Life Style Modification Intervention among Infertile Obese Women with Poly Cystic Ovary Syndrome

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Abstract: Background: Polycystic ovarian syndrome is linked to metabolic and reproductive problems and affects 5% to 10% of women who are of reproductive age. The most recent worldwide guidelines on PCOS from 2018 propose lifestyle management as the first-line treatment for PCOS symptoms. **Purpose** was to assess the effect of life style modification intervention on the clinical features of polycystic ovarian syndrome among infertile obese women with polycystic ovarian syndrome. **Design**: A quasi-experimental (study and control groups) design was utilized. **Sample**: A purposive sample of 115 women with infertility, overweight and obese with polycystic ovary syndrome. **Settings**: The study was conducted at gynecological and infertility outpatient clinics and inpatients at Beni-Suef University Hospital. Specialized medical center for infertility. **Instruments**: a structured interview questionnaire, Lifestyle and habits characteristics, the Block Adult Physical Activity (PA) Screener and Follow-up card. **Results**: The present study revealed that there were improvement in menstrual cycle irregularities, fertility and ovulation after six months of the lifestyle modification. **Conclusion**: Lifestyle modifications in the form of diet and exercise should be placed as the first-line treatment for PCOS symptoms able to address clinical and metabolic characteristics. **Recommendations**: Life style modification intervention should be developed for women about the importance of lifestyle change is required to increase their awareness.

Keywords: *infertility, life style modification, obesity, polycystic ovary syndrome (PCOS).*

Introduction

Polycystic ovarian syndrome (PCOS) is one of the most common reasons contributing to female anovulatory infertility. (Gambineri et al., 2019).

Polycystic ovarian syndrome is a hormonal imbalance that results in elevated levels of estrogen, testosterone, and luteinizing hormone

(LH) and decreased follicle-stimulating hormone release (FSH). This disease is associated with other problems related to the hypothalamic-pituitary-ovarian axis in addition to cancers that generate testosterone (Hajivandi et al., 2020). Meanwhile, Meñosa et al. (2023) stated that an estimated 1.55 million women of reproductive age worldwide suffer from PCOS, accounting for 0.43 million disability-adjusted life-years (DALYs). The prevalence of PCOS is estimated to be between 12 and 21% of females of reproductive age worldwide. One of the most prevalent issues among PCOS patients is obesity. Furthermore, there is a strong link between the prevalence of PCOS and obesity. Women with a body mass index (BMI) of less than or equal to 25 kg/m2 are 4.3% more likely to have PCOS than women with a BMI of more than 30 kg/m2 (14%). Furthermore, compared to healthy controls, people with PCOS have a four-fold increased risk of obesity (Cochrane et al., 2021). In addition, Gu et al., 2022 stated that Lifestyle changes (diet, exercise, sleep, and so forth) are the first line of treatment for PCOS. Are thought to contribute to the development of PCOS by controlling normal testosterone levels, maintaining a balanced weight, and regulating insulin sensitivity. According to a report, in overweight or obese an ovulatory PCOS patient, lifestyle modifications also seem to affect the restoration of ovulation and normal menstrual cycles, as well as improve the likelihood of pregnancy. Nurses can have a positive effect on women with PCOS through counseling and education. Support patients who are struggling with low self-esteem as a result of PCOS's physical expression. To avoid long-term health issues, educate the patient about the syndrome and the risk factors that go along with it. Encourage the patient to adopt healthier habits. Make suggestions for nearby support groups so that the patient can develop coping mechanisms (Akers, 2023).

Significance of the study

Polycystic ovarian syndrome is the most prevalent endocrinopathy among women of reproductive age, with a prevalence ranging from 8% to 13%. In addition, the prevalence might reach one in three among women who are overweight (Öberg, E. (2022).

Recently, many researchers examined the effect of lifestyle change in PCOS women's and suggested that diet, exercise, and weight loss are recommended as the first line of treatment for women's with PCOS; these changes should precede pharmacological treatment (Afefy et al., 2019).

So, this study will be conducted to evaluate the effect of lifestyle modifications on PCOS symptoms among infertile obese and overweight women.

Purpose of the Study

To evaluate the effect of Lifestyle modification intervention among infertile overweight and obese women with polycystic ovary syndrome.

Research Hypothesis

1) Obese and overweight women with polycystic ovarian syndrome who will receive lifestyle modification

interventions are expected to experience a reduction related to symptoms suggesting hyperandrogenic (hirsutism, acne vulgaris, and androgenic alopecia) after the intervention program than those who do not receive it.

