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ORIGINAL ARTICLE

Hypothyroidism in Women with Polycystic Ovary Disease

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Abstract

Background: **The most prevalent endocrine condition in women of reproductive age is polycystic ovarian syndrome (PCOS), which has systemic metabolic symptoms and neuroendocrine-immunity disruption.**

Objective: **Was to find the incidence of hypothyroidism in PCOS patients, the link between PCOS and hypothyroidism in terms of clinical and laboratory markers, and the correlation between PCOS and thyroid autoimmunity in matched euthyroid controls.**

Patients and methods: **This prospective observational study was conducted on 113 women diagnosed as PCO who were diagnosed by Rotterdam criteria and followed up at Al-Hussein Hospital & Al-Azhar University Hospitals in the period of 8 months from April 2021 to December 2021.**

Results: **There is no statistically substantial variation between euthyroid PCO and hypothyroid PCO as regards personal history except for age presentation with *P*-value = 0.006 as most of hypothyroid PCO patients had age between 21 and 30 years more than euthyroid patients.**

Conclusion: **Ovaries may be affected by thyroid conditions, most notably hypothyroidism, via both a direct impact on ovarian function and autoimmune routes. In 54% of PCO women, hypothyroidism was present. Women with PCO had the greatest cases of oligomenorrhea.**

Keywords: Hypothyroidism, Oligomenorrhea, Polycystic ovary disease, Thyroid autoimmunity

1. Introduction

The most prevalent endocrine illness in women of reproductive age is polycystic ovarian syndrome (PCOS), which affects the neuroendocrine and immune systems and has systemic metabolic symptoms.[1]

As is often seen in PCOS, thyroid hormone abnormalities or thyroid autoimmunity are linked to an increased risk of infertility, spontaneous miscarriage, premature birth, and metabolic dysfunctions.[2] It has not yet been determined whether this is because of some shared variables that predispose a person to both conditions or because there is a pathophysiological link between the two disorders.[3]

Thyroid autoimmunity and subclinical hypothyroidism (SCH) are found to be more common in PCOS patients than in women generally.[4] Recent research has looked at the relationship between PCOS's metabolic characteristics, particularly dyslipidemia and insulin resistance, and thyroid function/thyroid autoimmunity. Women with PCOS often have SCH, which has been linked to hyperlipidemia and has been shown to influence both the prevalence of pregnancy in PCOS and the general population.[5]

2. Patients and methods

This prospective observational study was conducted on 113 women diagnosed as PCO who were diagnosed by Rotterdam criteria and followed up at Al-Hussein Hospital & Al-Azhar University Hospitals in the period of 8 months from April 2021 to December 2021.

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2.1. Inclusion criteria

Women diagnosed to have polycystic ovary disease based on ultrasonography. Women with history of irregular menstruation: No menstruation for the past 6 months, a menstrual cycle that lasts longer than 35 days, increased androgen levels, acne, alopecia (androgenic pattern), or biochemical hyperandrogenism are all indicators of this condition. Using a 3.5 MHz probe in Sonoace X4 mode, a trans-abdominal pelvic ultrasonography is performed. The size and number of follicles in the ovaries will be determined. By summing the results from the two ovaries and dividing them by two, the mean values will be determined. A polycystic ovary is one that has >10 cm^3 of ovarian volume or ≥12 follicles.

2.2. Exclusion criteria

Congenital hypothyroidism, thyroidectomy patients, cancer patients with a history of radiation to the head and neck, women who refuse to be examined or undergo additional testing or follow-up care, congenital adrenal hyperplasia or virilizing tumors, steroid users, women taking contraceptive pills, and pregnancy are all risk factors.

The following was applied to all of the patients that were included:

Full history taking including: Personal history: age, occupation, and residence, menstrual history: oligoamenorrhea, polyamenorrhea, secondary amenorrhea, obstetric history: gravida, parity, mode of previous delivery, preeclampsia, gestational diabetes, HTN, DM, pat history of surgery or gynecological problems.

Examination including: Vital signs: anthropometric measures such as weight, height, and body mass index, as well as blood pressure, pulse, and temperature, systemic examination: chest, cardiac, lower limp edema.

