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Research Article

ASSOCIATION OF POLYCYSTIC OVARY SYNDROME AND THYROID DYSFUNCTION AMONG REPRODUCTIVE WOMEN: A CROSS-SECTIONAL STUDY

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ABSTRACT

Objective: Polycystic ovarian syndrome (PCOS) is became most common problem in the reproductive age group women who seem to be adversely affected by associated thyroid dysfunction. Ovarian failure and pregnancy-related complications leaded by both factors. The study helps to explore the incidence and etiology of diverse thyroid conditions among PCOS individuals.

Methods: This prospective single-center study with 40 female patients with hyperandrogenism, hirsutism, oligo-anovulation, and polycystic ovaries patients were defined as having PCOS according to the revised 2003 Rotterdam criteria and Ferriman–Gallwey score with comprised the study population. Normal female subjects were studied as the control population who had normal thyroid function and without PCOS. By measuring of serum thyroid-stimulating hormone (TSH), free thyroxine levels (free T3 and free T4), follicle-stimulating hormone (FSH), luteinizing hormone (LH), estrogen, progesterone, and testosterone can evaluate thyroid function. Along with ultrasound was performed to confirm the PCOS. By SPSS version 19 Chi-square test and t-test were determined.

Results: This case–control study revealed that a statistically significant higher prevalence of PCOS patients was found to have higher mean TSH values that were 5.33±2.51 μIU/mL, the mean for T3 and T4 was 154±138 μg/dL and 11.27±8.47 μg/dL, respectively. The mean FSH values were 07.27±4.49 μIU/mL, the mean LH was 84.27±38.49 μIU/mL, the mean estrogen 342±202 pg/mL, the mean progesterone values were 14.2±8.9 ng/mL and the mean testosterone levels were 69.73±9.28 ng/mL.

Conclusion: Thyroid dysfunction shows a high prevalence in PCOS patients. Dysfunction can be treated which helps to manage infertility associated with PCOS.

Keywords: Follicle-stimulating hormone, Hypothyroidism, Polycystic ovarian syndrome, Luteinizing hormone.

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INTRODUCTION

Testosterone-associated polycystic ovarian syndrome (PCOS) is the most common form of chronic anovulation; perhaps occurring in 5–10% of reproductive women [1]. Cardiovascular risk factors, higher risk for Type 2 diabetes, high blood pressure, and other metabolic disorders also associated with PCOS [2]. General insulin resistant occurs due to obesity in general individuals, and non-obesity insulin resistance occurs due to PCOS conditions.

Infertility, irregular uterine bleeding, and increased pregnancy loss are the major cause of the PCOS reproductive sexual age group women. Along with the various clinical conditions, thyroid dysfunction and anatomic abnormalities of the thyroid were parallel linked with PCOS. Hormonal imbalance was majorly associated with alteration in a number of metabolic processes. Thyroid dysfunction early stage, infantile hypothyroidism, and untreated juvenile hypothyroidism cause an overall dysfunction metabolic factor, growth inhibit, puberty delay, anovulatory cycles, diminished libido, and failure of ovulation. The impact of the pregnancy complications was varied from previous studies. For the past few years, different studies from various parts of the world were carried regarding thyroid disorders in PCOS patients. Mostly the results showed a higher incidence of elevated thyroid stimulating hormone (TSH) levels and other related hormones [3]. Again, routine screening for thyroid dysfunction in hyperandrogenic patients is of little value since the incidence of these disorders is not higher in hyperandrogenic patients than in normal women of child bearing age [4]. The present study has tried to explore the PCOS-thyroid interface.

METHODS

About 40 female patients in the age group of 13–45 years with hyperandrogenism, hirsutism, and oligoanovulation (amenorrhoea or oligomenorrhoea) visiting the outpatient departments of OBG were screened for this study. The study received approval from the IEC of SLIMS, Puducherry. Well informed consent was obtained from all the patients who contributed in the research project. The Rotterdam classification was used to define PCOS in the event of: (1) Oligomenorrhoea; more than 35 days and above long cycle or no periodic cycles in the past 6 months (2) hyperandrogenism individuals, and (3) polycystic ovaries with multiple cysts >12 under ultrasound (USG) study.