2) Obese and overweight women with polycystic ovarian syndrome who will receive lifestyle modification interventions are expected to experience a reduction in menstrual irregularity (as measured by frequency and duration of menstrual cycle) and lead to improved fertility and ovulation function after the intervention program than those who do not receive it.

3) Obese and overweight women with polycystic ovarian syndrome who will receive lifestyle modification interventions are expected to experience a reduction in the metabolic measure after the intervention than those who do not receive it.

4) Obese and overweight women with polycystic ovarian syndrome who will receive lifestyle modification interventions are expected to experience a reduction in the metabolic measure after the intervention than those who do not receive it.

Methods

Research Design:

A quasi –experimental design (study and control groups) was used to carry out the present study.

Settings:

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

Sample type and size:

A purposive sample of 116 women with infertility, overweight and obese with polycystic ovary syndrome. The study group consisted of 58 patients who received lifestyle modification intervention, while the 58 patients in the control group received only routine care.

Instruments:

Data was collected using instruments, which are developed by the researcher and revised by qualified experts, then tested for validity and reliability.

Instrument one: (Arabic Structured interviewing questionnaire (Arabic Structured interviewing questionnaire) Adapted from (Mostafa et al., 2012).

The instrument consisted of four parts that were revised by three professors at the Maternal and Newborn Health Department and then tested for validity and reliability.

- **Part 1**: Basic data (nine questions): Telephone number, Age, Residence, marital status, employment, Length, etc.
- **Part 2**: This part is concerned with women's menstrual, and reproductive/ gynecological history.

- **Part 3** Features of hyperandrogenism (three questions): Included questions about hirsutism, acne, and androgen-related alopecia.

Scoring system of Instrument 1:

Hirsutism

Scoring system for each item ranged from One (little invisible hair growth) to four (very thick hair) (Kahraman & Erdoğan, 2021).The total score:

- A total score of ≤33.3% indicates no hirsutism (0-12)
- A total score of >33.3%-66.6% indicates mild hirsutism (>12-24)
- A total score >66.6%-100% indicates moderate to severe hirsutism (>24-36)

Acne vulgaris:

The total score was adopted from Shahbag (2017) and assessed by summation of sub-scores in the six areas:

- ❖ A total score of 25% indicates no acne (0-6)
- ❖ A total score of >25%-50% indicates mild acne (>6-12)
- ❖ A total score >50%-75% indicates moderate acne (>12-18)
- ❖ A total score >75%-100% indicates severe acne (>18-24)

Androgenic alopecia

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) (Kahraman & Erdoğan, 2021).
For those who had androgenic alopecia, the degree of alopecia was assessed using the Ludwig scale as:

- ❖ Stage I: begins with thinning on the top of the head.
- ❖ Stage II: the scalp starts to show.
- ❖ Stage III: all the hair at the crown of the head may be lost.
- **Part 4**: Included questions about Disease History (20questions): included questions related to the age was the diagnosis of PCO made, the time of onset of symptoms, the treatment line followed by your doctor, symptoms experiencing among PCOS.

Instrument two: Lifestyle and habits characteristics:

- **Part 1** Data about Nutrition Habits (10 questions): It includes data about food and soft drinks.

Scoring system for each item:

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 (Shahar, et al., 2003)

Total scores:

- ❖ Poor habits if score < 60% of total scores that mean (0-24).
- ❖ Good habits if score ≥ 60 % of the total score, that means (25-40).
- **Part 2** the Block Adult Physical Activity (PA) Screener was the predictor for physical activity. This instrument assessed the frequency and duration of job-related, daily life, and leisure activities. 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 (Sternfeld et al., 2009). 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).

Follow-up card:

Arabic card was constructed by the researcher to assess the outcome measures.

All participants included assessment of the following:

1) Anthropometric measures (Body mass index, Waist circumference)

a) Body mass index = weight in kg /height^2 (in meter)

BMI categories:

❖ Underweight: < 18.5 kg/m^2
❖ Normal: 18.5- 24.9 kg/m^2
❖ Overweight: 25 -29.9 kg/m^2
❖ Obese: 30- 39.9 kg/m

b) Waist circumference: Start measuring with a tape measure at the level of the umbilicus at the top of the hipbone, and then wrap it around the body without being too loose or too tight (Zeng et al., 2022)

Waist circumference categories:

❖ Normal (≤ 88 cm).
❖ Increased (> 88 cm).

