

# Evaluation of Thyroid Function Status in Polycystic Ovary Syndrome

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## ABSTRACT

**Background:** PCOS is very commonly seen in young females with chronic anovulatory cycles. It is manifested by features of hyperandrogenism, polycystic ovaries. The risk of insulin resistance is greater in patients with PCOS. There is also a greater incidence of type 2 diabetes, obesity and cardiovascular diseases in patients with PCOS. There are associated endocrinal abnormalities with PCOS most common of which include hypothyroidism. Therefore we in the present study tried to evaluate the existence of hypothyroidism in patients with PCOS in the patients reporting to our Hospital.

**Methods:** The present study was conducted in the Department of Obstetrics and gynecology, MGM Hospital and Kakatiya Medical College, Warangal. Institutional Ethical committee permission was obtained for the study. The duration of the study was from January 2018 to May 2019. N=30 patients were detected with PCOS during the study period. A similar number of age-matched controls without PCOS were taken for comparison. Anthropometric measurements were made for BMI, waist-hip ratio calculation. TSH, FSH, LH, and Testosterone were estimated by Chemiluminescence ImmunoAssay (CLIA) technique.

**Results:** The Mean Bodyweight 62.17 Vs 49.33 Kgs, The mean BMI was 24.03 Vs 22.48 Kg/m<sup>2</sup>. The mean TSH values were 5.33 Vs 2.51  $\mu$ IU/ml. The mean FSH values were 12.27 Vs 8.49  $\mu$ IU/ml the mean LH was 4.27 Vs 10.49  $\mu$ IU/ml and the mean Testosterone levels were 69.73 Vs 9.28 ng/ml.

**Conclusion:** The present study concludes that patients with PCOS have a greater frequency of thyroid dysfunctions including other endocrinal abnormalities. Accordingly, those diagnosed with PCOS must undergo complete endocrinal investigations. This can help to identify the co-existing endocrinal abnormalities and treatment is given accordingly to prevent morbidity and mortality.

**Keywords:** Polycystic Ovary Syndrome, Thyroid functions

## INTRODUCTION

Polycystic ovary syndrome [PCOS] is a common chronic anovulatory disorder usually associated with androgen excess.

It occurs in approximately 5 -10% of reproductive women<sup>[1]</sup>. The reported prevalence of hypothyroidism in Indian adults is approximately 10%. The etiology of PCOS is considered multifactorial. It is also found to be associated with increased metabolic and cardiovascular risk factors. These risks are associated with insulin resistance which is exaggerated by obesity. However, insulin resistance may also found to be present in non-obese women with PCOS. Thyroid disorders and PCOS are two different endocrinal disorders but have many features that are common in both. An increase in ovarian volume and cystic changes has been seen in primary hypothyroidism. There is also an increased presence of thyroid disorders in women with PCOS as compared to the normal population<sup>[1-4]</sup>. Women in reproductive age with PCOS have symptoms associated with reproductive morbidity including infertility, irregular uterine bleeding, and pregnancy loss. In the early stages of the thyroid, dysfunctions change in ovulation and endometrial receptivity is seen which affects fertility<sup>[5]</sup>. In the past, some studies have been conducted across the world regarding thyroid disorders in PCOS patients. They have shown that higher levels of TSH are associated with a four-time higher prevalence of autoimmune thyroiditis in PCOS subjects<sup>[6]</sup>. The pathophysiology linking hypothyroidism with PCOS is a rise in thyrotropin-releasing hormone TSH leads to increased prolactin and TSH release. Prolactin contributes towards polycystic ovarian morphology by inhibiting ovulation due to changes in the ratio of FSH and LH and increased DHEA from adrenal glands<sup>[7]</sup>. The increase in TSH also causes increased collagen deposition in ovaries. It is therefore said that the severity of ovarian morphology also depends on the duration and severity of hypothyroidism. Van Wyk and Grumbach syndrome show that long-standing untreated cases of congenital hypothyroidism lead to change in ovarian morphology so much that it may sometimes be mistaken for ovarian malignancy<sup>[8]</sup>. Certain common factors that predispose the individual to both the disorders have not been established in this group of population. Hence we in the present study tried to explore the connection between the two disorders.

