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ORIGINAL RESEARCH ARTICLE

Thyroid Dysfunction in PCOS and Non PCOS Women – A Tertiary Care Cross Sectional Study

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ABSTRACT

BACKGROUND

Thyroid disorders and polycystic ovary syndrome (PCOS) are the most common endocrine conditions in the general population. PCOS is characterised by various menstrual and hormonal irregularities culminating in anovulation, infertility, and hyperandrogenism. PCOS is viewed as a heterogeneous disorder of multifactorial aetiology also associated with increased metabolic and cardiovascular risk factors. Both PCOD and thyroid dysfunction have multiple common presentations and both have profound effect on fertility and reproductive biology. In patients with PCOS, thyroid dysfunction can worsen the existing insulin resistance, leading to higher levels of androgens and cardiovascular disorders.

AIM

To determine the association between thyroid function profile of patients with Polycystic Ovary Syndrome (PCOS) and to compare it with healthy women.

MATERIALS AND METHODS

This is a cross-sectional study on 80 patients with PCOS at Sri Siddartha medical centre, over a period of 6 months. In this study, PCOS was diagnosed based on Rotterdam criteria and patient details regarding history, physical examination and thyroid profile were obtained. In all these patients, thyroid profile, age, BMI, W/H ratio, Clinical hirsutism and Menstrual abnormalities were studied.

RESULTS

PCOS was more common in the age group of 26-30 years. The women in group P were found to have a higher BMI as compared to women in Group H, and the difference was found to be statistically significant (p=0.0065). The mean TSH level in PCOS was found to be higher than

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Non PCOS, and the difference was found to be statistically significant ($p<0.001$).20 % of PCOS patients diagnosed to have hypothyroidism, 15% patients found to have Sub-clinical hypothyroidism and rest 80 % were euthyroid. 63% of PCOS patients with hypothyroidism presented with complaints of irregular menstrual cycle, 26% with complaints of infertility and 11% with other complaints.

CONCLUSION

The prevalence of subclinical hypothyroidism was found to be significantly high in women with PCOS. Periodic testing can reduce the likelihood of additional health issues and improve overall well-being.

KEYWORDS

PCOS – Polycystic Ovarian Syndrome, SCH – Subclinical hypothyroidism, TSH – Thyroid Stimulating Hormone, Infertility, Hypothyroidism, Rotterdam Criteria.

INTRODUCTION

Thyroid disorders and polycystic ovary syndrome (PCOS) are the most common endocrine conditions in the general population. While the causes of hypothyroidism and PCOS differ, these conditions share many similarities. Primary hypothyroidism has been linked to an increase in ovarian volume and cystic changes in the ovaries. Moreover, it is increasingly evident that thyroid disorders are more prevalent in women with PCOS than in the general population.[1]

The prevalence of PCOS in the worldwide is 5-20% and in India it is 5 - 10 %.[2] PCOS is characterised by various menstrual and hormonal irregularities resulting in anovulation, infertility, and hyperandrogenism. Insulin resistance (IR) and hyperandrogenism are amongst the most common. IR is commonly seen in women with PCOS due to the prevalence of obesity.[3]

Many use the guidelines recommended by the Rotterdam criteria for diagnosis, which mandate the presence of two of the following three clinical findings--hyperandrogenism, ovulatory dysfunction, i.e., oligo-ovulation or anovulation, and polycystic ovaries--plus the exclusion of other diagnoses that could cause hyperandrogenism or ovulatory dysfunction.[4]

PCOS is characterized by genetic predispositions, metabolic abnormalities, and hormone imbalances. One common feature is insulin resistance, which leads to increased ovarian androgen production and hyperinsulinemia. Hyperandrogenism influences the development of ovarian cysts and irregular anovulatory cycles, resulting in the various clinical manifestations experienced by PCOS patients.[5]

In patients with PCOS, thyroid dysfunction can worsen the existing insulin resistance, leading to higher levels of androgens.[6]

