost clear; rare noninflammatory lesions with more than one small inflammatory lesion	18	31%	15	25.8%	**>0.05 ns**	8	13.8%	15	25.8%	**<0.05***
- Mild severity; some non-inflammatory lesions with no more than a few inflammatory lesions (papules/pustules only	14	24.1%	10	17.2		6	10.3%	10	17.2%	

NB: ns non- statistically significant (p≥0.05) * statistically significant (p≤0.05)

a. No statistics are computed because the chin is a constant.

Table 3 Androgenic alopecia and other co-morbidities among the studied infertile overweight and obese women with polycystic ovary syndrome (n = 116)

Variables	Before the intervention				χ^2	After the intervention				χ^2
	Study n=58		Control n=58		P –value	Study n=58		Control n=58		P –value
	No.	%	No.	%		No.	%	No.	%	
Androgenic alopecia (thinning on the top of the head)?										
Begins with thinning on the top of the head. Not visible hair loss	26	44.8%	29	50%	0.38ns	40	69.0%	30	51.7%	≤ 0.001**
Hair loss with the scalp starts to show	25	43.1%	21	36.2%	> 0.05	16	27.6%	22	38%	
Severe hair loss with baldness	7	12.1%	8	13.8%		2	3.4%	6	10.3%	
Do you have a DM					0.10ns					
- No	52	89.7%	53	91.4%		52	89.7%	53	91.4%	≤ 0.001**
- Yes	6	10.3%	5	8.6%	> 0.05	6	10.3%	5	8.6%	
Do you have HTN					a					a
- No	58	100%	58	100%	a	58	100%	58	100.0%	a
Do you have Dyslipidemia					0.19ns					
- No	44	75.9%	46	79.3%		44	75.9%	46	79.3%	≤ 0.001**
- Yes	14	24.1%	12	20.7%	> 0.05	14	24.1%	12	20.7%	
Do you have obstructive sleep apnea (does your breathing repeatedly stop and start during sleep)					0.14ns					≤ 0.001**
- No	36	62.1%	38	65.5%	> 0.05	44	75.9%	38	65.5%	
- Yes	22	37.9%	20	34.5%		14	24.1%	20	34.5%	

NB: ns non-statistically significant (p≥0.05) **highly statistically significant (p≤0.001) a. a. No statistics are computed because do you have HTN is a constant.

Table 4 Total lifestyle and daily habits levels (diet and physical activity) among the studied infertile overweight and obese women with polycystic ovary syndrome (n = 116)

Habit	Variables	Before the intervention				χ^2	After the intervention				χ^2
		Study n=58		Control n=58		P –value	Study n=58		Control n=58		P –value
		No.	%	No.	%		No.	%	No.	%	
Diet	Poor habits	42	72.4%	40	69%	0.606	17	29.3%	40	69%	0.562
	Good habits	16	27.5%	18	31%	> 0.05	41	70.7%	18	31%	> 0.05
Physical Activity	Mild activity	47	82%	46	79%	0.100	15	26%	46	79%	5.22
	Moderate activity	11	18%	12	21%		36	62%	12	21%	
	Vigorous activity	0	00.%	0	00.%	>0.05	7	12%	0	00.%	≤0.05*

NB: ns non- statistically significant (p≥0.05) * statistically significant (p≤0.05)

Discussion

Maternity nurses play a crucial role in women's life style improvement, which provides woman education and support. At the same time, the nurse can provide health promotion & psychosocial services include assessment, health education, counseling & appropriate referral.[32-41] This study was conducted to evaluate the effect of lifestyle modification intervention among hyper-androgenic infertile overweight and obese women.

According to the results of the current study, before the intervention, over half and more than one-third of the study and control groups, respectively, exhibited moderate hirsutism. Approximately two thirds of the study group had no apparent terminal hair after the intervention. In the meantime, neither before nor after the intervention, there were any statistically significant differences between the study and control groups. The outcomes of this study aligned with the research conducted by Niranjani et al.,[42] which examined the "Effectiveness of cinnamon, exercise, and counseling on hyperandrogenic symptoms and level of anxiety among young girls with olycystic ovarian syndrome". They found that during Pre-test through Post-test 2, the non-interventional group showed no improvement in score on the Modified Ferriman Gallwey scale (hirsutism), while groups A and B exhibited a decrease of 1 point.

The results of the current investigation showed that, for the study group, there was an improvement in acne vulgaris levels following the intervention. Prior to the intervention, about 25% of the study and control groups had moderate acne, but most of them had mild acne by the end of the intervention. In the meantime, neither before nor after the intervention, there were any statistically significant differences between the study and control groups.

Conversely, these results disagreed with a crossover single-blind trial by Smith et al.[43] that revealed no difference in acne between chocolate and a placebo bar. Subsequent analysis of the chemicals in the placebo bar, however, revealed that the sugar and fatty acid composition were almost exactly the same as those in the chocolate. These variations may be connected to the disparities in the demographics examined in their study of obese and overweight PCOS women.