**Material and methods**

This cross-sectional prospective study was conducted in the Department of Obstetrics and gynecology, MGM Hospital and Kakatiya Medical College. Institutional Ethical committee permission was obtained for the study. Written consent was obtained from all the participants of the study after explaining the nature of the study in the local language. The duration of the study was from January 2018 to May 2019. Inclusion criteria: all the women of reproductive age diagnosed with PCOS on USG. Women with complain of infertility, menstrual irregularities, and miscarriages. Exclusion criteria: patients not fitting in the inclusion criteria, Patients with other endocrinal abnormalities, patients not willing to participate in the study voluntarily. Based on the inclusion and exclusion criteria a total n=30 patients were identified during the study period. A similar number of n=30 females were included to act as controls. A detailed medical history, history of past illnesses, family history and complete menstrual history including menstrual irregularities, infertility, history of last pregnancy, lactation, any miscarriages were recorded for each patient. The patient was clinically examined for signs and symptoms of hirsutism, acne, alopecia, deepening of voice were noted. Anthropometric measurements were done as per standard protocol which included height, weight, waist circumference; hip circumference and BMI and waist-hip ratio were calculated. The diagnosis of PCOS was based on Rotterdam criteria<sup>[9, 10]</sup>. The patients were subjected to laboratory investigations. An 8-10 hours fasting blood sample of 5ml was obtained from the antecubital vein with aseptic precaution in a Vacutainer. The serum was separated for estimation. FBS, TSH, Total testosterone was measured. Glucose was analyzed by a fully automatic chemistry analyzer using the GOD-POD method. The serum TSH, FSH, and Total testosterone were analyzed in Seimens Advia Centura XP with chemiluminescence immunoassay technique. Normal levels of TSH were 3.5–5 µU/ml and values >5µU/ml as the hypothyroid state. Normal values of FSH were 4.5 to 21.5 µU/ml and Normal serum total testosterone as 14-76 ng/ml and >76 ng/ml as a hyperandrogenic state.

**Results**

A total of n=30 patients were detected during the study period having PCOS and age-matched controls were taken from the normal population with no PCOS by USG or hypothyroidism on laboratory investigations. The data was analyzed between the two groups. The table 1 shows that the most common age groups of patients in the study group were from 26 – 30 years 46.67% followed by 31 – 35 years 43.33%. In the control group 21 – 25 years and 26 – 30 years were 43.33% and 13.33% were from 31 – 35 years age group.

**Table 1:** the age-wise and group-wise distribution of the cases in the study

Age group	Study group		Control group	
	Number (n)	Percentage	Number (n)	Percentage
21 – 25	02	6.67	13	43.33
26 – 30	14	46.67	13	43.33
31 – 35	13	43.33	04	13.33
36 – 40	01	3.33	00	00.00
<b>Total</b>	30	100	30	100

Measurement of weight and comparison between the two groups revealed the mean weight in the study group was 62.17 ± 4.37 which was higher than the mean values from the control group. The calculated p values by the chi-square test were < 0.0001 which is considered highly significant. It indicates the women in the study were significantly overweight as compared to the normal control group shown in table 2.

**Table 2:** Comparison of mean weight between the groups

Weight in Kgs	Number of cases (N)	Mean ± SD	df	t Stat	P values
Study group	30	62.17 ± 4.37		9.020695	<0.0001 *
Control group	30	49.33 ± 6.45	58		

The determination of BMI in Kg/m<sup>2</sup> was done for each case based on the measurements of weight and height according to the standard format. The mean values of BMI were 24.03 ± 1.26 higher in the study group as compared to the control group 22.48 ± 3.48. The p values were < 0.02 which were considered as significant given in table 3.