Elevated levels of thyrotropin releasing hormone (TRH) in hypothyroidism lead to changes in follicle stimulating hormone (FSH) and luteinizing hormone levels. Elevated dehydroepiandrosterone (DHEA) and luteinizing hormone (LH) ratio affect DHEA-S concentrations. Furthermore, excessive thyroid stimulating hormone (TSH) leads to FSH receptor stimulation. The coexistence of polycystic ovary syndrome (PCOS) and

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hypothyroidism has been associated with complex pathophysiological alterations induced by adiposity.[7]

It is evident that PCOD and thyroid dysfunction share many common symptoms and greatly affect reproductive health and fertility. [8] PCOD can be triggered, continued, or worsened by hypothyroidism. Consequently, numerous international studies have been conducted in recent years to explore the relationship between thyroid disorders and PCOS. These studies have found that PCOS patients are four times more likely to have autoimmune thyroiditis and are also more likely to have elevated levels of thyroid-stimulating hormone (TSH).[9]

Recent meta-analysis demonstrated a two-fold increased risk of coronary heart disease and stroke in women with PCOS. Although there is an increased risk of cardiovascular disorders, there is no apparent risk of increase mortality for PCOS. Therefore, PCOS is not only a reproductive disorder but also an endocrinopathy with long-term effects on women's health.[10]

Recognizing and addressing thyroid dysfunction in the management of PCOS could potentially enhance treatment outcomes and improve the overall well-being of affected individuals.[11]

With this background, we undertook this cross-sectional study of patients with PCOS to assess their thyroid function status and its prevalence in PCOS women.

AIM

To determine the association between thyroid function profile of patients with Polycystic Ovary Syndrome (PCOS) and to compare it with healthy women.

METHODS AND MATERIALS

This prospective cross sectional observational study was conducted at Department of obstetrics and gynaecology, Sri Siddhartha medical college, Tumkur from November 2023 to April 2024. The study was approved by the Ethical Review Committee, SSMC, Tumkur.

- This study analysed Outpatients, 40 PCOS and 40 Non PCOS women living in Tumkur district for a period of 6 months.
- The diagnosis of PCOS was made according to Rotterdam criteria.

1. Menstrual abnormalities like amenorrhea (no cycles in the past 6 months), oligomenorrhoea (cycles lasting longer than 35 days), or long cycles,
2. Clinical and/or biochemical hyperandrogenism,
3. Ultrasound (USG) appearance of polycystic ovaries (multiple cysts >12 in number of 2-9 mm size). The presence of two of these three criteria was required to define PCOS.

   Group P (PCOS patients): 40 women with PCOS diagnosed on the basis of Rotterdam criteria.

   Group H (Healthy women): 40 healthy women with no PCOS enrolled as the control group.

Sample Size

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80

Inclusion Criteria

1. Patients having PCOS on the basis of Rotterdam criteria (hypergonadism, menstrual irregularities, and polycystic ovaries on ultrasound examination)
2. Healthy women with no PCOS or any other significant illness enrolled as the control group
3. Individuals between 18 and 40 years of age.
4. Those who gave written informed consent to be part of the study.

Exclusion Criteria

1. Pregnant women
2. Patients on lithium, amiodarone, phenytoin, heparin, or any other drug known to affect thyroid function
3. Patients with significant psychiatric illness
4. Known cases of hypothyroidism or hyperthyroidism
5. Patients who are lost to follow up.

