



RESEARCH ARTICLE

The effect of lifestyle modification on metabolic, anthropometric parameters and hirsutism score in polycystic ovary syndrome

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ABSTRACT

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Polycystic ovary syndrome (PCOS) is a hormonal disorder that affects women of reproductive age. It is characterised by several clinical signs and symptoms, including hyperandrogenism, ovarian dysfunction, and chronic anovulation. Obesity and hormonal imbalances can be reduced in PCOS by modifying lifestyle habits. The effects of lifestyle changes on PCOS were investigated, and it was found that consuming less fat and engaging in physical activity reduced metabolic disturbances. The purpose of this study was to examine the effects of lifestyle modifications on metabolic parameters, anthropometric parameters, and the hirsutism score as they relate to the pathogenesis of PCOS. This study involved a total of 10 patients diagnosed with PCOS at the Sultan Agung Semarang Islamic Hospital. Blood glucose, triglycerides, HDL (high density lipoprotein), blood pressure, waist circumference, hirsutism score, and vital sign data related to PCOS were measured before and after a 4-month treatment. PCOS patients' fasting blood sugar levels, triglycerides (TG), high density lipoprotein (HDL), hirsutism scores, blood pressure (systolic and diastolic), and waist circumference averaged 92, 60; 48.10; 96.90; 10.5; 121.5/77; 86.80, respectively, at baseline (pretreatment). After four months of treatment, the average levels of fasting blood sugar, triglycerides, high-density lipoproteins, blood pressure (systolic and diastolic), hirsutism scores, and waist circumference were 108.7, 50, 99.8, 7, 122.3, 82.7, and 87.50, respectively. Changes in lifestyle led to significant variations in fasting blood sugar levels as a metabolic parameter and hirsutism scores, but not in triglycerides, high-density lipoprotein, waist circumference, or blood pressure.

1. Introduction

Polycystic ovary syndrome (PCOS) is a hormonal imbalance that affects many women of childbearing age. Clinical signs and symptoms such as oligomenorrhea or amenorrhea, as well as chronic anovulation with specific polycystic ovarian morphology on ultrasonography, define PCOS. (Palomba, 2018). PCOS affects 5–10% of young women and is frequently associated with infertility. Women suffering from this condition may experience irregular menstruation, abnormal hair growth, and ovaries containing a large number of small cysts (Sirait, 2018).

Despite the existence of numerous hypotheses, the cause of PCOS is unknown. This can be explained by several factors, including genetics, environment, and lifestyle. PCOS is also diverse regarding metabolic disorders. In addition to the metabolites produced, daily lifestyle and diet can have a significant effect on metabolites, according to this context. Metabolic syndrome refers to the PCOS-related clinical characteristics of insulin resistance, obesity, dyslipidemia, and hyperandrogenism. As a result, 43% of adult PCOS women and nearly one-third of adolescents are affected by metabolic syndrome (Chen & Pang, 2021).

Insulin resistance (IR) is prevalent in PCOS

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patients. In 50–80 percent of women with the PCOS phenotype, which varies by race, IR has been reported. As a result of decreased insulin sensitivity in peripheral tissues such as skeletal muscle and adipose tissue, as well as insulin receptor abnormalities, many PCOS patients may have compensatory hyperinsulinism. Another metabolic disorder that is a frequent symptom of PCOS is obesity, particularly abdominal obesity. Several studies have linked abdominal obesity to a variety of PCOS clinical characteristics. For instance, adipose tissue dysfunction causes adipocytes to secrete excessive amounts of adipokines, which may contribute to IR (Stracquadanio & Ciotta, 2015).

Hyperandrogenism is a diagnostic criterion for PCOS. IR, obesity, and hyperandrogenism are all factors in the pathogenesis of PCOS, but IR-induced hyperinsulinemia has gonadotropin effects on the ovaries and reduces the expression of sex hormone-binding protein (SHBG), which results in hyperandrogenism. Androgens can cause accumulation of adipose tissue, particularly in the abdomen, and IR in subcutaneous adipose tissue. In addition, androgens play a dual role in folliculogenesis. Low levels of androgen stimulate follicular growth, whereas high levels of androgen stimulate anti-Müllerian hormone (AMH) secretion in granulosa cells and may inhibit follicle development (Palomba, 2018).

Even though dyslipidemia is not required for a PCOS diagnosis, it remains a serious metabolic disorder. 70% of PCOS patients suffer from dyslipidemia, which is characterised by elevated levels of low-density lipoprotein cholesterol (LDL-c), very low-density lipoprotein cholesterol (VLDL-c), triglycerides (Tgs), and free fatty acids. That is the case. The levels of low-density lipoprotein cholesterol (LDL-c) rise while HDL-c levels fall. These conditions can lead to a variety of CVDs, such as hypertension, atherosclerosis, and coronary artery disease, and the prevalence of NAFLD in PCOS-affected women is frequently quite high. The research confirms this. In addition, it is generally acknowledged that elevated androgen levels contribute to the development of fatty liver in women with PCOS (Chen & Pang, 2021).

