

## STUDY OF THYROID FUNCTION TESTS IN PATIENTS WITH PCOS AT A TERTIARY CARE CENTRE

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### Abstract

**Background:** Polycystic ovarian syndrome (PCOS) and thyroid disorders especially hypothyroidism are the most common endocrine disorders in women of reproductive age group. The prevalence of PCOS in reproductive age group women in India varies from 3.7 to 22.5% depending on the population and the diagnostic criteria, while the prevalence of hypothyroidism for the same population is 11.97% for the year 2019, according to ICMR. The objective is to study the prevalence of thyroid disorders in PCOS patients and evaluate the relationship between polycystic ovaries and thyroid dysfunction. **Materials and Methods:** The proposed study is a hospital based study centered in tertiary care hospital SDM COLLEGE OF MEDICAL SCIENCES AND HOSPITAL, DHARWAD. The patients who fulfilled the inclusion and exclusion criteria were included in the study. Thyroid function tests were done in patients who met the inclusion criteria. **Result:** A total of 31 patients had thyroid disorders in the study of 100 PCOS patients (31%) with a majority of them being hypothyroid (26%). With  $p=0.001$ , this is statistically significant, there is higher incidence of thyroid disorders in PCOS patients with majority of them being hypothyroid. The highest incidence of Thyroid and PCOS disorders was between the ages of 19-28 years in the reproductive age group. Homemakers, students, accountants and software engineers had a higher prevalence of PCOS and thyroid disorders in this study with a marginal dominance by upper, upper middle and middle socioeconomic classes and urban population. Oligomenorrhoea was more prevalent than amenorrhoea and there was a high prevalence of hirsutism, Ultrasound features of PCOS, Insulin resistance and Infertility in both PCOS patients and in patients with thyroid dysfunction with a large percentage of patients being Obese (I,II,III) or overweight. **Conclusion:** Adiposity, increased Insulin resistance, high leptin and evidence of deranged autoimmunity present in both PCOS and thyroid disorders seem to play a complex role in linking these two disorders. Hypothyroidism is the most common thyroid disorder in PCOS patients. Increased prevalence of thyroid disorders in PCOS patients warrants the need for early diagnosis and management to prevent complications, improve compliance and for better outcomes to treatment and general well being. This decreases severity of either disease and improves fertility, significantly improves reproductive, cardiovascular and metabolic health of the patient.

## INTRODUCTION

Polycystic ovarian syndrome (PCOS) is the most prevalent form of persistent an ovulation linked with an excess of androgens, affecting around 5-10% of reproductive women. PCOS is regarded as a

disorder with a complex aetiology.<sup>[1]</sup> In addition, it is associated with metabolic and cardiovascular risk factors. These risks are associated with insulin resistance and are exacerbated by the prevalence of obesity, despite the fact that insulin resistance is also present in nonobese women with PCOS. PCOS is

associated with significant reproductive morbidity during the reproductive years, including infertility, irregular uterine bleeding, and increased pregnancy loss.<sup>[2]</sup>

Thyroid dysfunction and anatomic abnormalities are among the most prevalent thyroid gland illnesses. A number of metabolic processes are connected with abnormalities in the delivery of thyroid hormone to peripheral tissue.<sup>[3]</sup> Early stages of thyroid dysfunction (before symptoms are evident) might result in minor changes in ovulation and endometrial receptivity, which can have a significant impact on fertility. Untreated infantile hypothyroidism results in sexual immaturity. Untreated juvenile hypothyroidism causes delayed puberty and anovulatory cycles. Severe hypothyroidism may be related with decreased libido and anovulatory cycles in adult women. As part of the autoimmune polyglandular syndrome, people with Hashimoto's thyroiditis can also have primary ovarian failure. Rarely, ovarian atrophy and amenorrhea may result from secondary decrease of pituitary function in Primary hypothyroidism.<sup>[4]</sup> There is a correlation between obstetrical complications and overt and subclinical hypothyroidism; however, the results vary amongst different studies.