The current study's findings regarding androgenic alopecia among the hyper-androgenic infertile, overweight, and obese women under investigation showed that the study group's alopecia levels improved following the intervention. Prior to the intervention, two-fifths of the study group had stage II androgen alopecia (visible scalp hair loss), which was subsequently decreased to one-quarter. Furthermore, following the intervention, more than two thirds of them had stage I (minimal thinning barely visible). Meanwhile, there were statistically significant differences between study and control groups after the intervention.

A sedentary lifestyle and high-calorie meals could also contribute to the exacerbation of PCOS. By modifying gut flora, causing chronic inflammation, raising insulin resistance, and increasing androgen production, high-sugar diets may be a factor in PCOS. The defining characteristics of this condition are made worse by obesity and weight gain.[44–48]

Our results were consistent with those of Niranjani et al.'s (2022) investigation into the "Effectiveness of cinnamon, exercise, and counseling on hyperandrogenic symptoms and level of anxiety among young girls with Polycystic Ovarian Syndrome." Additionally, Roya et al.,[49] "study of prevalence, phenotypic features, and lifestyle modifications of polycystic ovarian syndrome patients" corroborated similar findings. They found that altering one's lifestyle can lessen the severity of PCOS and the symptoms of hyperandrogenism (LSM).

The results of the current investigation showed that the hyperandrogenic infertile overweight and obese women under observation had improved in terms of lifestyle and daily habit levels. It reveals that most of the study and control groups had poor habits before the intervention, which improved to most of the study, and less than one-third of the control group had good habits after the intervention, respectively. George,[50] who determined that the majority of the study participants suffered from bad lifestyle dietary habits, further corroborated these findings. This should be addressed early in life with lifestyle treatments as it may increase long-term health risks due to higher body weight. About the overall levels of physical activity among the overweight and obese hyper-androgenic infertile women under study, the results of the current investigation showed that overall physical activity has improved. Two-thirds of the study group had moderate physical activity after the intervention, compared to the majority of the control and study groups who were sedentary before the intervention. Following the intervention, there is a statistically significant difference between the study and control groups.

According to Wang et al.,[51] all of the women in our study who followed a 6-month lifestyle intervention reduced their intake of high-calorie snacks and beverages and increased their moderate to vigorous physical activity compared with women without lifestyle intervention. This study examined the effectiveness of a 6-month lifestyle intervention on diet, physical activity, quality of life, and markers of cardio-metabolic health in women with PCOS and obesity and non-PCOS obese controls. The results of the current study showed that, among the study group of hyper-androgenic infertile overweight and obese women, there is a statistically significant correlation between changes in hyper-androgenic traits (hirsutism, acne, and alopecia) and

lifestyle choices. This is in line with A meta-analysis indicated that hirsutism was an aspect of quality of life most affected by PCOS; however, a more recent systematic review discovered that infertility and weight issues were the two factors most detrimental to HRQoL.[52]

In addition, Cowan et al.,[53] reported significant improvements in hyperandrogenism can be achieved with lifestyle changes (diet and exercise).

The results did not align with the meta-analysis conducted by Benham et al.[54] on 14 studies involving 617 adult women. Their study, "Role of exercise training in polycystic ovary syndrome," revealed that the effects of exercise interventions on reproductive function were not well understood. Differences in the kinds and lengths of therapies and populations investigated may be the cause of this discrepancy.

In brief, the results of the current study declare the infertile women's hyperandrogenic symptoms (hirsutism, face acne, and androgenic alopecia) and lifestyle (diet and physical activity) were achieved and improved after the implementation of the program sessions; the results indicated that there is a significant improvement in women's physical activity. Moreover, the progression of women's good habits grading and regression of women's poor habits grading after the implementation of program sessions compared to before. This improvement could be attributed to the attending of the sessions and the lecture and positive reinforcement or the long-term retention of knowledge, as well as a wide variety of educational methods used.[55–57] Additionally, the distributed Arabic booklets also played a crucial role in attaining and retaining knowledge. Booklets are best used when they are brief, written in plain language, and full of good pictures and when they are used to back up other forms of education. This recommendation is in accordance with Edgar Dale's or the NTL's Pyramid of Learning as cited by Masters, as the pyramid illustrated that individuals can retain 10.0% of what they read and 20.0% of what they see and hear (audiovisual). The same author added that one can retain 50.0% of what he learned by a discussion.[58–73]

Conclusion

For Infertile women with poly cystic ovary syndrome, significant improvements in hyperandrogenic symptoms were achieved with lifestyle changes (diet and exercise).

Recommendations

Based on the results of the study, the following recommendations can be derived:

1. To understand the negative consequences of PCOS on other metabolic organs and their activities, and to increase knowledge related to lifestyle modification intervention, additional research may be useful.
2. Implement research-based nurse information and education programs on the nature, effects, and management of PCOs.
3. The public and professionals should be educated about the benefits of lifestyle changes for women and girls, and nurses and national nurse organizations should play a major part in this effort.

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Conflict of interest

The author declares that there is no conflicts of interest.

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