



## Original Research Article

## Association of hypothyroidism and polycystic ovary syndrome (PCOS)

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## ARTICLE INFO

## Article history:

Received 19-07-2019

Accepted 10-08-2019

Available online 21-09-2019

## Keywords:

Hypothyroidism

Infertility

PCOS

Rotterdam criteria

Subclinical hypothyroidism

TSH

## ABSTRACT

**Introduction:** Polycystic ovarian syndrome (PCOS) and hypothyroidism are the most common endocrine disorders in women of reproductive age group and both these disorders present with complaints of menstrual irregularities like oligomenorrhoea, secondary amenorrhoea and sometimes menorrhagia. The relationship between hypothyroidism and PCOS is not clearly understood.

**Aim and Objective:** To determine the association between thyroid profile and polycystic ovary syndrome (PCOS)

**Materials and Methods:** This is a retrospective study on 71 patients with PCOS at Sri Ramachandra 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 was analysed in Beckman coulter DXI 800 based on the principle CLIA.

**Results:** Statistical analysis was done using SPSS software version 13.0. Student t test was performed and p value < 0.05 considered to be significant. The p value is not statistically correlated for TSH and age to hypothyroidism and other presenting complaints.

**Discussion:** PCOS was more common in the age group of 26-30 years. 18% of PCOS patients diagnosed to have hypothyroidism, 4% patients found to have Sub-clinical hypothyroidism and rest 78% were euthyroid. 46% of PCOS patients presented with complaints of irregular menstrual cycle, 31% with complaints of infertility and 23% with other complaints.

**Conclusion:** There is increased prevalence of hypothyroidism in patients with PCOS. Similarly, the coexistence of hypothyroidism and PCOS can lead to severity of complaints in hypothyroid patients. Screening for hypothyroidism in PCOS patients will decrease the morbidity. Thus improving quality of life.

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## 1. Introduction

Polycystic ovarian syndrome (PCOS) is a highly complex and heterogeneous metabolic syndrome and the prevalence of PCOS in the worldwide is 5-20%<sup>1</sup> and in India it is 5-10%.<sup>2</sup> PCOS described by Stein and Leventhal in the year 1935. Hence it is also called as Stein-Leventhal syndrome. There are various criteria's for diagnosing PCOS. They are National Institutes of Health [NIH], Rotterdam, Androgen Excess Society (AES), Amsterdam, Endocrine Society (ES) and Paediatric Endocrine Society (PES),<sup>3</sup> but widely acceptable criteria worldwide is Rotterdam Criteria.<sup>4</sup> Atleast 2 of the following criteria should be

present in a patient with PCOS.

1. Oligo /amenorrhea: absence of menstruation for 45days or more and/ or  $\leq 8$  menses per year
2. Clinical hyperandrogenism [Hirsutism, acne and androgenic alopecia are clinical signs and symptoms of hyperandrogenism. The hirsutism is scored using Modified Ferriman - Gallway (mFG) score of more than 6 and in mongoloid or Asiatic women it is  $\geq 3$ . For acne, grading is done as 0: none, 1: mild, 2: moderate & 3: severe]
3. Polycystic Ovaries: presence of >10 follicles, 2-8mm in diameter, with increased ovarian volume >10mm & echo-dense stroma in pelvic ultrasound scan.

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The most common metabolic endocrine disorders in women of reproductive age group are polycystic ovarian syndrome (PCOS) and hypothyroidism. Both these disorders have few clinical features in common like menstrual irregularities (oligomenorrhoea and secondary amenorrhoea and menorrhagia), obesity, infertility and dyslipidaemia. In PCOS, anovulatory cycles leads to infertility. It also causes other pregnancy related complications like miscarriage, gestational diabetes mellitus and pre-eclampsia.<sup>5</sup>

The underlying mechanism of the link between PCOS and hypothyroidism is not clearly understood. It has been found that reproductive hormones imbalance can also lead to thyroid disorders. Thyroid hormone, T3 along with FSH enhances granulosa cell proliferation and also inhibits granulosa cell apoptosis by PI<sub>3</sub> / AKT Pathway. Thyroid hormone s are involved from the process of folliculogenesis to implantation of the fertilized ova in reproduction.<sup>6</sup> When Serum TSH value is above the upper reference limit to 10 mIU/mL with the normal free thyroxine (fT<sub>4</sub>), then it is known as Sub-clinical hypothyroidism.<sup>7</sup> So, the objective of our study is to determine the association of hypothyroidism and PCOS in the reproductive age group women.

