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Unweaving the interaction between polycystic ovarian disease, hypothyroidism, and infertility

By

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Abstract

Objective: To observe the percentage and incidence of polycystic ovarian syndrome and hypothyroidism in infertile females and their impact on reproductive health.

Methods

A prospective study was conducted in the Social Security Hospital Lahore Jan 2022 to Sep 2022 Obs and Gynae Department Hospital enrolled 43 women with an age range of 17-46 having PCOS, hypothyroidism, or both based on Rotterdam criteria (2003) and thyroid stimulating hormone assessment. Males, women without reproductive age group and having fertility treatment, chronically ill patients, and those having other thyroid disorders were excluded and data was analyzed to explore the prevalence and relationship between infertility, hypothyroidism, and PCOS.

Results

5-7% of the infertile females suffered from subclinical hypothyroidism whereas the prevalence of PCOS was greater than 70-80% of the females. 11-36% of the females diagnosed with PCOS were also found to have hypothyroidism causing infertility. The data suggested that women suffering from these conditions exhibit a greater risk of infertility, along with menstrual irregularities, hormonal imbalances, and metabolic dysfunctions.

***Conclusion**: These findings highlight the importance of the coexistence of the intricately interlinked pathologies: PCOS, hypothyroidism, and infertility and how they aggravate reproductive difficulties, suggesting the need for appropriate diagnostic and therapeutic approaches.*

***Keywords**: PCOS, Hypothyroidism, infertility*

Introduction

Infertility is a disease of the male or female reproductive system defined by the failure to achieve a pregnancy after 12 months or more of regular unprotected sexual intercourse. It poses various noteworthy emotional, physical, and social difficulties to individuals, affecting almost 17.5% of adults worldwide (or every 1 in 6 individuals) according to WHO. It reportedly affects 22% of the Pakistani population (1). The etiology of this condition is multifactorial, the most common causes being ovulatory disorders, tubal factors, and male factor infertility. This disease may also be a result of conditions such as endometriosis, leiomyoma, thyroid dysfunction, decreased ovarian reserve, PCOS, etc. with unexplained infertility also being a major factor. Reproductive health is also affected by age-related factors, lifestyle, and environmental factors (2). Infectious diseases such as genital TB or historically prominent sexually transmitted diseases

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also contribute to infertility (3). This research focuses on the two highlighted determinants of ovarian dysfunction, the duo-endocrine disorders: PCOS and Hypothyroidism.

Polycystic ovarian syndrome is the most common gynecological endocrinopathy. Polycystic ovarian morphology, oligomenorrhea/amenorrhea, chronic anovulation, hirsutism, and eventually infertility are its distinguishing features (4). It is also marked by hyperestrogenism and hyperandrogenism increased levels of LH, and decreased levels of FSH as well as insulin resistance (5).

Material and methods

A prospective study was conducted in the Social Security Hospital Lahore Jan 2022 to Sep 2022 Obs and Gynae Department Hospital enrolled 43 women with an age range of 17-46 having PCOS, hypothyroidism, or both based on Rotterdam criteria (2003) and thyroid stimulating hormone assessment. Males, women without reproductive age group and having fertility treatment, chronically ill patients, and those having other thyroid disorders were excluded. In this study Rotterdam criteria were used to diagnose polycystic ovarian syndrome and thyroid-stimulating hormone levels were assessed for hypothyroidism. Pearson and Spearman's correlation was calculated to assess the relationship between pregnancy outcomes, THS levels, and androgen levels and multiple regression analysis examined the effects of hypothyroidism and PCOS on reproductive health. Data was analyzed using SPSS version 27, with t-tests for continuous variables and chi-square tests for categorical variables. and data was analyzed to explore the prevalence and relationship between infertility, hypothyroidism, and PCOS

Results

Table 1: Demographic Characteristics of Study Participants

Variable	**Mean ±SD**	**n(%)**
Age(years)	30.5 ±6.8	
BMI(Kg/m^2)	26.8 ± 4.2	
Parity (Number of Children	1.6 ±1.1	
Educational Status		
Primary		10(23.3%)
Secondary		15(34.9%)
Tertiary		18(41.9%)