Inclusion criteria

The presence of any of two Rotterdam classification and Ferriman–Gallwey score was required to define PCOS with all necessary diagnosis.

Exclusion criteria

Congenital adrenal hyperplasia, any kind of tumor, Prolactinoma, and Cushing syndrome were ruled out [5].

Hyperandrogenism can be determined by two method clinical hyperandrogenism scaled by (Ferriman–Gallwey score >7) and/or

acne, and/or androgenic pattern of alopecia [6,7] and biochemical hyperandrogenemia by screened a level of luteinizing hormone (LH), follicle stimulating hormone (FSH), testosterone ratio, etc. was considered. Detecting the presence of cystic ovaries diagnosed by performing Transabdominal pelvic USG. Control population picked by same age group female patients visiting with problems of thyroid dysfunction or unrelated to PCOS and with normal menses. Detailed clinical TSH, free thyroxine levels (free T3 and free T4), and free testosterone measured by an automated immune-enzyme assay systems were performed in both PCOS and control population. Using automated immune-enzyme assay the normal serum levels of various hormones and peptides were determined, day 2 of menstruation individuals were screened for LH and FSH investigation. USG was performed to identify the lower abdomen was done to identify PCOS and the thyroid was done in the presence of goiter. Statistical analysis was done by Student's t-test and Chi-square test using appropriate software (SPSS version 19).

RESULTS

A total of 72 patients with hypertrichosis and menstrual abnormalities were screened. PCOS was diagnosed in 40 patients according to Rotterdam classification of PCOS and the rest were eventually excluded from this study. In this study population, maximum numbers of PCOS patients were in the age group of 15–20, 26–30, 31–40, and 40–15 were 40%, 30%, 20%, and 10% subsequently (Table 1 and Fig. 1).

Both study population and a control group were compared with majorly several clinical characteristics and laboratory thyroid-related investigations. Twenty-two patients (55%) had body mass index (BMI) of more than 25, 32 patients (80%) had normal blood pressure, 07 patients (17.5%) had prehypertension, and only 1 patient (2.5%) were hypertensive. Clinical Hirsuitism as per modified Ferriman–Gallwey score (>7) was present in 29 patients (72.5%; mean F-G score 16.76±8.92) of PCOS while only 06 (15%; mean F-G score 7.28±4.98) of control were hirsute (Table 2 and Fig. 2).

Twenty-two patients (55%) had elevated LH-to-FSH ratio above 2.0 compared to control group (LH: 84.27±38.49 and FSH: 7.27±4.49 of controls LH: 79.89±37.27 and FSH: 7.01±5.23, respectively; $p<0.001$ and $p<0.05$). PCOS patients higher mean free T3 levels than the control group (154±138 and 153 ±136, respectively; $p<0.001$), Free T4 levels than the control group (11.27±8.47 and 11.01±8.72, respectively; $p<0.001$) and TSH levels than the control group (5.33±2.51 and 3.66±3.11, respectively; $p<0.001$). Estrogen, progesterone, and testosterone of PCOS subjects were (342±202, 14.2±8.9, and 69.73±9.28, respectively) of controls (338±205, 13.98±9.2 and 62.27±7.54, respectively) were significance ($p<0.01$, $p<0.05$ and $p<0.001$). On thyroid USG, a significantly higher percentage of PCOS patients (12.5%; controls 2.5%) had hypoechoic USG pattern (Table 3 and Fig. 3).