Consequently, it is apparent that both disorders have a significant impact on fertility and reproductive biology.<sup>[5]</sup> Moreover, hypothyroidism can cause, maintain, or aggravate PCOD. Consequently, the PCOS-thyroid interface has been investigated by several studies from various regions of the world concerning thyroid abnormalities in PCOS patients over the past few years.<sup>[6,7]</sup> In PCOS participants, the majority of the studies indicated a greater incidence of raised TSH levels and a fourfold higher prevalence of autoimmune thyroiditis.<sup>[8]</sup> Again, systematic screening for thyroid dysfunction in hyper androgenic patients is ineffective because the frequency of thyroid disorders is not higher in hyperandrogenic patients than in normal women of childbearing age. With this context in mind, it was decided to research the prevalence of thyroid disorders in PCOS patients presenting to a tertiary hospital.

## MATERIALS AND METHODS

This hospital based study was conducted among All Reproductive age group women 18-40 years diagnosed with PCOS based on ROTTERDAM criteria, at SDM COLLEGE OF MEDICAL SCIENCES AND HOSPITAL, DHARWAD. The patients who fulfilled the inclusion and exclusion criteria were included in the study. Thyroid function tests were done in patients who met the inclusion criteria. Duration of study was Nov 2021 to Oct 2022.

## Inclusion Criteria

All Reproductive age group women 18-40 years diagnosed with PCOS based on ROTTERDAM criteria

## Exclusion Criteria

1. Congenital hypothyroidism
2. Thyroidectomy patients
3. History of radiation to head and neck in cancer patients

**Sample Size-** 100

**Sampling Population-** Patients who meet the Inclusion Criteria

**Sampling Technique-** Simple Random Sampling  
**Statistical Analysis:** Data was analysed by Statistical Package for Social Sciences software with appropriate statistical test i.e. mean and percentage. Descriptive Statistical study was done. Calculated p value <0.05 was considered significant.

## RESULTS

Amongst euthyroid patients, the distribution shows that the majority of participants (46.38%) were aged between 19-23, followed by 34.78% aged between 24-28, 13.04% aged between 29-33 and 5.80% aged between 34-38. Amongst patients with thyroid dysfunction, the distribution shows that the majority of participants (45.16%) were aged between 24-28, followed by 22.58% aged between 19-23, 22.58% aged between 29-33 and 9.68% aged between 34-38 yrs

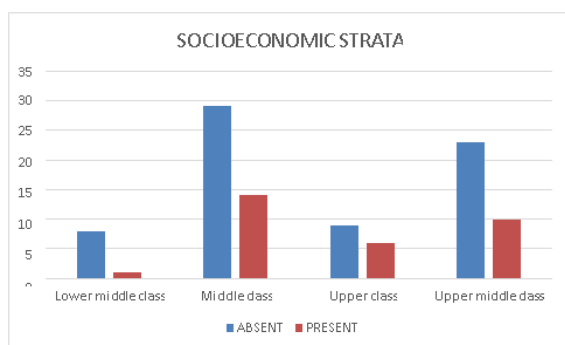
The mean age of those with thyroid dysfunction is 27, with a standard deviation of 4, while the mean age of those without is 25, with a standard deviation of 4. The p-value for this comparison is 0.043, indicating that there is a statistically significant difference between the two groups.

In patients with Thyroid disorders, homemakers make up the majority with 54.80%, followed by accountants and students with 12.90% each. Euthyroid patients also consist mainly of homemakers with 52.20%, followed by students with 29.00%. The p-value for the two columns is 0.466, which suggests that there is no significant difference between the two distributions. Note that Homemakers, Students, Accountants and Software engineers have a higher prevalence of PCOS and thyroid disorders.

Amongst euthyroid patients, 42% percent were middle class, 33.3% were upper middle class and 13% were upper class. Amongst patients with thyroid disorders, 45.2% were middle class, 32.3% were upper middle class and 19.4% were from upper class. The P-value for this study was 0.515, indicating that there is no statistically significant difference in the prevalence of thyroid dysfunction among the different socio-economic strata.

