

## Assessing Health Outcomes for Women with Polycystic Ovary Syndrome and Hypertension

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**Abstract: Background:** About 6–12% of women in their reproductive years suffer with PCOS, a common endocrine condition characterized through hyperandrogenism, ovulatory dysfunction, as well as polycystic ovarian anatomy. At the same time, hypertension (HTN) is a significant cardiovascular risk factor. Aim: The objective of this study is to evaluate health outcomes associated with young women diagnosed with polycystic ovary syndrome (PCOS) and to determine the relationship between PCOS and hypertension. Methods: Data were collected for 126 patients with polycystic ovary syndrome (PCOS) at different hospitals in Iraq during the follow-up period from March 12, 2023, to April 24, 2024. Blood pressure, metabolic factors, hormonal profiles, and other tests were performed. Fertility outcomes were determined for women. Quality of life was assessed using the SF-36 questionnaire for all patients, some of whom had undergone various treatments. Results: It enrolled clinical outcomes of women with PCOS in this study. Our results showed high in BMI ( $27.6 \pm 12.4$ ), systolic blood pressure ( $129.7 \pm 13.6$ ), and diastolic blood pressure ( $86.4 \pm 8.9$ ). Outcomes of hormonal profiles found Testosterone was  $73.5 \pm 12.3$  (ng/dL), and Estradiol was  $126.5 \pm 31.6$  (pg/mL). Liquid profile characterized in Cholesterol  $<200$ mg/dL got 26.98%, elevated LDL got 70.63%, and decreased HDL got 52.38%. Fertility outcomes found rates of ovarian dysfunction with 75.40% and pregnancy with 31.75%. Quality of life assessment outcomes rised in mental score ( $64.8 \pm 11.4$ ) and physical score ( $61.5 \pm 12.6$ ). Conclusion: According to our study, young women having PCOS had an even greater likelihood of acquiring hypertension. In people with PCOS, the comorbidities of diabetes mellitus and hyperlipidemia may combine and raise the risk in hypertension even more. For young women with PCOS, an early screening for comorbidities and hypertension may be necessary.

**Keywords:** Polycystic ovary syndrome (PCOS); Hypertension; SF-36 Questionnaire; and Women.

## INTRODUCTION

From five to ten percent of women of reproductive age suffer from polycystic ovarian syndrome (PCOS), the most frequent endocrinological condition in this group (Rotterdam, E.S., 2004). Adolescence is frequently observed whenever PCOS first manifests, demonstrated by the commencement of menstruation (Azziz, R. *et al.*, 2016). Furthermore, in both the time of diagnosis and in the years that follow, PCOS has been linked to an increased risk of cardiovascular disease. One common finding in women having PCOS is elevated blood pressure, that is a major risk factor of cardiovascular disease (Cooney, L.G. *et al.*, 2018; Chang, A.Y. *et al.*, 2016).

There has been an enormous amount of study on PCOS in recent years, with several studies being carried out in this field. For example, 256 clinical and experimental research on PCOS were reported within the PUBMED database in just the first 50 percent of 2016 (Ramezani Tehrani, F. *et al.*, 2020; Behboudi-Gandevani, S. *et al.*, 2018; Meun, C. *et al.*, 2020).

By definition, however, the existence in one or more for these symptoms is regarded as a potential PCOS criteria. In a study involving several women with hyperandrogenism, for example, 72.1% of the women had PCOS (Pinola, P. *et al.*, 2017; Ding, D.C. *et al.*, 2018; Tarkun, I. *et al.*, 2004). Women with hirsutism showed a similar pattern, with 78.4% of all these instances also fitting the diagnostic criteria for PCOS. The incidence of PCOS in women with ovulatory and menstrual problems was 27.1% (Glintborg, D. *et al.*, 2018). In addition, 20–30% of women who were of reproductive age had polycystic ovaries, and 20% of them had PCOS, which is three times more common than the general population (Osibogun, O. *et al.*, in press; Joham, A.E. *et al.*, 2015).