Biochemically investigation of thyroid disorders was detected in 26 (65%) out of 40 patients with PCOS as compared to only 18 of control population (45%; $p<0.05$). Hyperthyroidism was detected in two patients (5%; 2.5% of control), subclinical hyperthyroidism was detected in four patients (10%; 5% of control), hypothyroidism was detected in nine patients (10%; 1.75% of control), subclinical hypothyroidism was detected in six patients (15%; 12.5% of control), and five patients were detected with goiter (12.5%), 7.5% of control (Table 4 and Fig. 4).

Table 1: Statistical age group in PCOS subjects and control group

Age group	Subjects (n=40) (%)	Controls (n=40) (%)
13–20	16 (40)	12 (30)
21–30	12 (30)	15 (37.5)
31–40	8 (20)	11 (27.5)
41–45	4 (10)	2 (5)

PCOS: Polycystic ovarian syndrome

Table 2: Anthropometric statistical correlation between PCOS subjects and control group

Variables	PCOS (n=40)	Control (n=40)	p-value
Age (years)	23.47±6.87	24.3±6.97	<0.01
BMI (kg/m^2)	23.21±3.07	24.55±3.98	<0.01
FG score	16.76±8.92	7.28±4.98	0.036

Values are expressed as means±standard deviations (range). PCOS: Polycystic ovarian syndrome, BMI: Body mass index, FG: Ferriman–Gallwey

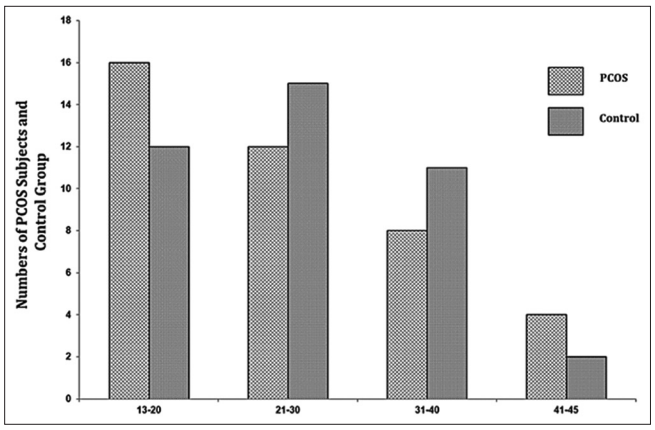

Fig. 1: Statistical age group in polycystic ovarian syndrome subjects and control group

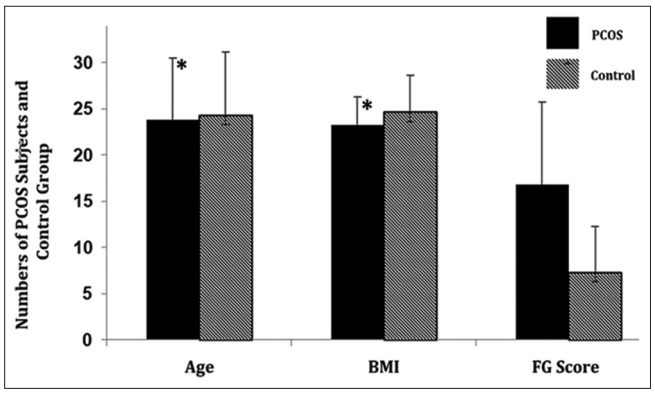

Fig. 2: Anthropometric statistical correlation between PCOS subject and control group. *Age and BMI: p<0.01

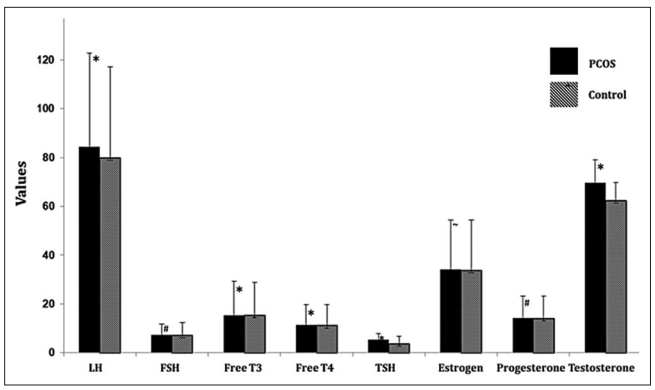

Fig. 3: Biochemical parameters statistical correlation between PCOS subjects and control group. *LH: Free T3, Free T4, and testosterone: p<0.001. #FSH and progesterone. FSH: Follicle-stimulating hormone, PCOS: Polycystic ovarian syndrome