Based on the various causes of PCOS, the metabolic symptoms appear to be interrelated. PCOS patients with excessive androgen may initiate a cycle of metabolic problems if they have excessive levels of this hormone. Visceral adipose tissue may form in response to hyperandrogenism, IR induction, and high insulin levels, causing the ovaries and adrenal glands to produce more androgen. Consequently, vicious circles are a potential mechanism for impaired steroidogenesis, the severity of which depends on a number of factors (Ortiz-Flores, 2019).

Lifestyle modification is a safe and effective first-line treatment for polycystic ovary syndrome (PCOS). Obesity and hormonal imbalances can be reduced in PCOS through lifestyle interventions, particularly dietary modifications and physical activity. It has been reported that it can result in a 5-10% weight loss in overweight girls with PCOS, as well as a reduction in androgen levels and irregular menstrual cycles. A systematic review discovered that lifestyle modification can improve clinical, hormonal, and metabolic parameters in young PCOS patients (Kim, Chon, & Lee, 2020). We examined how changes in her lifestyle impacted her PCOS and discovered that her metabolic issues improved when she consumed less fat and engaged in moderate exercise. With or without exercise, high-fibre, low-fat diets consistently influenced metabolic complications. It has been demonstrated that all fat and lipid stores in the body are depleted and reduced, along with the BMI and waist circumference. In addition to improved cardiac issues, patients exhibited increased homeostatic model scores, i.e., insulin resistance (HOMA-IR), and decreased insulin resistance (Khalid *et al.*, 2019).

This study aims to summarise the effect of lifestyle modification on hirsutism score and several metabolic and anthropometric parameters associated with PCOS, including fasting blood glucose (FBG), triglyceride (TG), high density lipoprotein (HDL), systolic and diastolic blood pressure, and waist circumference in PCOS patients.

2. Materials and Methods

This study involved 17 polycystic ovarian syndrome (PCOS) patients at the Sultan Agung Semarang Islamic Hospital, Semarang, Indonesia. The lifestyle modification was conducted by weekly face-to-face lifestyle modification sessions (diet and physical activity) or via a WhatsApp group. After four months of treatment, only 10 patients in the sample were able to return to collect post-intervention data. The metabolic parameters including the level of fasting blood sugar, triglycerides, and High Density Lipoprotein (HDL) were analysed in the lab of the hospital. Waist circumference and blood pressure were measured as anthropometric parameters from the patients. Furthermore the Hirsutism Score was analysed a pathogenesis parameter of PCOS. The parameters were analysed before (pre) and after (post) 4 months treatment of lifestyle modification.

Data were analysed using the SPSS software. The post-test data of HDL and triglyceride level was analysed using T-test, while for other parameters were analysed using Wilcoxon. *P*-value <0.05 was considered a significant difference between pre and post treatment

Table 1. Metabolic, Anthropometric Parameters and Hirsutism Score in PCOS patients before (pre) and after (post) 4 months treatment of lifestyle modification

Parameters	Pre-treatment	Post treatment	p value
Fasting blood glucose (mg/dL)	92,6±37,2	108,7±46,8	0,003
High density lipoprotein (HDL) (mg/dL)	48,1±6,7	50,0±6,1	0,384
Triglycerides (TG) (mg/dL)	96,9±56,0	99,8±60,0	0,721
Waist Circumference (Cm)	86,8±9,0	87,5±8,5	0,539
Sistolic blood pressure (mmHg)	121,5±9,7	122,3±0,7	0,823
Diastolic blood pressure (mmHg)	77,0±6,3	82,7±5,5	0,060
Hirsutism Score	10,5±3,2	7,0±4,2	0,015

of lifestyle modification.

3. Results

Table 1 depicts the metabolic parameters (fasting blood sugar, HDL, and triglycerides level), anthropometric parameters (waist circumference, systolic and diastolic blood pressure), and hirsutism score in PCOS patients before (pre) and after (post) 4 months treatment of lifestyle modification. Lifestyle modification for 4 months in PCOS patients caused a significance differences ($p < 0.05$) in fasting blood sugar level, diastolic blood pressure, and hirsutism score. The levels of HDL and trygliseride, as well as waist circumference, systolic and blood pressure, were slightly higher but not statistically different ($p > 0.05$).