**Table 3:** Comparison of mean BMI Kg/m<sup>2</sup> between the groups

BMI in kg/m <sup>2</sup>	Number of cases (N)	Mean ± SD	df	t Stat	P values
Study group	30	24.03 ± 1.26		2.2804	<0.02 *
Control group	30	22.48 ± 3.48	58		

\* Significant

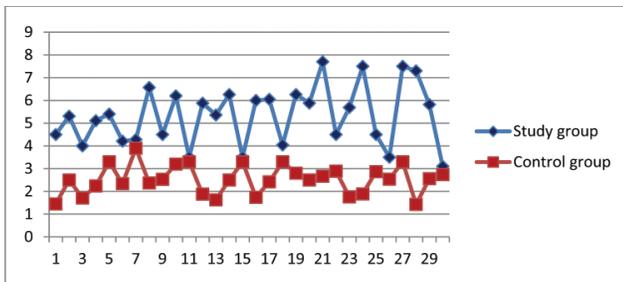
The mean values of TSH in the study group were 5.33 ± 1.29 and in the control, the mean TSH values were 2.51 ± 0.63 µU/ml and the p values were found to be <0.001 hence found to be significant table 4.

**Table 4:** Comparison of mean between TSH values the groups

TSH values in µU/ml	Number of cases (N)	Mean ± SD	df	t Stat	P values
Study group	30	5.33 ± 1.29		10.68	<0.001 *
Control group	30	2.51 ± 0.63	58		

\* Significant

**Chart 1:** showing the Mean TSH values between the two groups



The mean levels of Follicle Stimulating Hormone FSH were measured in both the study and the control group. The mean FSH values were  $12.27 \pm 1.90$  in the study group and  $5.49 \pm 2.05$   $\mu\text{IU/ml}$ . The p values were not found to be significant (Table 5). Similarly, the LH values were recorded and in the study group, the LH values were  $4.27 \pm 0.45$  and the control group the values were  $10.49 \pm 2.05$  (table 6). Consequently, the LH to FSH ratio in the study was approximately 3:1 which is a typical feature in patients of PCOS.

**Table 5:** Comparison of mean FSH values between the groups

FSH values in $\mu\text{IU/ml}$	Number of cases (N)	Mean $\pm$ SD	df	t Stat	P values
Study group	30	$12.27 \pm 1.90$			
Control group	30	$8.49 \pm 2.05$	58	18.0503	> 0.1

**Table 6:** Comparison of mean LH values between the groups

LH values in $\mu\text{IU/ml}$	Number of cases (N)	Mean $\pm$ SD	df	t Stat	P values
Study group	30	$4.27 \pm 0.45$			
Control group	30	$10.49 \pm 2.05$	58	18.0503	<0.01 *

\* Significant

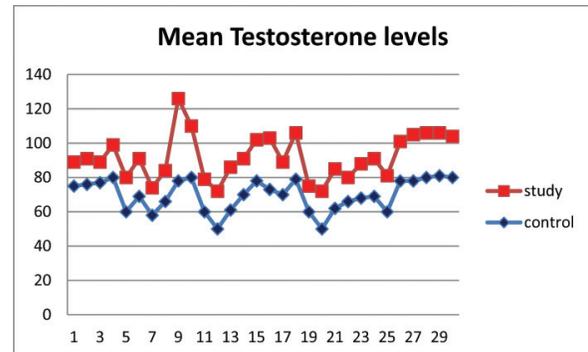
The mean testosterone levels in the study were  $69.73 \pm 9.28$  and the control group was  $22.10 \pm 6.72$  ng/ml. The women with PCOS are found to have increased both total testosterone and free testosterone levels. This increased testosterone levels in the woman's body suppress the normal menstruation and ovulation.