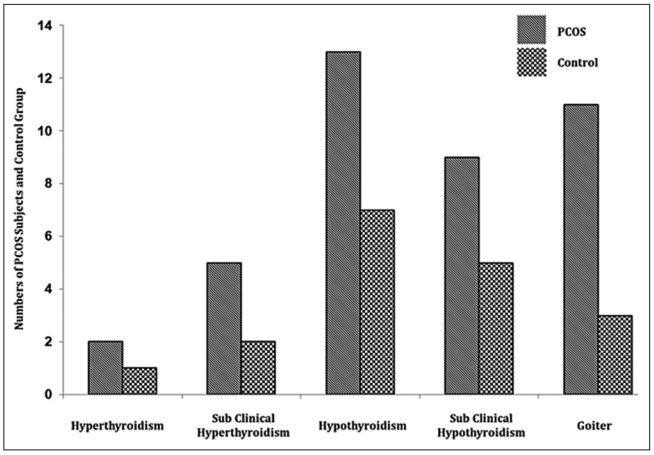

Fig. 4: Statistical significant of difference thyroid disorders in PCOS subjects and control group. PCOS: Polycystic ovarian syndrome

Table 3: Statistical correlation between PCOS subjects and control group

Variables	PCOS (n=40)	Control (n=40)	p-value
Age (years)	23.47±6.87	24.3±6.97	<0.01
BMI (Kg/m^2)	23.21±3.07	24.55±3.98	<0.01
FG score	16.76±8.92	7.28±4.98	0.036
LH (mIU/mL)	84.27±38.49	79.89±37.27	<0.001
FSH (mIU/mL)	7.27±4.49	7.01±5.23	<0.05
Free T3 (pg/mL)	154±138	153±136	<0.001
Free T4 (ng/dL)	11.27±8.47	11.01±8.72	<0.001
TSH (mIU/mL)	5.33±2.51	3.66±3.11	<0.001
Estrogen (pg/mL)	342±202	338±205	<0.01
Progesterone (ng/mL)	14.2±8.9	13.98±9.2	<0.05
Testosterone (ng/mL)	69.73±9.28	62.27±7.54	<0.001

Values are expressed as means±standard deviations (range). PCOS: Polycystic ovarian syndrome, BMI: Body mass index, FG: Ferriman–Gallwey, LH: Luteinizing hormone, FSH: Follicle stimulating hormone, TSH: Thyroid stimulating hormone

Table 4: Statistical significant of different thyroid disorders in PCOS subjects and control group

Common thyroid related abnormalities	PCOS (n=40) (%)	Controls (n=40) (%)
Hyperthyroidism	2 (05)	1 (2.5)
Sub-clinical hyperthyroidism	4 (10)	2 (05)
Hypothyroidism	9 (22.5)	7 (1.75)
Sub-clinical hypothyroidism	6 (15.0)	5 (12.5)
Goiter	5 (12.5)	3 (7.5)