2) Signs of hyperandrogenism

❖ Hirsutism
❖ Acne

❖ Androgenic alopecia

Supportive material (Arabic Booklet):

It was designed by the researcher based on a literature review. It was designed in the form of a handout (booklet) using simple Arabic language and different illustrative pictures to facilitate understanding its content. It contained information about polycystic ovary syndrome. Part I e.g. (Definition of polycystic ovary syndrome, signs, symptoms, risk factors, diagnosis, and medical treatment. Part II: lifestyle modification interventions (such as; exercise and diet).

Validity and Reliability:

The face validity of the study instruments was assessed by a jury group consisting of three experts in the obstetrics and gynecological nursing department of the Faculty of Nursing, Menoufia University for comprehensiveness, accuracy, and clarity in language.

Reliability

Cronbach's α scores ranging from 0.80 to 0.95 for instruments one and two.

Ethical consideration:

Approval of the Faculty of Nursing Ethical and Research Committee, Menoufia University was obtained A written consent was obtained from all participants who met the inclusion criteria to participate in the study. Confidentiality and anonymity of nurses was assured through coding all data and all informations obtained would only be used for the purpose of th study. All participants were informed

about the purpose, procedure and benefits of the study. They were informed that participation in the study was voluntary and they can withdraw from the study at any time without penalty. Moreover, they were assured that the nature of instruments would not cause any physical or emotional harm to them.

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. All pregnant women who participated in the pilot study were excluded from the study participants because the researcher rephrased some questions and sentences and then set the final fieldwork schedule.

Procedure:

An official letter was submitted from the Dean of the Faculty of Nursing, Menoufia University to the director of medical center for the treatment of infertility including the purpose of the study and methods of data collection. Data collection of the study was started at the beginning of October 2023 and completed by the end of March 2024 (6 months).

Preparatory phase:

Data was collected about PCO and lifestyle of infertile and obese women.

Planning phase:

Based on the analysis of the data obtained from the assessment phase, and review of the related literature a lifestyle educational intervention was planned

Implementation phase (for the study group only):

The lifestyle modification intervention was implemented in the training halls in the study settings. The researcher started to explain the lifestyle modification intervention for the women was used for comparison between two groups having qualitative variables.

- The level of significance was set at a
- ❖ A P value of > 0.05 was considered statistically non-significant.
- ❖ A P value of ≤ 0.05 was considered statistically significant.
- ❖ A P value of ≤ 0.001 was considered highly statistically significant.

Results

Table 1 shows characteristics of studied infertile, overweight, and obese women with polycystic ovary syndrome. It revealed that there were no statistically significant differences between the study and control groups regarding their socio-demographic data in terms age, level of education, residence, marital status, employment (p value > 0.05).

Table 2 shows the Anthropometric measures of the studied infertile, overweight, and obese women with polycystic ovary syndrome. It revealed that there were highly statistically significant differences between the

study and control groups regarding the Anthropometric measures (weight, BMI, Thigh circumference) after the intervention (p value > 0.001). Also, there were statistically significant differences between the study and control groups regarding waist circumference after intervention (p value > 0.05). Meanwhile, there were no statistically significant differences between the study and control groups before the treatment (p value > 0.05).

Table 3 shows the total hirsutism levels and total acne vulgaris levels among the studied infertile, overweight, and obese women with polycystic ovary syndrome. It revealed that there were highly statistically significant differences between the study and control groups after the intervention (p value < 0.001). It also revealed that there were no statistically significant differences between the study and control groups before the intervention (p value > 0.05).

Regarding total acne vulgaris levels among the studied infertile, overweight, and obese women with polycystic ovary syndrome. It revealed that there were statistically significant differences between the study and control groups after the intervention (p-value < 0.05). It also revealed that there were no statistically significant differences between the study and control groups before the intervention (p-value > 0.05).

Figure 1 shows the total androgenic alopecia levels among the studied infertile, overweight, and obese women with polycystic ovary syndrome. It reveals that 12.1% and 13.8% of the study and control groups were in stage III before the intervention, compared to 3.4% and 10.3% of them after the intervention, respectively.

Table 4: lipid profile and investigation among the studied infertile overweight and obese women with polycystic ovary syndrome. It revealed that there were highly statistically significant differences between the study and control groups after the intervention (p-value < 0.001). It also revealed that there were no statistically significant differences between the study and control groups before the intervention (p-value > 0.05).

Table 5 shows the total lifestyle and daily habit levels among the studied infertile overweight and obese women with polycystic ovary syndrome. It revealed that there were highly statistically significant differences between the study and control groups after the intervention (p value < 0.001). It also revealed that there were no statistically significant differences between the study and control groups before the intervention (p value > 0.05).