Note the higher prevalence of PCOD and Thyroid disorders among the middle, upper and upper middle classes.

Amongst euthyroid patients, 24.6% of participants were from rural areas, while the rate was significantly higher in urban areas at 75.4%. In patients with thyroid dysfunction, urban contribution was 54.8% while rural was 45.2%. This suggests that there may be a higher prevalence of thyroid dysfunction in urban areas compared to rural areas. The p-value of 0.041 supports this conclusion. These indicate that further research is needed to better understand the underlying causes of the difference in rates of thyroid dysfunction between rural and urban populations.



**Figure 1: Prevalence of PCOD and Thyroid disorders among Socio-economic strata**

In the Euthyroid patients, 62.3% had oligomenorrhoea and 37.7% had amenorrhoea. Among The Patients with Thyroid Dysfunction, 77.4% had oligomenorrhoea and 22.6% had amenorrhoea. The p-value for this comparison was 0.137, indicating that there is not a statistically significant difference between the prevalence of oligo/amenorrhoea in individuals with thyroid dysfunction compared to those without thyroid dysfunction. Note that oligomenorrhoea is more prevalent than amenorrhoea in both Thyroid and PCOS patients.

In Euthyroid patients, hirsutism was absent in 66.7% of patients and present in 33.3% of the patients. In patients with thyroid dysfunction, 51.6% had hirsutism and 48.4% patients had no hirsutism. The p-value for the study was 0.083, which indicates a weak correlation between hirsutism and thyroid dysfunction. This suggests that although there may be a small correlation between hirsutism and thyroid dysfunction, it is not strong enough to draw definite conclusions. Further research is needed to investigate the relationship between hirsutism and thyroid dysfunction.

The results of this study indicate that there is no statistically significant difference between the presence or absence of Ultrasound features of PCOS and thyroid dysfunction. Amongst the thyroid patients 77.4% had USG PCOS, while it was not seen in 22.6%. Amongst the Euthyroid patients,

84.1% had USG PCOS. This suggests that USG PCOS does not have an effect on thyroid dysfunction. However, further research should be conducted to confirm this finding. Note the high prevalence of USG features of PCOS in both thyroid and PCOS patients in this study. Normal: Of the 20 individuals, 23.20% had no thyroid dysfunction and 12.9% had thyroid dysfunction.

Without thyroid dysfunction: Amongst them, 78.3% had features of IR, while it was absent in 21.7%. With Thyroid dysfunction: Amongst them, 87.1% had features of IR and 12.9% had no insulin resistance features.

With a  $p=0.298$ , there is no statistically significant difference between thyroid disorders and Insulin resistance. Note the ubiquitous presence of features of IR in both Thyroid and PCOS patients.

Euthyroid: Of the total sample, 69.00% (69 individuals) were euthyroid. Hyperthyroidism: Of the total sample, 1.00% (1 individual) had hyperthyroidism. Hypothyroidism: Of the total sample, 26.00% (26 individuals) had hypothyroidism. Subclinical hypothyroidism: Of the total sample, 4.00% (4 individuals) had subclinical hypothyroidism.

With  $p=0.001$ , this is statistically significant, there is higher incidence of thyroid disorders in PCOS patients with majority of them being hypothyroid. Amongst the Euthyroid patients, 52.2% had Primary infertility and 21.7% had secondary infertility. Amongst the patients with thyroid dysfunction, 67.7% patients had Primary infertility, 19.4% had Secondary infertility. With  $p=0.265$ , there is no statistical difference in fertility between euthyroid patients and patients with thyroid disorders but there is high incidence of infertility-86% (both primary and secondary) in patients with thyroid dysfunction. T3: The mean T3 level among individuals without thyroid dysfunction was 3.007 with an SD of 0.697. The mean T3 level among individuals with thyroid dysfunction was 3.313 with an SD of 1.837. The overall mean T3 level was 3.101 with an SD of 1.173. The P-value for this measure was 0.063.

