

Androgen-Related Alopecia and Infertility: Impact of Lifestyle Modifications

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Abstract

Background: Dietary changes and regular exercise are the first-line treatments for obese women with hyperandrogenism. Extreme weight and infertility all have strong correlations. Even small lifestyle adjustments can make a big difference, and in obese anovulatory women

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

Subjects and Methods: Using a purposive sample, 116 hyper-androgenic infertile overweight women were studied using a quasi-experimental research design at gynecological and infertility outpatient and inpatient clinics as well as a specialized medical center for the treatment of infertility and delayed childbearing affiliated with Beni-Suef University Hospital in Egypt. Arabic is the first tool. The Ludwig Scale, which measures female baldness, and basic sociodemographic data are included in the structured interviewing questions. (2): Characteristics of lifestyle and habits that were classified into: Part I: Information regarding eating habits Section II: Adult Physical Activity Block (PA) The predictor of physical activity was the screener.

Results: Statistically significant association between androgenic alopecia levels and lifestyle dietary habits was observed after program implementation ($p < 0.05$). 28.6% of moderate activities of the studied group have had stage III androgenic alopecia levels before intervention compared to 0% after intervention. Statistically significant association between androgenic alopecia levels and physical activity level habits was found ($p < 0.05$).

Conclusion: For obese and overweight infertile women with PCOs, lifestyle modification therapies significantly improve the levels of androgenic alopecia.

Recommendations: Maternity and gynecologic health nurses need proper knowledge and skills to help clients adjust to daily challenges, and continuous training in fertility settings is necessary to understand psychological and social impacts.

Keywords: androgenic alopecia; lifestyle; modifications; infertile women

Introduction

According to the Rotterdam criteria, the prevalence of polycystic ovarian syndrome in adolescents was 11.04% (95% CI: 6.84-16.09%); according to the criteria of the National Institute of Health, it was 3.39% (95% CI: 0.28-9.54%); and according to the criteria of the Androgen Excess and Polycystic Ovary Syndrome Society, it was 8.03% (95% CI: 6.24-10.01%). This study demonstrated that the prevalence of PCOS in adolescents varies depending on many parameters (Naz et al., 2019).

According to the 2012 National Institutes of Health (NIH) workshop study, about 5 million American women of reproductive age are thought to be affected by PCOS. Not adding the price of major comorbidities linked to

PCOS, the cost of identifying and treating PCOS is about \$4 billion yearly for the healthcare system (Leon et al., 2022). According to American Nurses Today, PCOS is the most prevalent endocrine condition in women of childbearing age, impacting one in ten females in the United States (John, 2021).

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 (Zeng et al., 2020; Hassan et al., 2019b; Mohamed & Hassan, 2020; Hassan & Farag, 2019). 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 (Di Lorenzo, et al., 2023; Mohammed et al., 2018; Nady et al., 2017; Sheha et al., 2018; Hassan et al., 2015; Emem & Hassan, 2017).

The main clinical sign of high levels of androgen is female pattern hair loss (formerly known as androgenic alopecia). Female androgenetic alopecia (FAGA) is a prevalent cause of non-scarring alopecia in women. After puberty, the onset can happen at any age, and as you get older, it happens more frequently. Clinically, it manifests as a generalized loss of hair throughout the center scalp, while the frontal hairline is typically preserved (Kamenov & Gateva, 2020; Nady et al., 2018a; Hassan, 2016; Gamel et al., 2019; Hassan, 2019a)

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

I. 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 (Armanini et al., 2022).

b) 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 (Calcaterra, et al., 2023).

II. Surgical treatment: a) Laparoscopic ovarian drilling, b) Bariatric surgery, and c) Assisted Reproductive Technology

III. Non-pharmacological interventions (Lifestyle interventions):

The most recent global guidelines on PCOS from 2018 suggest that the first line of treatment for PCOS symptoms be lifestyle control by dietary changes, physical activity, behavioral modification, or a combination of these. All of the symptoms of PCOS can be alleviated by losing weight (Hoeger et al., 2023; Nady et al., 2014; Hassan et al., 2015; Hassan et al., 2016; Hassan, 2020b; Mostafa et al., 2018) Although the majority of doctors advocate lifestyle changes for the management of PCOS, the majority of PCOS patients said that they infrequently receive recommendations for lifestyle changes from their therapists (Nemchikova & Frontoni, 2022; Hassan, 2020a; Mohamed et al., 2024; Nady et al., 2018b).

Aim of the study:

This study was conducted to evaluate the effect of lifestyle modification intervention alopecia among infertile overweight and obese women with PCOs.