**Table 7:** Comparison of mean Testosterone values between the groups

Testosterone ng/ml	Number of cases (N)	Mean $\pm$ SD	df	t Stat	P values
Study group	30	$69.73 \pm 9.28$			
Control group	30	$22.10 \pm 6.72$	58	22.748	<0.001 *

\* Significant

**Chart 2:** showing the Mean Testosterone values between the two groups



**Discussion**

In this study, we found out of the total n=30 patients of PCOS the commonly involved patients in the age group were 26 - 30 years. A similar study by A Jansirani et al; [11] found 11% of patients below the age of 19 years and 89% were aged 20 and above. In this study, we found only n=2 (6.66%) in the age group of 21 - 25 years. In our study, we found n=13 (43.33%) out of n=30 PCOS patients with hypothyroidism. Uma Sinha et al; [5] showed the prevalence of hypothyroidism in 22.7% of patients with PCOS in eastern India and Maryam et al; [12] and Janssen et al; [13] have shown 26.9% prevalence of autoimmune thyroiditis in PCOS women. This shows that there is a higher prevalence of hypothyroidism in PCOS women as compared to the general population. Some factors could be responsible for this; the first one is women with PCOS are predisposed at a greater level to autoimmune diseases due to excessive estrogen sections [14]. The second is the action of estrogen on functions of B lymphocytes which causes their proliferation. Estrogen receptors have also been found on T-cells and macrophages [15]. In this study, we found the mean weight in study group 62.17 Vs 49.33 Kg and the mean BMI 24.03 Vs 22.48 kg/m<sup>2</sup>. In a study by Moustafa MM et al; [16] the PCOS patients exhibited greater BMI as compared to controls 28.6 vs. 24.9 kg/m<sup>2</sup>. Although the BMI was lesser in our group of patients it may be also due to variation in genetic background and geographic locations. The LH levels in the study were 4.27 Vs 10.49  $\mu\text{IU/ml}$ . The mean FSH levels were 12.27 Vs 8.49  $\mu\text{IU/ml}$ . The LH/FSH ratio was greater than 2:1 in 63.33% of cases of the present study. Ganvir S et al; [17] in a similar study found the LH/FSH ratio of more than 2 was found in 60% of the cases, 41 subjects (68%) were insulin resistant. The patients in the study group were having complains of menstrual irregularities in n=25 (83.33%). Najem et al; [18] in their study have shown menstrual irregularity as the prominent symptom present in 93% of patients with PCOS. Carmina E Lobo RA et al; [19] have shown 60-85% of patients with menstrual irregularities in PCOS. In this study, we found the mean testosterone values of 69.73 Vs 22.10 ng/ml in the study versus the control population. Hyperandrogenism is one of the key

features of the PCOS phenotype and it is said to be present in approximately 60% of females<sup>[20]</sup>. Hence clinical markers of hyperandrogenism like hirsutism, acne, and alopecia are commonly seen in patients with PCOS<sup>[21, 22]</sup>. The diagnosis of PCOS according to Rotterdam criteria patients must display two of the three features to be diagnosed as PCOS. The presence of polycystic ovaries by ultrasound is important for the diagnosis of PCOS. However, only the presence of polycystic ovaries cannot guarantee PCOS. The PCO under ultrasound is the presence of 12 or more follicles in ovaries measuring 2-9mm in diameter and increased ovarian volume >10ml is a must for diagnosis of PCOS<sup>[23]</sup>. As far as treatment is concerned women with PCOS not looking to get pregnant administration of combined OCPs are given as the first line of treatment. The OCPs tends to regulate the menstrual cycle and also decreases the secretion of adrenal androgens<sup>[24]</sup>. Adopting a healthy lifestyle may not reverse PCOS however; it will control associated conditions such as obesity and cardiovascular diseases. Apart from that those detected with hypothyroidism must be given suitable dose thyroxine for the elevation of hypothyroidism.

#### Conclusion

The present study concludes that patients with PCOS have a greater frequency of thyroid dysfunctions including other endocrinal abnormalities. Accordingly, those diagnosed with PCOS must undergo complete endocrinal investigations. This can help to identify the co-existing endocrinal abnormalities and treatment is given accordingly to prevent morbidity and mortality.

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**How to cite this article :** Syeda Sobia Harmain , Khan MI . Evaluation of Thyroid Function Status in Polycystic Ovary Syndrome. *Perspectives in Medical Research* 2020; 8(1):38-42

**Sources of Support:** Nil, Conflict of interest: None declared.