T4: The mean T4 level among individuals without thyroid dysfunction was 1.44 with an SD of 0.71. The mean T4 level among individuals with thyroid dysfunction was 1.47 with an SD of 0.63. The overall mean T4 level was 1.45 with an SD of 0.69. The P-value for this measure was 0.059.

TSH: The mean TSH level among individuals without thyroid dysfunction was 2.6 with an SD of 1.15. The mean TSH level among individuals with thyroid dysfunction was 19.97 with an SD of 35.1. The overall mean TSH level was 7.98 with an SD of 20.96. The P-value for this measure was 0.001.

**Table 1: Thyroid dysfunction between rural and urban populations.**

	Thyroid dysfunction						P-value
	Absent		Present		Total		
	Count	Column n	Count	Column n	Count	Column n	

			%		%		%	
RURAL /	Rural	17	24.60%	14	45.20%	31	31.00%	0.041
URBAN	Urban	52	75.40%	17	54.80%	69	69.00%	

**Table 2: Prevalence of oligo/amenorrhoea in individuals with thyroid dysfunction**

		Thyroid dysfunction						P-Value
		Absent		Present		Total		
		Count	Column N%	Count	Column N%	Count	Column N%	
OLIGO/AMENOR RHOEA	Amenorrhoea	26	37.70%	7	22.60%	33	33.00%	0.137
	Oligomenorrhoea	43	62.30%	24	77.40%	67	67.00%	

**Table 3: Relationship between hirsutism and thyroid dysfunction.**

		Thyroid dysfunction						P-value
		Absent		Present		Total		
		Count	Column N %	Count	Column N %	Count	Column N %	
Hirsutism	Absent	46	66.70%	15	48.40%	61	61.00%	0.083
	Present	23	33.30%	16	51.60%	39	39.00%	

**Table 4: Thyroid Profile**

		Tab: thyroid dysfunction						P-value
		Absent		Present		Total		
		Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	
T3		3.007	0.697	3.313	1.837	3.101	1.173	0.063
T4		1.44	0.71	1.47	0.63	1.45	0.69	0.059
TSH		2.6	1.15	19.97	35.1	7.98	20.96	0.001

## DISCUSSION

Polycystic ovarian syndrome (PCOS) and thyroid disorders especially hypothyroidism are the most common endocrine disorders in women of reproductive age group. The prevalence of PCOS in reproductive age group women in India varies from 3.7 to 22.5% depending on the population and the diagnostic criteria, while the prevalence of hypothyroidism for the same population is 11.97% for the year 2019, according to ICMR.

The study reveals that majority of participants without thyroid dysfunction (46.38%) were between the ages of 19 and 23, followed by 34.78% between the ages of 24-28, 13.04% between the ages of 29 and 33, and 5.80% between the ages of 34 and 38. The distribution for the subjects with thyroid dysfunction reveals that the majority of participants (45.16%) were between the ages of 24-28, followed by 22.58% between the ages of 19 and 23, 22.58% between the ages of 29 and 33, and 9.68% between the ages of 34 and 38.

While the mean age of those without thyroid dysfunction is 25, those with it is 27, with a standard deviation of 4, and vice versa. Since there is a statistically significant difference between the two groups, the p-value for this comparison is 0.043

We can note the higher incidence of Thyroid and PCOS disorders between the ages of 19-28 years in the reproductive age group.

54.80 percent of the population with thyroid disorders are housewives, followed by 12.90 percent of students and accountants each, 6.50 percent of software engineers and teachers each. Homemakers make up the majority of those without thyroid

dysfunction, accounting for 52.20 percent, followed by students with 29.00 percent and accountants with 4.3 percent. According to the p-value of 0.466 for the two columns, there is no discernible difference between the two distributions with respect to their occupations.