PCOS increases the risk of endometrial cancer by three times, obesity by fifty percent, type 2 diabetes as well as insulin resistance by fifty to seventy percent, and hyperleptinemia by seventy percent in women (Christakou, C.D. *et al.*, 2008; Amiri, M. *et al.*, 2020; Zhu, S. *et al.*, 2019). These people are often found to have cardiovascular

illnesses and hypertension. Women having PCOS are more inclined to get the illness themselves; the genetic or family history of PCOS is an important factor (Kalaitzidis, R.G. *et al.*, 2018).

## PATIENTS AND METHODS

The study design was conducted on 126 patients with polycystic ovary syndrome (PCOS). A cross-sectional study was conducted on 126 female patients with PCOS who were admitted to different hospitals in Iraq during the follow-up period from March 12, 2023, to April 24, 2024. Demographic characteristics and parameters of the women with PCOS were recorded, including age, body mass index (BMI), smoking status, family history of hypertension or cardiovascular disease, other comorbidities, educational level, and economic status. Inclusion and exclusion criteria included only patients aged 18–43 years who were diagnosed with polycystic ovary syndrome (PCOS), as well as women with other medical conditions, smokers, and women with a family history of hypertension or cardiovascular disease. Exclusion included women younger than 18 years or older than 42 years, pregnant or breastfeeding women, women with other endocrine disorders, generalized thyroid dysfunction, adrenal gland disorders, and women who had previously been treated with hormonal therapies or medications that affect metabolic parameters in the previous months. Clinical characteristics of the patients were determined, including body mass index ( $\text{kg}/\text{m}^2$ ), prevalence of hypertension (%), waist circumference (cm), and blood pressure (mmHg).

Regarding laboratory data, hormonal profiles were recorded during hospitalizations, including testosterone ( $\text{ng}/\text{dL}$ ), luteinizing hormone (LH) ( $\text{IU}/\text{L}$ ), follicle-stimulating hormone (FSH) ( $\text{IU}/\text{L}$ ), and estradiol ( $\text{pg}/\text{ml}$ ). Metabolic profiles were also recorded for women with PCOS, including insulin resistance (%), mean fasting insulin ( $\text{mIU}/\text{ml}$ ), and mean glycated hemoglobin ( $\text{HbA1c}$ ) (%). Lipid profiles were defined as cardiovascular risk factors for PCOS patients, including dyslipidemia (cholesterol  $<200$   $\text{mg}/\text{dL}$ ), elevated LDL cholesterol, and low HDL cholesterol. Fertility outcomes were determined and distributed to all women diagnosed with PCOS, determining baseline parameters including ovarian dysfunction, pregnancy rate, and mean duration to pregnancy (months). Furthermore, 95 of the 126 women with PCOS were treated with various treatments, including antihypertensive medications and the success rate of lifestyle interventions. The SF-36 survey, which includes physical, mental, social, emotional, as well as everyday activities, was used to gauge the patient's quality of life. It has a range of 0-100, where higher scores indicate a higher quality of life. Women with PCOS also had a psychological health evaluation, with the GAD-7 used to measure anxiety and the PHQ-9 to measure depression. The SPSS 22.0 program was employed for assessing and recording all results for the PCOS patient group.

## RESULTS

**Table 1:** Baselines demographic features of patients with PCOS syndrome

Features	Variables	Frequency {126}	Percentage {%}
Age	25	40	31.75%
	$\geq 25$	86	68.25%
Body mass index, { $\text{kg}/\text{m}^2$ }	Normal weight	12	9.52%
	Overweight	45	35.71%
	Obesity	69	54.76%
Smoking status	Present	27	21.43%
	Absent	99	78.57%
Family history of hypertension or cardiovascular disease	Absent	93	73.81%
	Present	33	26.19%
No. of comorbidities	No	96	76.19%
	Diabetes mellitus	30	23.81%