## 2. Materials and Methods

This is a Single Centre, Retrospective cross-sectional study.

### 2.1. Study population

This study includes the women of reproductive age group 20–40 years attending Gynaecology OPD at Sri Ramachandra Institute of Higher Education & Research, Chennai.

### 2.2. Case group

### 2.3. Inclusion criteria

Reproductive age group women 20–40 years diagnosed with PCOS based on ROTTERDAM criteria

### 2.4. Exclusion criteria

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

### 2.5. Period of the study

This study was conducted for a period of 6 months from January 2018 to June 2018.

### 2.6. Methods

The study was conducted after obtaining the approval from the Institutional Ethics Committee. Then the patient's

history, drug history and the relevant lab data of Serum fT<sub>3</sub>, fT<sub>4</sub> and TSH were obtained from patient records in Medical Records Department.

Serum fT<sub>3</sub>, fT<sub>4</sub> and TSH were done using Chemiluminescence immunoassay in Beckmann Coulter DXI 800 at Clinical Biochemistry lab in Sri Ramachandra Laboratory Services (SRLS) at Sri Ramachandra Institute of Higher Education and Research.

The biological reference interval for fT<sub>3</sub> was 2.5 to 4.4 pg/mL, fT<sub>4</sub> was 0.58 to 1.64 ng/mL and TSH was 0.38 to 5.33  $\mu$ IU/mL.

### 2.7. Statistical analysis

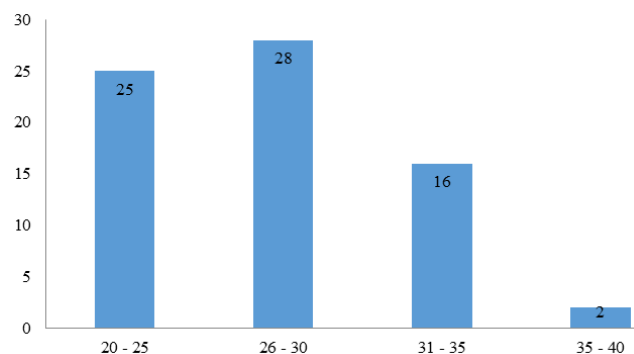
Statistical analysis was done using SPSS software version 13.0. Non parametric Mann-Whitney U test done for TSH and Age in Euthyroid and Hypothyroid patients.

## 3. Results

### 3.1. Baseline characteristics

### 3.2. Age distribution

Among 71 PCOS patients, 28 of them belonged to the age group of 26 to 30 years, 25 were between 20 and 25 years old, 16 were between 31 and 35 years, 9 were between 14 and 20 years and 2 were 35 to 40 years (Figure 1).



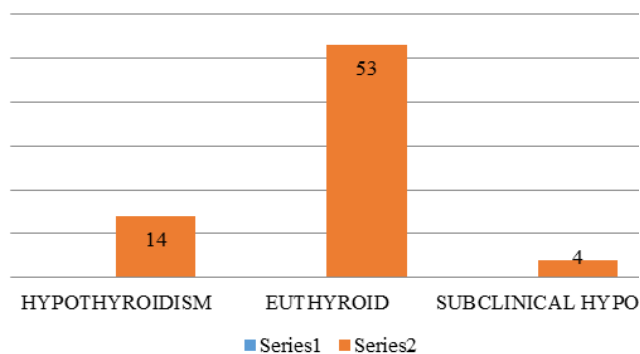
**Fig. 1:** Age wise distribution of PCOS cases

### 3.3. Alterations of thyroid Profile in PCOS Cases

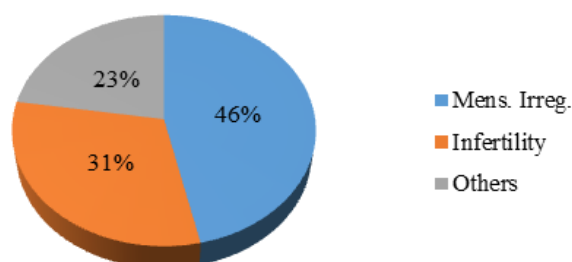
Out of 71 patients, 14 were diagnosed to have hypothyroidism, 4 had Sub clinical hypothyroidism and remaining 53 were Euthyroid (Figure 2).

In our study, 46% presented with complaints of menstrual irregularities, 31% patients presented with infertility and 23% with other complaints (Figure 3).

In Patients with overt hypothyroidism in PCOS mostly presented with menstrual irregularities of 64% and 29% with Infertility (Figure 4). In our study, only 20% showed reversal of LH and FSH ratio (Figure 5) and it is not statistically correlated (Figure 7).