Method of Collection

- Informed written consent was taken from each participant prior to enrolment in the study. Demographic details such as age, occupation, and socioeconomic status of patients was noted.
- The height, weight, Body mass index, WHR (WC/HC) was used as measure of central obesity and readings was noted.
- Detailed menstrual history including history of oligomenorrhea, irregular periods or amenorrhea was taken in all the cases, history of infertility (primary or secondary), and the presence of systemic illness such as hypertension, diabetes mellitus, and a history of any thyroid illness was asked and noted.
- Examined for presence and distribution of hirsutism Hirsutism was graded by modified Ferriman–Gallwey score which can range from 1 to 36, with scores > 6 indicating clinical hirsutism.
- Early morning Thyroid blood test samples will be collected. Serum fT3, fT4 and TSH were done using Chemiluminescence immunoassay at Clinical Laboratory of SSMC Tumkur.
- The normal reference values for T3, T4, and TSH were taken as 0.8–2 ng/mL, 5.5–12.2 μg/dL, and 0.3–4.5 μIU/ml, respectively.

STATISTICAL ANALYSIS

- Data was analysed by Descriptive statistics such as frequency and proportion for categorical variables, Mean and Standard deviation for continuous variable.
- Using data appropriate diagrams like pie diagrams and bar charts was done.
- Independent t test was performed between continuous and categorical variables.
- P value <0.05 was considered as significant statistically.

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RESULTS

Parameter	Group P (40) (Mean ± SD)	Group H (40) (Mean ± SD)	t value	P value
Age	24.27±4.36	25.6±5.98	1.131	0.2611
BMI	25.67±3.68	23.62±2.7	2.796	0.0065**
W/H ratio	0.8±0.1	0.7±0.1	-0.996	0.322

Table 1: General Characteristics of Study Participants

Thyroid Profile	Group P (40) Mean±S.D	Group H (40) Mean±S.D	P value
S.TSH	4.78±1.36	2.65±1.09	<0.001*
Free T4	0.70±0.3	0.89±0.34	0.023
Free T3	3.11±0.12	3.13±0.23	0.836

Table 2: Thyroid Profile in PCOS and Non PCOS Women

Thyroid Distribution	Group P (40)	%	Group H (40)	%
Euthyroid	32	80%	38	95%
Sub Clinical Hypothyroid	6	15%	2	5%
Clinical Hypothyroid	2	5%	0	0

Table 3: Distribution of Thyroid Disorder in both groups

Hyperthyroidism were found to nil during this study.

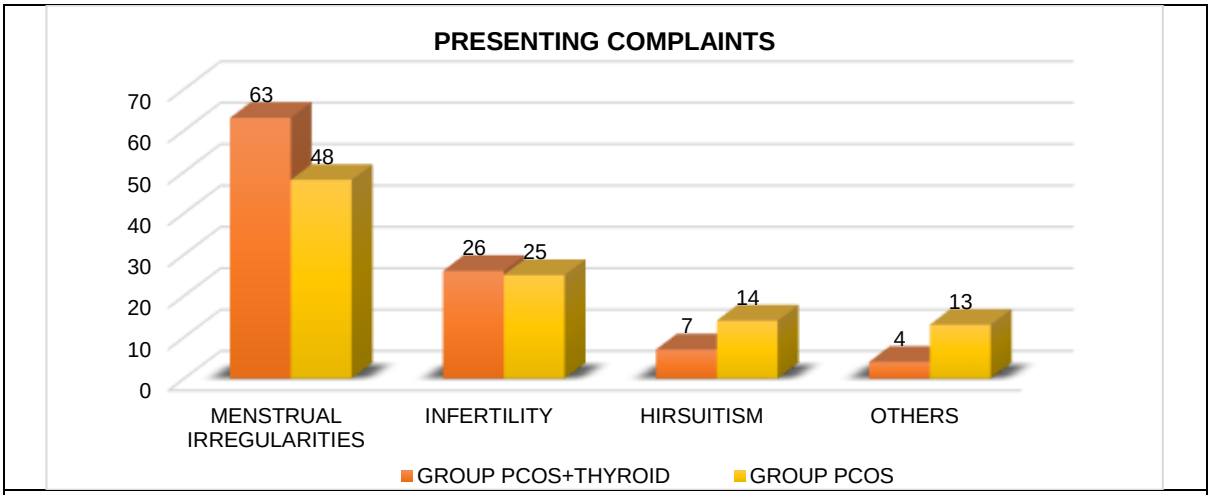

Figure 1: Menstrual Irregularities in Group P (N=32) and Group p with Thyroid Abnormalities (N=8)

DISCUSSION

PCOS and thyroid disorders are two of the most common endocrine diseases affecting young women worldwide and contribute to severe metabolic and reproductive disorders.