	Hyperlipidemia	17	13.49%
	Chronic obstructive pulmonary disease (COPD)	18	14.29%
	Asthma	6	4.76%
	Chronic kidney disease	3	2.38%
	Coronary artery disease	2	1.59%
	Congestive heart failure	2	1.59%
<b>Education status</b>			
	Primary	27	21.43%
	Secondary	42	33.33%
	University	57	45.24%
<b>Income level</b>			
	< 400	58	46.03%
	400 – 700	51	40.48%
	> 700	17	13.49%

Clinical and demographic findings were recorded in 126 women with polycystic ovary syndrome (PCOS). Our study noted no significant differences in participants' ages. However, there were differences in body mass index ( $27.6 \pm 12.4$ ), waist

circumference ( $84.2 \pm 8.11$ ), systolic blood pressure ( $129.7 \pm 13.6$ ), and diastolic blood pressure ( $86.4 \pm 8.9$ ). A family history of hypertension or cardiovascular disease was found in 26.19% of the total group of women.

**Table 2:** Enrolling clinical characteristics of patients

Variables	Frequency, {n = 126}	Percentage, %
Mean BMI (kg/m <sup>2</sup> )	$27.6 \pm 12.4$	
Prevalence of Hypertension (%)	126	100%
Mean Waist Circumference (cm)	$84.2 \pm 8.11$	
Mean Blood Pressure (mmHg)		
Systolic	$129.7 \pm 13.6$	
Diastolic	$86.4 \pm 8.9$	

Our study reported hormonal profiles at varying levels, with elevated testosterone levels ( $73.5 \pm 12.3$ ) and alterations in luteinizing

hormone/follicle-stimulating hormone (LH/FSH) levels ( $9.3 \pm 2.6$ ) and ( $5.4 \pm 1.1$ ) in women with PCOS.

**Table 3:** Outcomes of hormonal profiles

Items	PCOS group
Mean Testosterone (ng/dL)	$73.5 \pm 12.3$
Mean LH (IU/L)	$9.3 \pm 2.6$
Mean FSH (IU/L)	$5.4 \pm 1.1$
Mean Estradiol (pg/mL)	$126.5 \pm 31.6$

Regarding metabolic outcomes, this study observed a significant increase in insulin resistance (63%) and fasting insulin levels ( $16.2 \pm 6.6$   $\mu$ U/mL) in women with PCOS. This study also

observed high rates of dyslipidemia (26.98%) and changes in cholesterol levels in the PCOS group, including a 70.63% increase in LDL cholesterol and a 52.38% decrease in HDL cholesterol.

**Table 4:** Metabolic Outcomes

Parameters	PCOS Group
Rate of Insulin Resistance (%)	63%
Mean Fasting Insulin ( $\mu$ U/mL)	$16.2 \pm 6.6$
Mean HbA1c (%)	$5.7 \pm 0.8$

**Table 5:** Identifying cardiovascular Risk Factor's effect on patients with PCOS

Parameters	Frequency {n = 126}	Percentage {%}
Dyslipidemia (Cholesterol <200mg/dL) (%)	34	26.98%
Elevated LDL (%)	89	70.63%
Decreased HDL (%)	66	52.38%

Furthermore, this study demonstrated that although pregnancy rates were lower in women with PCOS, they demonstrated a high incidence of ovarian

dysfunction, with ovarian dysfunction rates estimated at 75.40% and pregnancy rates at 31.75%.

**Table 6:** Distribution of fertility outcomes on all patients with PCOS

Parameters	Frequency {n = 126}	Percentage {%}
Rate of Ovarian Dysfunction (%)	95	75.40%
Pregnancy Rate (%)	40	31.75%
Mean Time to Conceive (months)	12.6 ± 6.7	

**Table 7:** Quality of life assessment using SF – 36 questionnaire

Items	SF – 36 Scores
Mean SF-36 Mental Score	64.8 ± 11.4
Mean SF-36 Physical Score	61.5 ± 12.6
Mean SF-36 Social and Emotional Scores	59.7 ± 12.2
Mean SF-36 Daily Activity Scores	57.6 ± 10.3

This study reported a decrease in overall health and quality of life in women with PCOS. A decrease was observed in all areas of patient health, most notably the mental assessment (64.8 ±

11.4) and physical assessment (61.5 ± 12.6). Also, psychological outcomes showed a decrease in both depression (10.4 ± 3.8) and anxiety (8.1 ± 4.1).