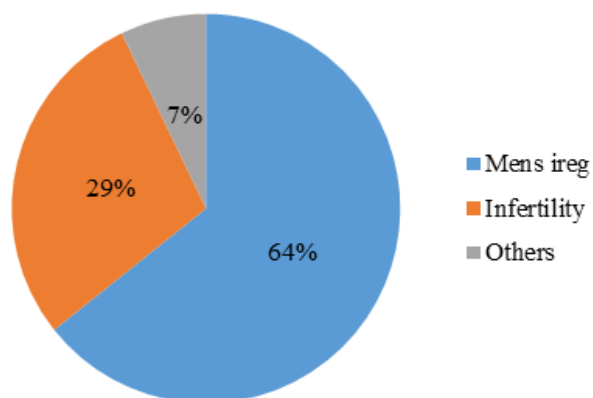


**Fig. 2:** Distribution of Hypothyroidism in PCOS patients

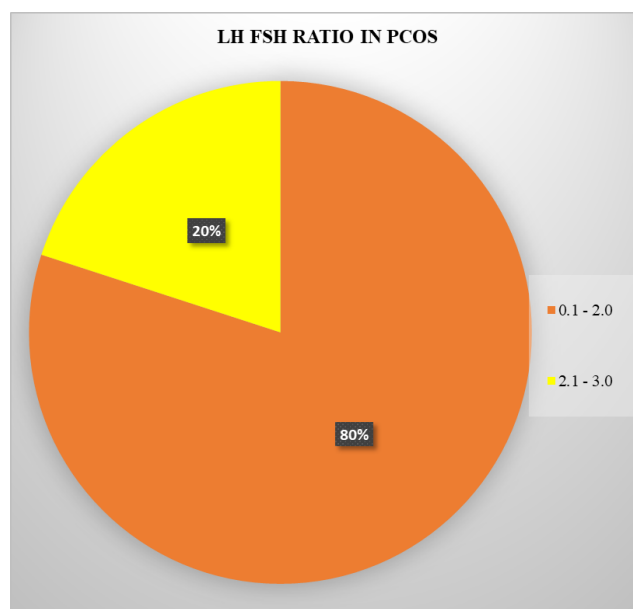


**Fig. 3:** Distribution of PCOS cases with respect to Presenting Complaints

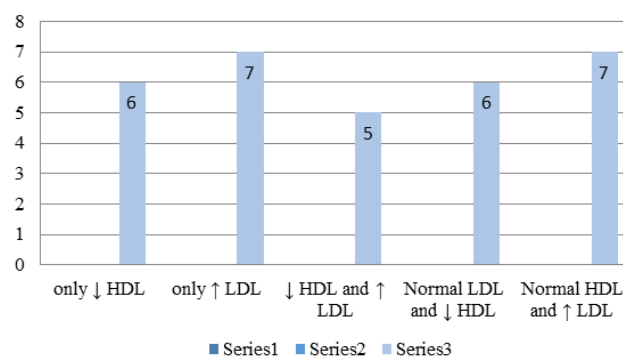
In our study, out of 71 patients, serum lipid profile was done only for 18 patients, out of which 39% of patients with PCOS had decreased HDL levels, 12% with increased triglyceride levels and 59% with increased LDL levels in the patients with PCOS (Figure 6).



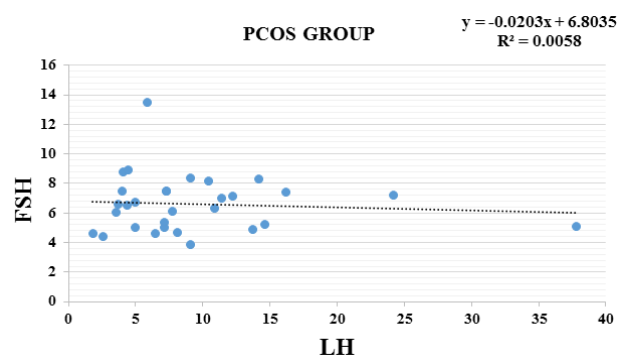
**Fig. 4:** Distribution of presenting complaints in Hypothyroidism



**Fig. 5:** Reversal of LH FSH ratio in PCOS



**Fig. 6:** Alterations of Lipid profile in patients with PCOS



**Fig. 7:** Correlation of LH and FSH in patients with PCOS

**Table 1:** Comparison of TSH and Age between the groups (Values expressed as median and Range)

Parameters	Characteristics	N	Median	Range	p value (<0.05 significant)
TSH ( $\mu$ IU/mL)	Hypothyroidism	14	3.96	18.39	0.0477
	Euthyroid	53	2.145	4.866	
	SCH	4	8.633	3.33	
AGE (Years)	Hypothyroidism	14	27.5	20	0.5552
	Euthyroid	53	28	19	
	SCH	4	28.5	5	