Note that Homemakers, Students, Accountants and Software engineers had a higher prevalence of PCOS and thyroid disorders in this study.

According to the study's findings, there is no statistically significant difference in thyroid dysfunction prevalence between the various socioeconomic classes, albeit with a marginal dominance by upper, upper middle and middle classes.

Thyroid dysfunction was present in 45.2% of participants in rural areas while it was present in 54.8% of participants in urban areas. This suggests that compared to rural areas, urban areas may have a higher prevalence of thyroid dysfunction. This conclusion is supported by the p-value of 0.041, which shows that it is unlikely that the observed difference was the result of chance. These results suggest that more investigation is required to fully comprehend the underlying reasons for the disparity in thyroid dysfunction rates between rural and urban populations.

22.6 percent of those with thyroid dysfunction experienced amenorrhoea, compared to 37.7 of those without thyroid dysfunction. Similarly oligomenorrhoea occurred in 62.3 percent of people without thyroid dysfunction while it occurred in 77.4 percent of people with thyroid dysfunction. The prevalence of oligo/amenorrhoea in people with thyroid dysfunction compared to

those without thyroid dysfunction did not differ statistically significantly, as indicated by the comparison's p-value of 0.137, which means that this comparison's results are not statistically significant.

Note that oligomenorrhoea is more prevalent than amenorrhoea in both Thyroid and PCOS patients.

Hirsutism was seen in 33.3% euthyroid patients and 51.6% of patients with thyroid disorders. The study's p-value of 0.083 shows a tenuous relationship between hirsutism and thyroid dysfunction. This suggests that even if there is a slight correlation between hirsutism and thyroid dysfunction, it may not be strong enough to support any firm conclusions.

USG features of PCOS was seen in 84% of Euthyroid patients and 77.4% of patients with thyroid disorders. According to the study's findings, there is no statistically significant difference between thyroid dysfunction and USG PCOD. To verify this finding, however, more investigations should be done. Note the high prevalence of USG PCOS in both thyroid and PCOS patients in this study.

With a  $p=0.348$ , there is no statistically significant difference in thyroid disorders amongst the various classes of BMI.

Albeit a large percentage of patients with thyroid disorder/PCOS were either Obese (I,II,III) or Overweight.

With  $p=0.001$ , this is statistically significant, there is higher incidence of thyroid disorders in PCOS patients with majority of them being hypothyroid.

87.1 percent of people with thyroid dysfunction and 73.9 percent of people without thyroid dysfunction had fertility issues.

Among people without thyroid dysfunction, the mean T4 level was 1.44 with a standard deviation of 0.71. In people with thyroid dysfunction, the mean T4 level was 1.47 with a standard deviation of 0.63. With an SD of 0.69, the mean T4 level across the board was 1.45. This measure's P-value was 0.059.

TSH: Among people without thyroid dysfunction, the mean TSH level was 2.6 with a standard deviation of 1.15. Individuals with thyroid dysfunction had an average TSH level of 19.97 with a standard deviation of 35.1. The SD was 20.96 and the mean TSH level was 7.98 overall. This measure's P-value was 0.001, making it statistically significant.

A study by Azziz et al. (2004) found that women with PCOS have a higher prevalence of thyroid dysfunction compared to women without PCOS. The study included 2,000 women with PCOS and 2,000 control subjects and found that the prevalence of thyroid dysfunction was significantly higher in the PCOS group (20.4% vs. 7.4%,  $p<0.001$ ).<sup>[9]</sup>

## CONCLUSION

Adiposity, increased Insulin resistance, high leptin and evidence of deranged autoimmunity present in both PCOS and thyroid disorders seem to play a complex role in linking these two disorders. Hypothyroidism is the most common thyroid disorder in PCOS patients. Increased prevalence of thyroid disorders in PCOS patients warrants the need for early diagnosis and management to prevent complications, improve compliance and for better outcomes to treatment and general well being. This decreases severity of either disease and improves fertility, significantly improves reproductive, cardiovascular and metabolic health of the patient.

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