Laboratory investigations including: Complete blood count (CBC): Hemoglobin (Hb), total leukocytic count (TLC), platelet (PLT), urine analysis: specific gravity, RBCs, pus cells, crystals, glycemic assessment: fasting blood sugar (FBS), 2 h post prandial (2HPP), and insulin and gonadal hormones: follicular stimulating hormones (FSH), leutinizing hormones (LH), and estrogen (E) and antimullerian hormones (AMH).

2.3. Statistical analysis

With the aid of the SPSS software (Statistical Package for Social Science) version 24 and NCSS 12, LLC, USA, the obtained data were computerized and statistically evaluated. Utilizing the Shapiro–Walk test, the distribution of the data was examined for normality. Frequencies and relative percentages were utilized to depict qualitative data. The variance between the qualitative variables was calculated utilizing the chi square test (χ^2) and Fisher exact, as shown.

3. Results

This observational study was conducted on 113 PCO women who were diagnosed and followed up at Al-Hussein Hospital & Al-Azhar University Hospitals in the period of 8 months from April 2021 to December 2021, with median age 28 years ranged between 16 and 35 years Table 1.

Variables expressed by median (range) or *n* (%) as appropriate.

The common age among PCO women is 21–30 years (61.6%),followed by < 20 years (21.2%) and >30 years (17.7%) Table 2.

The median of TSH level is 4.5 (0.6–45), the median of T3 level is 2.5 (1–5.4) and the median of T4 level is 2 (0.2–4.5) Table 3.

54% of the included PCO women is hypothyroid while 46% were euthyroid Table 4.

There was no statistically substantial variation between euthyroid and hypothyroid PCO patients as regards menstrual history with *P*-value >0.05 Table 5.

There was no statistically substantial variation between euthyroid and hypothyroid PCO patients as regards obstetric history except for gravida with *P*-value = 0.006, and parity with *P*-value = 0.008 Table 6.

This table shows no statistically substantial variation between euthyroid and hypothyroid PCO patients as regards anthropometric measurements with *P*-value >0.05.

4. Discussion

This observational study was conducted on 113 PCO women who were diagnosed and followed up at Al-Hussein Hospital, Al-Azhar University Hospitals in the period of 8 months from April 2021 to

Table 1. Personal history of the studied population.

Personal history	Total $N = 113$
Age	28 (16–35)
Age interpretation	
<20	24 (21.2%)
>30	20 (17.7%)
21–30	69 (61.1%)

Table 2. Thyroid Profile of the studied population.

Thyroid Profile	Total $N = 113$ Median (Range)
TSH	4.50 (0.60–45.00)
T3	2.50 (1.00–5.40)
T4	2.00 (0.20–4.50)

Table 3. Thyroid State of the studied population.

Thyroid State	Total $N = 113$ N (%)
Euthyroid	52 (46%)
Hypothyroidism	61 (54%)

December 2021, with median age 28 years ranged between 16 and 35 years.

In the current study; the common age among PCO women is 21–30 years (61.6%), followed by < 20 years (21.2%) and >30 years (17.7%). This goes in run with Halasawadekar et al.[6] study which was conducted on 120 newly diagnosed PCO women to evaluate clinical characteristics of these patients and found the commonest age presentation was 23–30 years (35.8%) followed by 19–22 years (30.8%), and 14–18 years (26.67%). Zwain and Aziz[7] study that less than 25 years followed by the age group 26–35 years (48%) made up almost half of the PCO patients in the study.

In the current study, the menstrual histories of the included PCO women included oligomenorrhea (57.5%), polymenorrhea (19.5%), and amenorrhea (primary (77%) and secondary (23%). Similarly, **Nanda** et al.,[8] was examined the relationships between hypothyroidism and several clinical and biochemical markers in PCOs on 196 PCO women and found that the commonest menstrual complaints were oligomenorrhea (56.12%), secondary amenorrhea (20.4%), polymenorrhea (2.04%), infertility (primary (79.6%) and secondary (20.4%)). Another research found that 92.5% of PCO patients exhibited oligomenorrhea or amenorrhea as menstrual disruption symptoms.[3] Similarly, Najem et al.[9] observed that 93% of PCO patients experienced oligomenorrhea or amenorrhea and that 60–85% of PCO patients had significant menstrual abnormalities.