Study Hypotheses:

Infertile overweight and obese women who will receive lifestyle modification interventions will experience an improvement and decrease alopecia.

Materials and Methods:

A quasi-experimental design (Study-Control) was utilized to fulfill the purpose of this study. 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. A purposive sample of hyper-androgenic infertile overweight and obese women who attended the previously mentioned sitting will be selected, and fulfilled the following criteria; Women are medically diagnosed with hyper-androgenism (according to specific medical criteria related to PCOs); At reproductive age (18-40 years); Body mass index $>25\text{kg/m}^2$ (overweight and obese women). The sample size was estimated to be 116 women (Study-control), Women will be divided into two equal groups.

Tools

Tool (1): Arabic Structured interviewing questionnaire divided into two parts: **Part I.** Basic data and sociodemographic characteristics. **Part II.** Features of hyper-androgenism included questions about androgen-related 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 (Carmina et al., 2019). 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).

Scoring system: For those who had alopecia, the degree of alopecia was assessed using the Ludwig scale as:

Stage I: begins with thinning on the top of the head. Not visible hair loss

Stage II: Hair loss with the scalp starts to show

Stage III: all the hair at the crown of the head may be lost (Severe hair loss with baldness)

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

Part I: Data about nutrition habits: score was adopted from (Shahar, et al., 2003):

Poor habits if score $< 60\%$ of total scores that mean (0-21.5).

Good habits if score $\geq 60\%$ of the total score, that means (21.6-36).

Part II the Block Adult Physical Activity (PA) Screener was the predictor for physical activity. 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).

Pilot study:

The pilot study was carried out on 10% of the total study sample (10 women) to evaluate the applicability, efficiency.

Field Work:

Data collection of the study was started at the beginning of October 2023 and completed by the end of March 2024 (6 months). The fieldwork of this study was carried out through preparatory, interviewing and data gathering, planning, implementation, follow, and evaluation phases.

The study involved a literature review, data collection tools development, and expert validation. The interviewing and assessment phase involved questionnaire distribution to assess socio-demographic characteristics, lifestyle habits, and baseline measures. Oral consent was obtained from all participants, and anthropometric measurements were performed for body mass index, hirsutism score, and acne grade.

The researcher recruited women from gynecological and infertility outpatient clinics and specialized medical centers to implement a lifestyle modification intervention. The intervention aimed to achieve 5-10% weight loss or a BMI $< 29\text{kg/m}^2$ within six months. Participants were provided with three educational sessions, covering hyper-androgenism definition,

symptoms, complications, weight reduction, energy-restricted diet, eating behaviors, and physical activity.

The researcher created an Arabic card to assess hyperandrogenism, followed up monthly with interviews and regular appointments. After six months, the program was evaluated for anthropometry measures, menstrual cycle, hirsutism changes, and acne grade. Posttests were conducted for both control and study groups, with the control group receiving routine care and an educational booklet 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

Figure 1 shows the androgenic alopecia and other co-morbidities among the studied infertile overweight and obese women with polycystic ovary syndrome. It shows that the top of the head thinning occurs in 44.8% and 50% of the study group and control groups, respectively. Prior to the intervention, there was no discernible hair loss; after the intervention, that percentage was 51.7% and after it was 69.0%.

Furthermore, 89.7% and 91.4% of the study group and control groups, respectively, had no DM prior to the intervention, but 89.7% and 91.4% did so afterwards. In contrast, both before and after the intervention, there was no HTN in either the study group or the control groups. Moreover, prior to the intervention, 62.1% of the study groups did not have obstructive sleep apnea, however after the intervention, 75.9% of the groups did. Prior to the

treatment, there were no statistically significant differences between the control groups.

Table 1 shows the total alopecia levels among the studied hyper-androgenic infertile overweight and obese women. It reveals that 12.1% and 43.1% of the studied group were stage III and II, respectively, before the intervention, compared to 3.4% and 27.7% of them after the intervention, respectively. Furthermore, after the intervention, 69% of the studied women had stage I compared to 44.8% before intervention. However, minimal changes occur with the control group.

Table 2 presented relationship between androgenic alopecia levels lifestyle dietary habits among the study group of infertile overweight and obese women. About 14.3% of good nutrition habits of the studied group of women have had stage III androgenic alopecia levels before intervention compared to 0% after intervention. Statistically significant association between androgenic alopecia levels and lifestyle dietary habits among the study groups of infertile overweight and obese women was observed after program implementation ($p < 0.05$).