Table 6 showed that there was a significant association between the socio-demographic data and their total nutrition habits levels among the study group of infertile, overweight, and obese women with polycystic ovary syndrome. It revealed that there were highly statistically significant differences between the study and control groups after the intervention (p-value < 0.001). It also revealed that there were no statistically significant differences between the study and control groups before the intervention (p-value > 0.05). This means that there is more noncompliance and resistance

to change in lower-aged, primary education, rural residence, and unemployment.

Table 7 showed that there was a significant association between hyperandrogenic features, physical activity levels, and lifestyle dietary habits among the study group of infertile, overweight, and obese women with polycystic ovary syndrome. It revealed that there were statistically significant differences between the study and control groups after the intervention regarding androgenic alopecia (p-value < 0.05). Meanwhile, there were highly statistically significant differences between the study and control groups after the intervention regarding acne and hirsutism (p-value < 0.001). Furthermore, there were no statistically significant differences between the study and control groups before the intervention (p-value > 0.05).

Table 1: Characteristics of Studied Infertile Overweight and Obese Women with Polycystic Ovary Syndrome (n = 116)

Variables	Study n=58		Control n=58		χ^2	χ^2 P –value
	No.	%	No.	%		
Age (years)						
18-24	4	6.9%	6	10.3%	0.09ns	> 0.05
25-30	31	53.4%	28	48.3%		
31-35	23	39.7%	19	32.7%		
≥36	0	0.00	5	8.7%		
Mean±SD	28.7±2.87		28.8±3.00			
Level of education						
Primary education	9	15.5%	13	22.4%	2.05ns	> 0.05
Secondary education	17	29.3%	18	31%		
Higher education	32	55.2%	27	46.6%		
Residence						
Urban	32	55.2%	31	53.4%	0.03ns	> 0.05
Rural	26	44.8%	27	46.6%		
Marital status						a
Married	58	100.0%	58	100.0%		a
Employment						
Employed	28	48.3%	26	44.8%	0.13ns	> 0.05
Unemployed	30	51.7%	32	55.2%		

Table (2) Anthropometric Measures of Studied Infertile Overweight and Obese Women with Polycystic Ovary Syndrome (n = 116)

Variables	Before the intervention				χ^2 P –value	After the intervention				χ^2 P –value
	Study n=58		Control n=58			Study n=58		Control n=58		
	No.	%	No.	%		No	%	No.	%	
Length					t 0.12 > 0.05 ns					t 0.12 > 0.05 ns
Mean±SD	161.4±6.51		161.6±6.55			161.4±6.51		161.6±6.55		
Weight					t 0.04 > 0.05 ns					t 4.91< 0.001**
Mean±SD	85.1±10.77		85.1±10.56			76.5±8.33		85.1±10.56		
BMI										
BMI 18.5-24.9: normal weight	0	0.00	0	0.00	t 0.18 > 0.05 ns	3	5.2%	0	0.00	t 4.45 ≤ 0.001**
BMI ≥25.0: overweight	17	29.3%	21	36.2%		35	60.3%	24	41.4%	
BMI ≥30.0: Obesity	41	70.7%	37	63.8%		20	34.5%	34	58.6%	
Mean±SD	32.4±4.21		32.5±4.05			29.5±3.42		32.5±4.01		
Waist circumference										
≤88	13	22.4%	19	32.7%	t 1.92 > 0.05 ns	31	53.4%	21	36.2%	t 1.96 ≤ 0.05 ns
≥88	45	77.6%	39	67.3%		27	46.5%	37	63.8	
Mean±SD	86.0±6.37		88.24±5.79			85.0±6.09		88.24±5.78		
Thigh circumference					t 0.04 > 0.05 ns					t 3.976 < 0.001**
Mean±SD	110.7±4.75		110.7±4.07			107.8±3.71		110.7±4.07		

Table (3) Total Hirsutism Levels and Acne Vulgaris Levels among the Studied Infertile Overweight and Obese Women with Polycystic Ovary Syndrome (n = 116)

Variables	Before the intervention				χ^2 P –value	After the intervention				χ^2 P –value
	Study n=58		Control n=58			Study n=58		Control n=58		
	No.	%	No.	%		No.	%	No.	%	
Total Hirsutism Levels										
No hirsutism	14	25%	24	40%	0.396ns > 0.05	39	66%	24	40%	60.70 ≤ 0.001**
Moderate hirsutism	26	45%	23	39%		13	23%	23	39%	
Severe hirsutism	18	30%	11	21%		6	11%	11	21%	
Total Acne vulgaris Levels										
Mild acne	35	60.4%	38	66%	0.000ns > 0.05	49	84%	38	66%	3.052ns <0.05*
Moderate acne	15	25.8%	16	26%		7	12.5%	16	26%	
Severe acne	8	13.8%	4	8%		2	3.5%	4	8%	