PCOS: Polycystic ovarian syndrome

DISCUSSION

In this study, the 15–20 years age group of PCOS maximum has decreased significantly after 30 years. This might be because menstruation symptoms start to appear at adolescence, which prompts early OPD presentation. In this study, 72.5% of the patients had clinical hirsutism, as determined by the modified FG score. In 75% of patients, elevated levels of free testosterone were determined. This finding also correlates with other studies stating that hirsutism affects 65–75% of other parts of south-east Asian woman [8,9]. In addition, according to observations, 69% of 175 PCOS patients had high testosterone and 91% of 175 PCOS subjects showed hypertrichosis. Around 318 PCOS patients of Najem *et al*. [10] study found that 91% of individuals had hirsutism were 57% of the 130 PCOS patients in a Amato *et al*. [11] study was observed to have hirsutism, 61% of the patients had elevated free testosterone. In this study, patient having symptoms of menstrual disturbance in the form of oligomenorrhea or amenorrhea was 92.5%. This is also reflected in other studies which report 60–85% of patient suffering from gross menstrual dysfunction [8]. 93% PCOS patients had oligomenorrhea or amenorrhea as observed by Najem *et al*. [10]. In the present study, 17.5% of patients were pre-hypertensive, 2.5% of patients were detected to have hypertension. Other studies done previously also detected prevalence of raised blood pressure. Prevalence of hypertension was 4% in a study conducted by Najem *et al*. and pre-hypertension was detected in 8% as detected by Najem *et al*. [10] Huang *et al*. [12]. In the present study, 55% of PCOS subjects had elevated levels of LH/FSH (>2) while, 45% of patients had LH/FSH <2. This was additionally observed in other studies for example, discovered elevated LH (>14) in 56% of their patients, Banaszewska *et al*. [13] discovered elevated LH/FSH ratio in 45.4% of their patients, and Anlakash [14] discovered elevated LH/FSH prevalence in 64% of their 107 PCOS patients. While Anwary *et al*. discovered that 100% of patients had polycystic ovaries; Najem *et al*. showed that 74% of patients exhibited USG characteristics of polycystic ovaries. In this study, goiter was present in 12.5% of patient, subclinical hypothyroidism was present in 15%, hypothyroidism was present in 22.5%, and subclinical hypothyroidism and clinical hypothyroidism was present in 2.5% of cases. Among these hyperthyroid patients was present in 10% and hyperthyroidism was present in 5%. Therefore, this prospective case-control study found that young PCOS patients had a significantly greater frequency of thyroid problems than age-matched controls. Even more PCOS participants were found to have autoimmune thyroiditis in several other trials. Ozdemir *et al*. discovered a prevalence of 30.5% among 107 patients. 29 individuals (27.1%) had thyroid nodules found; 10 had a single nodule and 19 had multiple nodules. In half of the PCOS patients, thyroid abnormalities were found [15]. In one of the most recent investigations, Iranian researchers Kachuei *et al*. found that PCOS patients had considerably higher rates of autoimmune thyroiditis and goiter than did control subjects (goiter 62.3% vs. 35.7%, p=0.0001). Finally, a review of Indian literature focuses on Ghosh *et al*., who attempted to assess the contribution of hypothyroidism to the development of PCOS. Hypothyroidism would affect ovarian function and fertility since thyroid hormones are involved in the gonadotropin-induced estradiol and progesterone release by human granulosa cells [16]. It is time to raise awareness of the connections between the thyroid and PCOS and their complications because this hypothesis still seems to be valid today.

CONCLUSION

Our findings demonstrate that a higher HA incidence in PCOS is associated with a higher TSH level, regardless of age, BMI, and thyroid dysfunction. Patients with PCOS experience thyroid problems and other endocrine disorders more frequently. As a result, persons who have been diagnosed with PCOS must go through extensive endocrine testing. The coexisting endocrinal abnormalities may then be identified and treated appropriately to reduce morbidity and mortality. When PCOS patients get thyroid function testing, hypothyroidism and subclinical hypothyroidism are ruled out, which may prevent additional issues and enhance overall well-being.

AUTHORS CONTRIBUTIONS

Dr. Nithya Rajapandian presented the ideology of the articles and its references, Dr. Naveen Ravi helped in the sentence phrases of the manuscript, Dr. Naveen Kumar C looked over the journal selection and communication and Dr. V Anebaracy derived the full article with result and interpretation.

CONFLICTS OF INTEREST

Nil.

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