The Age groups in our study were well matched between Group P and Group H with mean age of 24.27±4.36 and 25.6±5.98 respectively and it was consistent with study done by, **Kedar et** al,[12] this study found that the mean age of women in the PCOS group was 22.86±3.5

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years and in the control, group was 24.3±3.5 years. In this study Clinical hirsutism was present in significant number 55% of cases of PCOS and 10% in Non PCOS women.

In our study the mean BMI in Group P and Group H was 25.67±3.6 kg/m2, and 23.62±2.7 kg/m2 respectively which was found to be statistically significant (p value =0.0065) This explains the increased prevalence of obesity in PCOS.

Similar high BMIs in cases of PCOS have also been reported by authors such as **Yuan et al.**[13] **and Barber et al.**[14]

The mean TSH level in Group P and H were found to be 4.78±1.36 and 2.65±1.09 μIU/mL, respectively, which was found to be statistically significant ($p<0.001$).

However, FT4/FT3 were not statistically significant because of more subclinical hypothyroidism in PCOS cases.

In this study prevalence of thyroid disorder in Group P was found to be 20% of which subclinical hypothyroidism (SCH) is 15% compared to Group H which is 5% In Group P the subclinical hypothyroidism (75%) was considerably higher (6 cases of total 8 cases) as compared to clinical hypothyroidism.

Unnikrishnan AG et al, states that overall percentage of thyroid dysfunction among females in general population was 11.4% in an epidemiological study from India.[15]

In 2012, American Thyroid Association guidelines, NHANES III states that SCH in general population was 4.3%.[16]

Singla R et al, states that SCH prevalence in women with PCOS varies from 10−25%.[7]

The results of our study are very similar to those of **Sinha et al**,[1] who reported 22.5% subclinical hypothyroidism and 2.5% clinical hypothyroidism. Thus, SCH in women with PCOS may be at least two-fold higher than SCH in unselected women.

Raj et al,[17] suggest a strong association of SCH in women with PCOS vs healthy women.

Ding et al.[18] conducted a meta-analysis to evaluate the prevalence of SCH in women with PCOS. Six studies in total-692 PCOS patients and 540 controls were taken. Based on the results, authors concluded that women who have PCOS have a higher risk of developing SCH.

In our study, incidence of menstrual irregularities was more in Group P with thyroid disorder compared to without thyroid disorder. Group P with hypothyroidism mostly presented with 63% menstrual irregularities,26% Infertility, 7% hirsutism and 4% with other complaints. In Group P without thyroid dysfunction 48% menstrual irregularities, 25% with infertility and 14% hirsutism and 13% with other complaints

Similar findings seen in study conducted by **Lavanya et al**[19] studied patients with hypothyroidism in PCOS mostly presented with menstrual irregularities of 64% and 29% with Infertility, 46% presented with menstrual irregularities and 31% with infertility with PCOS.

It is reasonable to believe that PCOS with multitude of endocrine dysfunction can also affect that hypo pituitary thyroid axis, however the exact mechanism is not known.

CONCLUSION

There is increased incidence of SCH, as shown by elevated TSH levels in PCOS patients of reproductive age group of 26-30 years. High TSH levels and SCH can be associated with a substantial worsening of several intermediate endpoints of cardiometabolic risk in women with PCOS. So, testing the thyroid function in PCOS patients can help in identifying subclinical hypothyroidism and early interventions can reduce the likelihood of additional future health morbidities and improve overall well-being.

Conflicts of Interests

Authors declare that they have no conflict of interests.

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Authors' Contribution
Both of the authors, contributed to the work equally.

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