Figure 1: Total Androgenic Alopecia Levels Among the Studied Infertile Overweight and Obese Women with Polycystic Ovary Syndrome (n = 116)
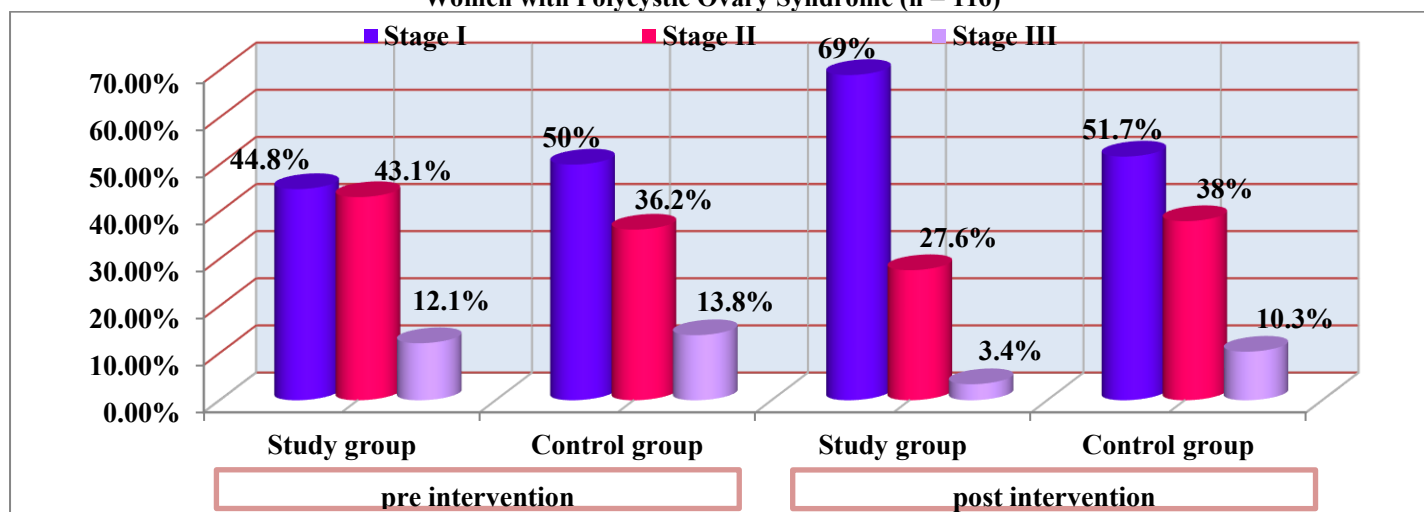

Table 4: Lipid Profile and Investigation among the Studied Infertile Overweight and Obese Women with Polycystic Ovary Syndrome (n = 116).

Variables	Before intervention				χ^2 P –value	After intervention				χ^2 P –value
	Study n=58		Control n=58			Study n=58		Control n=58		
	No	%	No	%		No	%	No	%	
Total cholesterol(CHO) (130 -240(mg/dl)										
Normal	26	44.8%	27	46.5%	2.14ns > 0.05	32	55.2%	27	46.5%	163.4<0.01
Above normal	32	55.2%	21	53.5%		26	44.8%	21	53.5%	
Mean +SD	184.7 ±39.3		188(±35.2)			162.9± 3.7		188(±35.2)		
LDL cholesterol (79- 180(mg/dl)										
Normal	24	41.4%	41	70.7%	2.14ns > 0.05	29	50%	41	70.7%	40.44**<0.001
Above normal	34	58.6%	17	29.3%		29	50%	17	29.3%	
Mean +SD	113.9(±36.3)		114.6(±25.6)			99.9± 23.5		114.6(±25.6		
Triglyceride(TG) (32 - 61(mg/dl)										
Normal	25	43.1%	47	81%	2.14ns > 0.05	31	53.4%	47	81%	78.06**<0.001
Abnormal	33	56.9%	11	19%		27	46.6%	11	19%	
Mean +SD	80(±6.1)		78(±9.2)			76.5 ±7.7		78(±9.2)		
HDL (42 -56(mg/dl)										
Normal	21	36.2%	35	60.3%	0.454	33	56.9%	35	60.3%	81.35**<0.001
Below normal	37	63.8%	22	39.7%		25	43.1%	22	39.7%	
Mean +SD	41.8(±2.3)		41(±1.8)			43.2 ±1.6		41(±1.8)		
FBG (71 - 91(mg/dl)										
Normal	52	89.6%	53	91.3%	**0.38ns** > 0.05	55	94.8%	53	91.3%	74.08**<0.001
Abnormal	6	10.4%	5	8.7%		3	5.2%	5	8.7%	
Mean +SD	84.7(±5.1)		84.5(±4.4)			82.1± 5.3		84.5(±4.4)		
Pregnancy test rate (HCG) (before – during- after the intervention)										
Positive	-	-	-	-	aa	21	36.2%	7	12%	68.06**<0.001
Negative	58	100%	58	100%		37	63.8%	51	88%	