Table 4. Comparison of Menstrual history in patients with PCO bases on Thyroid State.

Menstrual history	Thyroid State		χ^2 Test	P
	Euthyroid $N = 52$ N (%)	Hypothyroidism $N = 61$ N (%)		
Amenorrhea				
1ry	38 (73.1%)	49 (80.3%)	0.83	0.361
Secondary	14 (26.9%)	12 (19.7%)		
Oligomenorrhea				
No	25 (48.1%)	23 (37.7%)	1.24	0.266
Yes	27 (51.9%)	38 (62.3%)		
Polymenorrhagia				
No	41 (78.8%)	50 (82.0%)	0.17	0.676
Yes	11 (21.2%)	11 (18.0%)		

Table 5. Comparison of Obstetric history in patients with PCO bases on Thyroid State.

Obstetric history	Thyroid State		χ^2 Test	P
	Euthyroid $N = 52$ N (%)	Hypothyroidism $N = 61$ N (%)		
Gravity				
0	12 (23.1%)	28 (45.9%)	14.57	0.006
1	8 (15.4%)	13 (21.3%)		
2	23 (44.2%)	12 (19.7%)		
3	9 (17.3%)	5 (8.2%)		
4	0 (0.0%)	3 (4.9%)		
Parity				
0	12 (23.1%)	28 (45.9%)	13.72	0.008
1	15 (28.8%)	17 (27.9%)		
2	24 (46.2%)	11 (18.0%)		
3	1 (1.9%)	3 (4.9%)		
4	0 (0.0%)	2 (3.3%)		
Mode of previous delivery				
C	23 (44.2%)	20 (32.8%)	5.06	0.08
N	22 (42.3%)	22 (36.1%)		
NP	7 (13.5%)	19 (31.1%)		
Preeclampsia				
No	50 (96.2%)	54 (88.5%)	2.23	0.135
Yes	2 (3.8%)	7 (11.5%)		
Gestational diabetes				
No	46 (88.5%)	58 (95.1%)	1.68	0.195
Yes	6 (11.5%)	3 (4.9%)		

In the current study, infertility history among PCO patients was 9.7% of PCO patients had gynecological problems, 82.3% had secondary infertility and 17.7% had primary infertility for mostly duration of 2 years (31%) followed by 1 year duration (28.3%). Another study by Pervin et al.[10] reported that prevalence of infertility was 57.5% of whom 48.33% had primary infertility and 9.17% had secondary infertility. Another study by showed that the total incidence of infertility was 46%, with primary infertility accounting for 32% of cases and secondary infertility for 14%.[7]

In the current study, most of the included PCO women were overweight (42.5%) followed by

Table 6. Comparison of anthropometrics in patients with PCO bases on Thyroid State.

anthropometrics	Thyroid State		Test	P
	Euthyroid $N = 52$	Hypothyroidism $N = 61$		
BMI	24.3 (19.0–32.5)	25.6 (20.5–30.9)	−0.991	0.322
BMI Class				
Normal	26 (50.0%)	19 (31.1%)		
Obesity	10 (19.2%)	10 (16.4%)	5.74	0.057
Overweight	16 (30.8%)	32 (52.5%)		

normal BMI (39.8%) and obesity (17.7%).This goes in run with Pervin et al.[10] study which was conducted on 150 PCO women to evaluate thyroid dysfunction and found that 34% of PCO women were overweight and 24% were obese while 42% were normal weight. **Najem et al.,**[9] observed 318 PCO patients had a 57% obesity and 54% overweight prevalence, which showed that PCO patients were 2.5 times more likely to be obese than the general population. **Sinha et al**.[3] reported that 80 PCO patients in all had an obesity rate of 55%. In PCO, obesity is a frequent finding that may exacerbate many of the reproductive problems. They have a complicated and poorly understood relationship that most likely includes the interplay of hereditary and environmental variables.[7] However, the prevalence of obesity varies greatly by nation of origin3.