#### 4. Discussion

Hypothyroidism is more common in the reproductive age group women with PCOS.<sup>8</sup> Ramanand SJ *et al.* states that prevalence of hypothyroidism in women of reproductive age group is 3 – 4%.<sup>9</sup> In American thyroid association guidelines of 2012, according to British Whickham, the prevalence of Hypothyroidism in reproductive age group women was 9.3%.<sup>6</sup> In our study the prevalence of hypothyroidism is 18% and it is increased compared to the general population.

Amirtha Jansirani *et al.* states that 88% presented with menstrual irregularities in PCOS.<sup>10</sup> In our study, 46% presented with menstrual irregularities and 31% with infertility. In PCOS, there is disturbances in Hypothalamo-Pituitary-Adrenal (HPA) axis and Hypothalamo-Pituitary-Ovarian (HPO) axis that leads to reversal of LH/FSH ratio and excess production of adrenal androgens.<sup>10</sup> These leads to complaints of menstrual irregularities like oligomenorrhoea, secondary amenorrhoea and anovulatory cycles and Infertility. Hypothyroidism affects the pulsatile release of Growth hormone releasing hormone causing disturbances in HPO axis.<sup>11</sup>

In ATA guidelines 2012, NHANES III states that SCH in general population 4.3%. Amanda Jeffery *et al* states that prevalence of subclinical hypothyroidism is between 2 and 4% approximately.<sup>11</sup> In our study also the prevalence rate is 4%. In PCOS, there is an increased risk of subclinical hypothyroidism probably due to autoimmune thyroiditis. So, most of the patients with SCH in PCOS show presence of autoantibodies, which affects the reproductive health causing infertility.

In this study, TSH values and age are expressed in median and Range for euthyroid, hypothyroid and subclinical hypothyroidism. Mann-Whitney U test was used to compare euthyroid and hypothyroid individuals. There was significant difference in TSH with p value of 0.0477. SCH group was not included for comparison because of the sample size of 4 which was less than standard size of 5. p value for age between euthyroid and hypothyroid group was 0.552 and not statistically significant. The median of age of the groups was similar between these groups (Ref. Table 1).

For a long time LH/FSH ratio of greater than 2 has been considered as “gold standard” in diagnosis of PCOS. In our study, only 20% showed increased LH/FSH ratio and

it is not statistically correlated (Figure 7). Hence, it is not a characteristic features for diagnosing PCOS in the reproductive age group women.

In this study, out of 71 patients, serum lipid profile was done only in 18 patients. 5 patients have decreased HDL and increased LDL. Serum lipid profile is mandatory in all women with PCOS, so that early intervention can be done to minimize the risk of cardiovascular diseases in PCOS patients. Couto Alves *et al*

Rashidi *et al.* states that in PCOS patients 34.6% were found to be obese.<sup>12</sup> In obesity, leptin acts directly on hyperthyrotropinemia and increases TSH increases susceptibility to hypothyroidism.<sup>13</sup> Out of 71 PCOS patients, 9 patients were on metformin due to severity of complaints of PCOS. In PCOS patients with hypothyroidism, 24% patients were on metformin. Metformin is a biguanide, which reduces insulin resistance and also regulates menstrual cycle. It seem to benefit these individuals.<sup>14</sup>

#### 5. Conclusion

There is increased prevalence of hypothyroidism in patients with PCOS. Similarly, the coexistence of hypothyroidism and PCOS can lead to severity of complaints in patients. By performing thyroid function tests in PCOS patient's helps in rule out hypothyroidism and SCH, which might decrease further complications thus improving general well-being. Further studies with larger sample size is required to understand the correlation of SCH with PCOS.

#### 6. Limitations of the study

The study was conducted in short period of time with small sample size. This study can be conducted with larger sample size prospectively. So that association of thyroid profile with PCOS can be understood in a better way. A control group of apparently healthy age matched female individuals without PCOS will give a better understanding of the mechanism.

#### 7. Source of Funding

None.

#### 8. Conflict of Interest

None.

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**Cite this article:** Lavanya K, Silambanan S, Ganesh M. **Association of hypothyroidism and polycystic ovary syndrome (PCOS).** *Int J Clin Biochem Res* 2019;6(3):405-409.