Table5: Total Lifestyle and Daily Habit Levels among the Studied Infertile Overweight and Obese Women with Polycystic Ovary Syndrome. (n = 116)

Variables	Before the intervention				χ^2 P –value	After the intervention				χ^2 P –value
	Study n=58		Control n=58			Study n=58		Control n=58		
	No.	%	No.	%		No.	%	No.	%	
Total lifestyle and daily habits Levels					0.606 > 0.05 ns					045.26< 0.001**
Poor habits	42	72.4%	40	69%		17	29.3%	40	69%	
Good habits	16	27.5%	18	31%		41	70.7%	18	31%	
Total lifestyle and daily habits Levels										
Mild physical activity (sedentary lifestyle)	47	82%	46	79%	0.100 > 0.05ns	15	26%	46	79%	5.22 ≤0.05* 11
Moderate physical activity	11	18%	12	21%		36	62%	12	21%	
Vigorous physical activity	-	-	-	-		7	12%	-	-	-

Table 6: Relationship between Characteristics and Nutritional Habits Levels Of Infertile Overweight and Obese Women Study Group (n=58)

Variables	Before the intervention				χ^2 P – value	After the intervention				χ^2 P –value	Total
	Poor habits		Good habits			Poor habits		Good habits			
	No 42	%	No 16	%		No. 17	%	No 41	%		
Age											
18-24	2	50	2	50	2.000 ns > 0.05	2	50	2	50	65.55** <0.001	4
25-30	24	77.4	7	22.6		8	25.8	23	74.2		31
31-35	16	69.7	7	30.4		7	30.4	16	69.7		23
≥36	-	-	-	-		-	-	-	-		-
Primary education	7	77.8%	2	22.2%	15.105 * < 0.05	6	66.6%	3	33.3%	5.32* < 0.05	9
Secondary education	14	82.3%	3	17.7%		6	35.3%	11	64.7%		17
Higher education	21	65.6%	11	34.4%		5	15.6%	27	84.4%		32
Residence											
Urban	22	68.7%	10	31.3%	2.000 ns > 0.05	5	16.6%	27	84.4%	61.05** ≤ 0.001	32
Rural	20	77%	6	23%		12	46.2%	14	53.8%		26
Employment											
Employed	22	78.6%	6	21.4%	2.000 ns > 0.05	3	10.7%	25	89.3%	112.12** ≤ 0.001	28
Un employed	20	66.7%	10	33.3%		14	46.6%	16	53.4%		30

Discussion

The findings of the current study revealed that the mean age in the study and control groups was twenty-eight years, respectively. This finding might be because the incidence of PCOS increases among women at reproductive age. This finding came in agreement with Amirjani et al. (2019), who studied the "dietary intake and lifestyle behavior in different phenotypes of polycystic ovarian syndrome", in Iran. From the researcher's point of view, these results may be justified that PCOS is a very common endocrine disorder among women of reproductive age.

Regarding weight and BMI, The findings of the current study revealed that the weight in the study and control groups was eighty-five before the intervention, compared to seventy-six and eighty-five after the intervention, respectively. However, the mean BMI in the study and control groups was thirty-two before the intervention, compared to twenty-nine and thirty-two after the intervention, respectively. This finding might be because the prevalence of overweight and obesity in women is as high as 80%.

These findings came in agreement with Lass et al. (2011), who studied the "Effect of lifestyle intervention on features of the polycystic ovarian syndrome". They revealed that the mean BMI in the study and control groups was above thirty-two before the intervention, compared to twenty-eight in the study group after the intervention.

Also, in line with the present findings, these results agreed with Haqq et al.

(2014), who pointed to the positive effects of lifestyle modification interventions on the reduction of weight in patients with obesity and PCO.

From the researcher's point of view, many studies identified the positive effects of lifestyle modification interventions on the reduction of weight in patients with obesity and PCO. And more than half of the study group is young, aged twenty-five to thirty years.