Table 2 presented relationship between androgenic alopecia levels and physical activity levels habits among the study group of infertile overweight and obese women. About 28.6% of moderate activities of the studied group have had stage III androgenic alopecia levels before intervention compared to 0% after intervention. Statistically significant association between androgenic alopecia levels and physical activity level habits among the study groups of infertile overweight and obese women was observed after program implementation ($p < 0.05$).

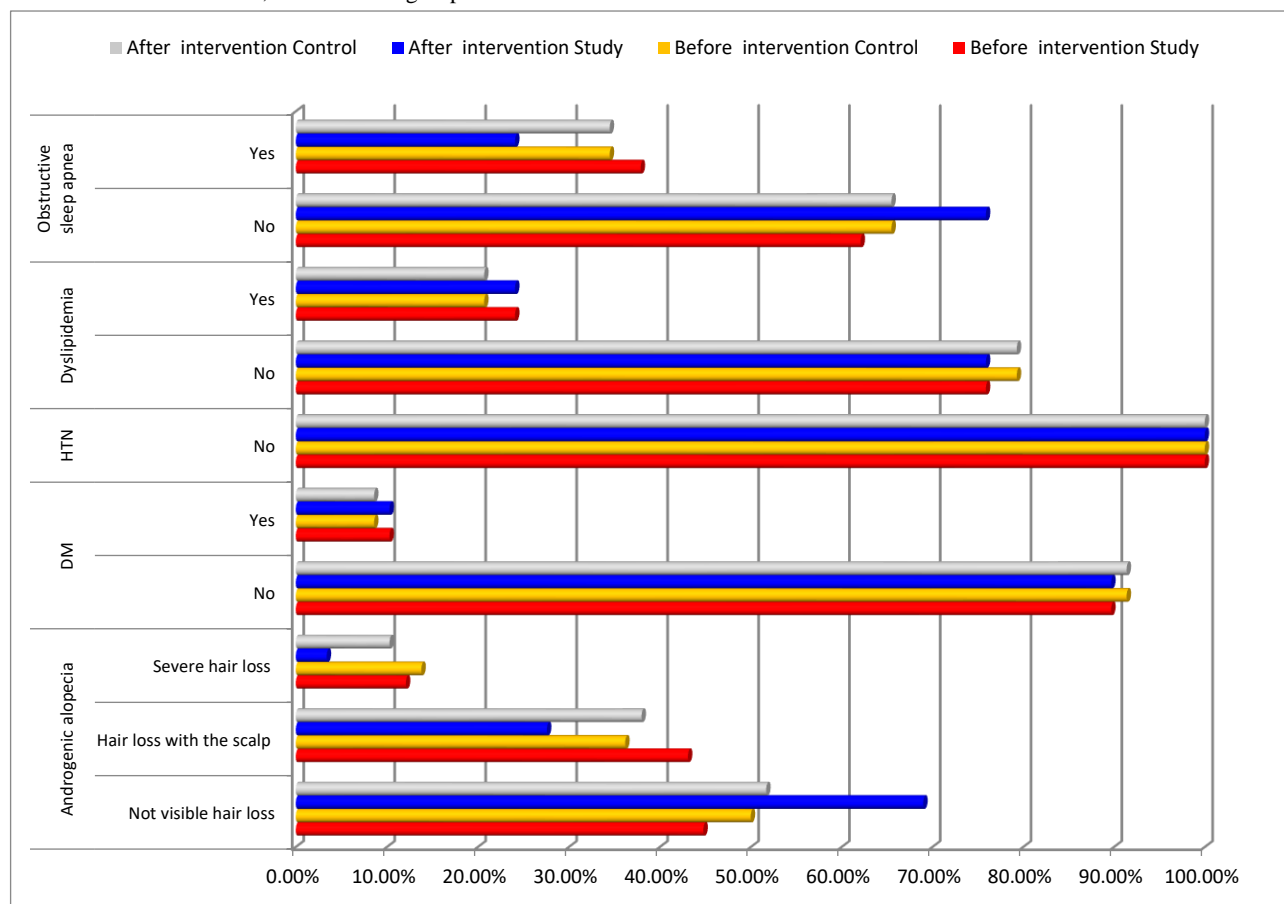


Figure 1: Androgenic Alopecia and Other Co-morbidities among the Studied Infertile Overweight and Obese Women with Polycystic Ovary Syndrome.