**Table 8:** Determining treatment outcomes of patients with PCOS.

Items	Number of patients {126}	Percentage, %
Medication for Hypertension (%)	53	42.06%
Lifestyle Intervention Success (%)	42	33.33%

**Table 9:** Psychological Outcomes.

Items	Scores
Depression (PHQ-9 Score)	10.4 ± 3.8
Anxiety (GAD-7 Score)	8.1 ± 4.1

## DISCUSSION

Hyperandrogenism, irregular menstrual periods, and polycystic ovaries are the hallmarks of PCOS, one of the most prevalent endocrine diseases affecting women of reproductive age (Ke, C. *et al.*, 2018). According to recent studies, PCOS and hypertension are related, which raises the risk of cardiovascular disease, metabolic disorders, and psychological issues. Improving clinical care and impacted individuals' quality of life requires an understanding of the health outcomes associated with both illnesses (Cryer, M.J. *et al.*, 2016).

The metabolic syndrome's hallmarks, including weight gain, insulin resistance, dyslipidemia, as well as hypertension, are commonly seen in women with PCOS. These women are more likely to have insulin resistance, which raises blood pressure and LDL cholesterol levels and increases

the risk of cardiovascular disease. Both genetic predisposition as well as environmental variables, including nutrition and lifestyle, can be blamed for this metabolic disorder. In women with PCOS, weight control with lifestyle changes, including diet and exercise has demonstrated promise in lowering blood pressure along with improving cardiovascular risk profiles (Zolotareva, O. *et al.*, 2019).

Women with PCOS frequently have higher amounts of androgens, such as testosterone, and different ratios of luteinizing hormone (LH) in follicle-stimulating hormone (FSH), according to their hormonal profiles. In addition to reproductive problems, these hormone imbalances can also lead to other health problems, such as elevated anxiety and depressed symptoms. Reduced quality of life may result from the psychological strain of coping



with symptoms and the possibility of infertility, causing the need for an all-encompassing treatment strategy that considers both psychological and hormonal factors (Xue, B. *et al.*, 2020).

Women with PCOS frequently worry about fertility problems since hormonal abnormalities can result in irregular ovulation and lower chances of pregnancy. The mental health of women can be severely affected through the emotional strain that comes with infertility issues. Some PCOS-afflicted women may ultimately become pregnant, while others might need assisted reproductive technology. For women with PCOS to feel empowered, fertility management awareness and education are essential (Liu, Q. *et al.*, 2019; Patil, C.N. *et al.*, 2017).

Research indicates that women having PCOS had poorer quality of life evaluations, weight problems, hormone imbalances, reproductive troubles, and related psychological suffering, including depression and anxiety. Since the psychological well-being of women with PCOS has an important impact on their overall health outcomes, mental health care is essential to the management strategy. A comprehensive approach to therapy is crucial since PCOS is a complex condition that is linked to hypertension and other comorbidities (Zierau, L. *et al.*, 2016; Tang, R. *et al.*, 2019).

Several studies have demonstrated the importance of promoting lifestyle changes. Given their substantial effects on weight, insulin sensitivity, along with cardiovascular health, structured programs emphasizing nutrition and exercise should be a crucial component of the treatment strategy. Pharmacological treatments include insulin-sensitizing drugs (metformin), contraceptives with hormones, and anti-anxiety drugs that may be necessary in situations with severe metabolic disturbances or psychiatric symptoms (Pan, M.L. *et al.*, 2015; Harnod, T. *et al.*, 2019).

## CONCLUSION

According to our study, women who have PCOS may be more susceptible to hypertension and associated metabolic disorders. To completely understand the consequences of cardiovascular health and treatment methods, further study is required.

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