The findings of the current study revealed that the mean waist circumference in the study and control groups was eighty-six and eighty-eight before the intervention, compared to eighty-five and eighty-eight after the intervention, respectively. Additionally, the mean thigh circumference in the study and control groups was one hundred and ten before the intervention, compared to one hundred seven and one hundred ten after the intervention, respectively. This may be rationalized by confirming that lifestyle interventions have been shown to have positive effects on improved body sculpture.

These findings came in agreement with Öberg (2022 who studied "Effects of Lifestyle Intervention in Overweight Women with Polycystic Ovary Syndrome" in Sweden. His study revealed that there was a significant reduction in waist circumference before and after intervention in the study group.

On the contrary, these findings were inconsistent with Serrao (2013) in Saskatoon, who revealed that lifestyle

interventions did not affect waist circumference. From the researcher's point of view, this could be related to the patient's residence in a rural area and not having adequate access to adherence to sports and adequate exercise.

Moreover, there was a significant relationship between menstrual dysfunction and WC. Most of the study group had irregular menstrual cycles and a waist circumference of ≥88 before intervention compared to the majority of the study group, who had regular menstrual cycles of ≤88 and a waist circumference after intervention.

According to the researcher, this may be justified as subscapular skinfold, supra iliac skinfold, and triceps skinfold thicknesses (which are indicators of subcutaneous fat) were significantly attributed to menstrual disorders.

These findings are similar to the study done by Taheri et al. (2020), who studied "Nutritional status and anthropometric indices concerning menstrual disorders," which showed that there was a significant statistic between menstrual irregularity and WC.

The current study revealed that there was marked improvement of symptoms suggesting hyperandrogenic (hirsutism) after the intervention of the program. About less than half and more than one-quarter of the study and control groups had moderate hirsutism before the intervention, which was decreased to about two-thirds among the study group with no terminal hair visible after the intervention, respectively.

These findings came in agreement with Niranjani et al. (2022), who studied "Effectiveness of cinnamon, exercise, and counseling on hyperandrogenic symptoms and level of anxiety among young girls with Polycystic Ovarian Syndrome.".

On the contrary, these findings were inconsistent with those of PRAMOD (2023), who studied dietary and physical activity patterns in PCOS women

From the researchers' point of view, these differences might be because of the different sample weights; the mean weight in their study is 65 kg.

Regarding acne vulgaris levels, the current study findings revealed that there is an improvement in acne vulgaris levels after the intervention for the study group According to the researcher's point of view, this may be explained by the fact that the majority of girls had a wish for a good body image which was an incentive to adhere to the change in their lifestyle.

This finding disagreed with Niranjani et al. (2022) who studied "Effectiveness of cinnamon, exercise, and counseling on hyperandrogenic symptoms and level of anxiety among young girls with polycystic ovarian Syndrome" in India

From the researchers' point of view, these differences might be because of the different samples' BMI (22.2 kg/m²).

Regarding androgenic alopecia levels there was an improvement in alopecia levels after the intervention for the study group. Less than half of the study group suffered from stage II androgen alopecia before the intervention, which

was reduced to more than two-thirds of them had visible hair loss after the intervention. These findings may be rationalized as a healthy diet reduces weight and leads to reduced insulin resistance and free testosterone, which reduce hair loss.

These findings came in agreement with Niranjani et al. (2022) who studied "Effectiveness of cinnamon, exercise, and counseling on hyperandrogenic symptoms and level of anxiety among young girls with polycystic Ovarian Syndrome" in India.

Regarding obstructive sleep apnea, the current study findings revealed that there is a significant improvement in obstructive sleep apnea after the intervention; about two-fifths of the study group had obstructive sleep apnea before the intervention, compared to three-quarters of them did not having obstructive sleep apnea after the intervention, respectively. This may be related to obesity increase. The risk for OSA. It has been suggested that obesity leads to the narrowing of the upper airway structure

This was inconsistent with Araghi et al. (2013), who studied the "Effectiveness of lifestyle interventions on obstructive sleep apnea (OSA).

Regarding lipid profile and investigation, the current study findings revealed that there was a significant reduction in total cholesterol (CHO) and LDL cholesterol levels, fasting glucose level, total triglyceride, and HDL

This was similar to some extent to Niranjani et al. (2022), who studied "Effectiveness of cinnamon, exercise, and counseling on hyperandrogenic

symptoms and level of anxiety among young girls with Polycystic Ovarian Syndrome" in India, who revealed that it reduces glucose, triglycerides, low-density lipoprotein (LDL), and total cholesterol and also improves insulin sensitivity in women with Polycystic Ovarian Syndrome (PCOS).