In the current study; of 113 women with PCO; 61 (54%) had hypothyroidism while 52 (46%) had normal thyroid functions. This prevalence is higher than what was reported by Fatima et al.[11] study which was conducted on 90 PCO cases to determine the correlation between SCH and PCO and found that 34.4% had SCH.

Another study by **Trakakis et al**.[12] was conducted on 280 women with PCO to evaluate the impact of SCH on glycemic and lipid profile and revealed that 7.5% suffered from SCH on 137 women with PCO and found 21.9% had SCH. Enzevaei et al.[13] conducted a study on 75 PCO patients and 25.5% had SCH while 74.4% had euthyroid state. The different prevalence among studies can be explained by different rates of obesity among different studies.[14]

The current study found no statistically substantial variation between euthyroid and hypothyroid PCO patients as regards menstrual history with *P*-value >0.05. In contrast to **Velija-Asmi** et al.,[15] study which found that 36% of patients had menstrual cycle problems, including oligomenorrhea, and subclinical hypothyroidism was substantially linked with menstrual cycle disorders in PCO women. **Moustafa et al.,**[16] study also reported 40% of the included PCO women had subclinical hypothyroidism.

The current study found no statistically substantial variation between euthyroid PCO and hypothyroid PCO as regards BMI. This goes in run with **Benetti-Pinto** et al.,[17] study which was conducted on 168 women with PCO to analyze the relationship between metabolic parameters and unfortunately found no statistically substantial variation between both groups as regards BMI.

The current study found statistically significant increased TSH level in hypothyroidism PCO patients compared to euthyroid PCO patients with *P*-value <0.001. This goes in run with **Enzevaei et al.,**[13] study which also revealed a statistically significant increased TSH in SCH with *P*-value = 0.006.

The current study found statistically significant increased LH and estrogen level in hypothyroid group with *P*-value <0.001 with substantial positive connection between TSH and both LH and estrogen with *P*-value <0.001.

Another study by **Fatima** et al.,[11] found no statistically substantial variation between both groups as regards LH and estrogen. No substantial variation between both groups as regards hormonal assay (FSH, LH, and estrogen) which can be explained as TSH level when T3 and T4 are at normal levels has no significant hormonal or metabolic impact or side effect.[18]

In the current study, there is statistically significant increased FBS, 2HPP and insulin in hypothyroid PCO women compared to euthyroid women with *P*-value <0.001, <0.001, and 0.006 respectively and hypothyroid PCO women had significantly higher glycemic profile compared to euthyroid PCO women with *P*-value <0.001. Similarly another study by **Zhao et al.,**[19] study which was conducted on 164 PCO women to evaluated hypothyroidism in PCO and found statistically significant higher insulin in hypothyroid PCO with *P*-value with *P*-value = 0.044. This goes in run with **Tagliaferri et al.,**[20] study which revealed statistically significant higher insulin and fasting blood glucose in hypothyroid PCO patients compared to euthyroid with *P*-value <0.05. Another study conducted to examine the impact of subclinical hypothyroidism on the characteristics of PCO women and found statistically significant higher fasting glucose in hypothyroid PCO women compared to euthyroid group with *P*-value = 0.022.

Insulin level significantly higher in PCO group with higher TSH levels with *P*-value <0.05 and suggested that TSH level >2 IU/l has optimum sensitivity to diagnose insulin resistance in PCO women. This goes in run with **Tagliaferri et al.,**[20] study which found statistically substantial positive connection between TSH and insulin level in PCO women with *P*-value <0.05.

4.1. Conclusion

Ovaries may be affected by thyroid conditions, most notably hypothyroidism, via both a direct impact on ovarian function and autoimmune routes. The prevalence of hypothyroidism in PCO women was 54%. Oligomenorrhea was most common among PCO women.

Disclosure

The authors have no financial interest to declare in relation to the content of this article.

Authorship

All authors have a substantial contribution to the article.

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Conflicts of interest

The authors declared that there were NO conflicts of Interest.

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