4. Discussion

According to the findings of this study, all participants had normal levels of blood sugar, triglycerides, and blood pressure prior to participation. Blood sugar and triglyceride levels should be less than 150 mg/dl in Asian women, while blood pressure should be between 90 and 60 mmHg and 120 and 80 mmHg, respectively. In addition, most women in this study (80%) had a waist circumference greater than 80 cm, as did the average waist circumference both before (96.90) and after (99.80) the intervention. The ideal waist circumference for Asian women is less than 85 centimetres; if it is greater, the risk of obesity increases (Aulia, 2022). If your waist size increases, it indicates that you have a great deal of excess fat, especially around your stomach. This will enlarge the waistline, resulting in metabolic changes that can reduce the body's insulin sensitivity. This is consistent with the identification of waist circumference as a significant predictor of a number of metabolic and cardiovascular disease risk factors (Stracquadanio & Ciotta, 2015).

Based on the findings of this study, both before (121.5/77) and after (122.3/82.7) the intervention, the average systolic and diastolic blood pressures of all study participants were deemed optimal. This demonstrated there was no correlation between PCOS and blood

pressure. While hypertension is a major risk factor for cardiovascular disease in the general population, the results for hypertension in PCOS are inconsistent, according to another study. A recent meta-analysis confirmed an increased risk of hypertension among PCOS patients, but only among women of reproductive age. In contrast, another systematic review and meta-analysis found no significant difference in hypertension between non-obese PCOS women and controls (Wu *et al.*, 2020).

Prior to intervention, the average hirsutism score in this study was 10.5, and most women (80%) had a score >8 . The examiner performs a physical examination before assigning the subject a Ferriman-Gallwey score on a scale of 0 to 4 for terminal hair growth on eleven different body areas. A Ferriman-Gallwey score of eight or more is believed to be diagnostic of hirsutism (Ilagan, 2019). If there are significant differences in how lifestyle modification patterns are applied to the hirsutism score, the average hirsutism score after the intervention (7) is lower than the average hirsutism score before the intervention (7), according to this study (10.5). This is consistent with previous research indicating that applying lifestyle modifications to the hirsutism score as determined by the Ferriman-Gallwey scoring method will influence the distribution of fine hair on the body of some individuals. This is due to the fact that androgen levels in patients decreased following the implementation of lifestyle modifications. (Boyd & Ziegler, 2019).

This study differs from those that report anthropometric parameters such as blood pressure and waist circumference in addition to metabolic parameters including TG, HDL, LDL, FBS, FBI, and HOMA-IR. It can be reduced significantly by implementing lifestyle modifications for three to twelve months, including calorie restriction and regular physical activity. Regularly implementing these alterations to lifestyle can improve clinical parameters, metabolic function, and hormone levels in women with PCOS (Elmenim & Emam, 2016). In previous studies that used lifestyle modifications to alter the metabolic index, 7 of 13

studies demonstrated an increase in fasting insulin levels after the intervention, while the remaining 6 studies showed no change. In addition, five of the thirteen studies compared body weight before and after treatment. Intervention is necessary. In studies involving subjects who lost at least 5 percent of their body weight, insulin levels rose (Kim & Lee, 2022)

Due to the fact that there were no significant differences in a number of metabolic parameters (BP, HDL) and anthropometric parameters (BP, waist circumference), this cannot be completely separated from the inadequate role and supervision of the study. They were unable to provide adequate supervision through the monitoring and supervision system for research participants who only participated through the WhatsApp group, as evidenced by the large number of participants who experienced a rise in waist circumference. In addition to inadequate monitoring, only 17 individuals participated in the screening and recording of metabolic parameters, anthropometric parameters, and hirsutism scores during the study. After four months of intervention, only ten participants could resume variable recording. This is because some participants have difficulty accessing research sites. It is therefore preferable to concentrate on multiple evaluation points in this study by collaborating with first-level health facilities in the surrounding area to facilitate process monitoring and participant access to research sites. To obtain a larger sample of PCOS patients, establish collaborations with first-level health facilities in the surrounding area.

5. Conclusions

Changes in PCOS patients' fasting blood sugar levels, a measure of their metabolism, and hirsutism scores resulted from a change in lifestyle. As a first-line treatment for obese women with PCOS, lifestyle modifications can influence the outcomes, and moderate weight loss is also anticipated to increase the metabolic index. While other metabolic parameters did not demonstrate a significant difference in the research data, this is intrinsic to the limitations of the study. Consequently, additional research on confounding and intermediate variables, such as other inflammatory disorders and hormonal medications used by patients, is required for this study. To obtain a larger sample of patients, it is also necessary to establish partnerships with the local primary care facilities to facilitate the follow-up process, provide access to the patients, and screen PCOS patients.

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