The agreement between the current and previous studies from the researcher's point of view reflects the efficiency of weight loss intervention has an important treatment modality for PCOS.

On the contrary, these findings were inconsistent with Liu et al. (2021), who studied "Lifestyle intervention for overweight/obese pregnant women with polycystic ovarian syndrome: lessons and challenges" in China. This showed that intensive lifestyle intervention, including dieting and exercise, did not affect GWG and glucose and lipid profiles of overweight/obese women with PCOS.

From the researchers' point of view, these differences might be due to the effect of pregnancy on the lipid profile. In a normal pregnancy, total cholesterol levels increase by half, LDL-C by more than one-third, HDL-C by one-quarter, and triglycerides by two to threefold.

The current study findings revealed that there is an improvement in lifestyle and daily habit levels among the studied infertile overweight and obese women with polycystic ovary syndrome. According to the researcher's point of view, the reduction of weight and physical activity was the first line of therapy for reproductive-age women with PCOS.

These results came in agreement with Eleftheriadou et al. (2015), who studied "Dietary Habits in Adolescent Girls with Polycystic Ovarian Syndrome" in Greece and found that poor eating habits were demonstrated in this group of adolescent PCOS patients.

Furthermore, these findings were supported by an Indian study conducted by George (2021), who concluded that most of the studied participants suffered from poor lifestyle dietary habits.

From the researcher's point of view, this may contribute to the development of obesity in later life.

Regarding total physical activity levels among the studied infertile, overweight, and obese women the current study findings revealed that there is an improvement in total physical activity. The majority of the study and control groups had mild physical activity (sedentary lifestyle) before the intervention, compared to two-thirds of the study after the intervention had moderate physical activity.

These results came in agreement with Wang, Z., et al. (2021), who studied "Effectiveness of a six month lifestyle intervention on diet, physical activity, quality of life, and markers of cardiometabolic health in women with PCOS and obesity and non-PCOS obese controls" in China

According to the researcher's point of view, this may be justified as exercise training improves an array of health-related outcomes, including protection against the development of cardiovascular disease (CVD) and diabetes, reduced morbidity and

mortality, and psychological benefits including improvements in mood and psychological well-being. Participation in regular exercise is also a key predictor of long-term weight maintenance.

However, results were in disagreement with Zhang et al. (2018) Also Mutsaerts et al. (2013), who revealed that women with PCOS did not show a different change in lifestyle According to the researcher's point of view, this disagreement may be attributed to the type and intensity of physical activity.

The current study findings revealed that there is a significant association between the characteristics of women and their nutrition habits especially among the study Younger-age , lower-educated women and rural residents had poor lifestyle habits and less compliance to live lifestyle modification programs. These findings may be rationalized as younger women were recently married On the other hand, educated women getting had more information sources about their condition through the internet or media than illiterate women.

Also, this was in line with de Abreu et al. (2013), who studied "low compliance with dietary recommendations for food intake among adults in Brazil, who revealed that older women were more compliant than younger with all recommendations.

These results were supported by Tay et al. (2023), who studied "high prevalence of medical conditions and unhealthy lifestyle behaviors in women with PCOS during preconception in

Australia and found out that better-educated women were be more proactive in healthcare engagement and adopted healthier lifestyle choices. The agreement between the current study and the previous studies from the researcher's point of view may be justified as the educational level can highly affect patient's perception of their condition, thus influencing the level of early detection, diagnosis, and treatment.

The current study findings revealed that there was a significant positive association between hyperandrogenic features, physical activity levels, and lifestyle dietary habits among the study group of infertile overweight and obese women with polycystic ovary syndrome. Changing dietary habits and moderate exercise reduces hyperandrogenic features with polycystic ovary syndrome.

These results came in agreement with Jedel et al. (2011), who studied theimpact of electro-acupuncture and physical exercise on hyperandrogenism and oligo/amenorrhea in women with polycystic ovary syndrome in Sweden.

Conclusion

Based on the findings of the present study, it can be concluded that lifestyle modification interventions for obese and overweight women with polycystic ovarian syndrome can improve and decrease polycystic ovarian syndrome symptoms.

Recommendations

Based on the findings of the present study, the following recommendations can be suggested:

- Educational programs should be developed to raise awareness about the importance of diet and exercise for women with Polycystic Ovary Syndrome (PCOS).
- A comparative study can be conducted to assess the effect between the vigorous exercise and mild to moderate exercise on PCOS symptoms.

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