Table 1: Total Androgenic Alopecia 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 Androgenic Alopecia Levels					0.38ns p> 0.05					(p≤0.001)
- Stage I	26	44.8%	29	50%		40	69.0%	30	51.7%	
- Stage II	25	43.1%	21	36.2%		16	27.6%	22	38%	
- Stage III	7	12.1%	8	13.8%		2	3.4%	6	10.3%	

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

Table 2: Relationship between androgenic alopecia levels and lifestyle habits among the Study group of Infertile Overweight and Obese Women with Polycystic Ovary Syndrome (n=58)

Variable	Dietary Habits Before the intervention					Dietary Habits After the intervention				
Androgenic Alopecia Levels	Poor habits N=42		Good habits N=16		χ^2 P-value	Poor habits N=17		Good habits N=41		χ^2 P-value
Stage I	16	61.5	10	38.5	0.437 >0.05ns	2	5	38	95	20.11 **< 0.001*
Stage II	20	80	5	20	9.35ns >0.05	13	81.2	3	18.8	6.39 *<0.05
Stage III	6	85.7	1	14.3	9.76ns >0.05	2	100	0	0	10.70 *<0.05

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

Table 3: Relationship between acne vulgaris levels and physical activity levels among the Study group of Infertile Overweight and Obese Women with Polycystic Ovary Syndrome (n=58)

Variable	Physical Activity Before the intervention							Physical Activity After the intervention						
	Mild N=47		Moderate N=11		Severe N=0		χ^2 P –value	Mild N=15		Moderate N=36		Severe N=7		χ^2 P –value
	No	%	No	%	No	%		No	%	No	%	No	%	
Androgenic Alopecia Levels														
Stage I	20	76.9	6	23.1	0	0	0.437 >0.05ns	3	7.5	32	80	5	12.5	20.11 **<0.001*
Stage II	22	88	3	12	0	0	9.35ns >0.05	10	62.5	4	25	2	12.5	6.39 * <0.05
Stage III	5	71.4	2	28.6	0	0	9.76ns >0.05	2	100	0	0	0	0	10.70 * <0.05

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

Discussion

Regarding androgenic alopecia levels among the studied hyper-androgenic infertile overweight and obese women, the current study findings revealed that there is an improvement in alopecia levels after the intervention for the study group. Two-fifths of the study group suffered from stage II (hair loss with visible scalp) androgen alopecia before the intervention, which was reduced to one-quarter. Moreover, more than two-thirds of them were having stage I (minor thinning not noticeable) after the intervention. Meanwhile, there were statistically significant differences between study and control groups after the intervention.

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". Furthermore, these findings were supported by Roya et al. (2021), who studied "study of prevalence, phenotypic features, and lifestyle modifications of polycystic ovarian syndrome patients." They revealed that hyperandrogenism symptoms and the severity of PCOS can be improved through lifestyle modification (LSM). This may be justified as lifestyle modifications in terms of an active lifestyle and healthy dietary habits are the first line of management and can significantly reduce the symptoms and morbidity related to the disorder. A healthy diet reduces weight and leads to reduced insulin resistance and free testosterone, which reduce hair loss.

The current study findings revealed that there is an improvement in lifestyle and daily habit levels among the studied hyper-androgenic infertile overweight and obese women. 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.

These results came in agreement with Wang et al. (2021), who studied "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" and showed that all women in our study who followed a 6-month lifestyle intervention decreased their intake of high-calorie snacks and beverages and increased their moderate to vigorous physical activity compared with women without lifestyle intervention. 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.

The current study findings revealed that there is a statistically significant association between hyper-androgenic features (Hirsutism, acne, and alopecia) improvement and lifestyle habits in the study group of hyper-androgenic infertile overweight and obese women.

The findings, however, are consistent with the meta-analysis conducted by Abdolalian et al. in 2020, which found that dietary and physical activity modifications are linked to improvements in hirsutism. However, the outcomes differed from the meta-analyses conducted by Patnode et al. (2017) and Fathey et al. (2022), who concluded that exercise intervention had no positive effect on any of the androgenic traits. This disagreement could be due to differences in the type and duration of interventions and populations

studied. This may be justified as 5% weight loss through low-calorie diets can improve reproductive system dysfunctions, menstrual irregularities, and fertility in these women (Mani et al., 2018).

Conclusion

For obese and overweight infertile women with PCOs, lifestyle modification therapies significantly improve the levels of androgenic alopecia.

Recommendations

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

1. Maternity and gynecologic health nurses need proper knowledge and skills to help clients adjust to daily challenges, and continuous training in fertility settings is necessary to understand psychological and social impacts.
2. Duplicate this study using a large sample and in various settings to generalize results for subsequent research.

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