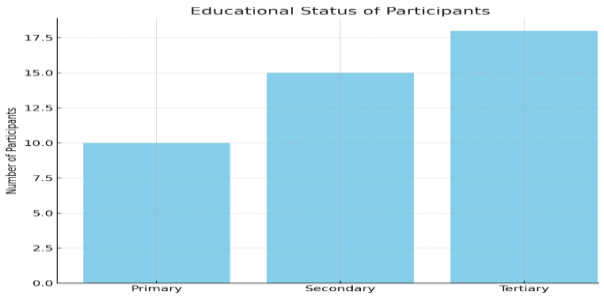

Figure 1: Demographic presentation of participants

Table 1 and Figure 1 provide the demographic characteristics of the study population, with the mean age of participants being 30.5 years. The BMI indicates that most participants fall into the overweight category, and educational status is divided into three levels.

Table 2: Clinical Characteristics of Participants Diagnosed with PCOS and Hypothyroidism

Variable	**PCOS**	**Hypothyroidism**	**PCOS± Hypothyroidism**
TSH Level (mlU/L)	1.8 ±0.7	6.2±2.1	4.3±1.8
Free T4 Level (pmol/L)	13.1 ±2.3	8.4 ± 1.7	10.6 ± 1.9
Androgen Level (ng/dl)	80.4 ± 15.8	60.2 ± 12.6	70.3 ± 14.4
Prevalence			
Infertility (%)	75.0%	28.0%	62.0%
Menstrual Irregularities (%)	83.7%	43.2%	70.6%

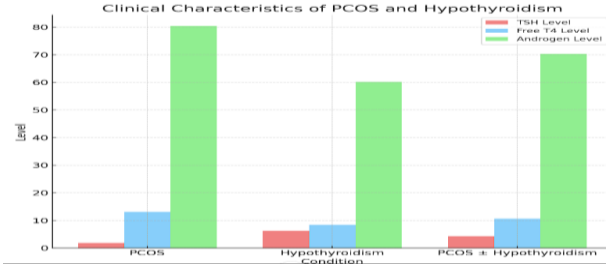

Figure 2: Clinical features of PCOS and Hypothyroidism among patients

Table 2 and Figure 2 show the clinical characteristics of participants diagnosed with PCOS, hypothyroidism, or both. Participants with both conditions had intermediate values for TSH, free T4, and androgen levels compared to the other groups. The prevalence of infertility and menstrual

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irregularities was highest in those with PCOS and lowest in the hypothyroidism group.

Table 3: Correlation Between TSH Level, Androgen Level, and Pregnancy Outcomes

Variable	Mean ± SD	r-value	p-value
SH Level (mlU/L)	3.5± 1.8	-0.62	0.002*
Free T4 Level (pmol/L)	10.4±2.7	0.48	0.015*
Androgen Level (ng/dl)	72.5± 16.5	-0.44	0.021*
Positive Pregnancy Rate %	42.7%		

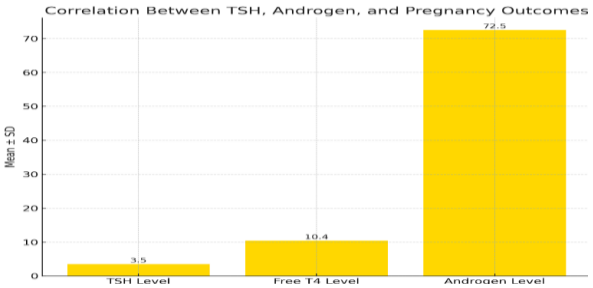

Figure 3; Correlation between TSH, androgens, and pregnancy outcomes

Table 3 and Figure 3 illustrate the correlations between TSH, androgen levels, and pregnancy outcomes. A significant negative correlation was found between TSH levels and pregnancy rates (r = -0.62, p = 0.002), while androgen levels also showed a negative association with successful pregnancies (r = -0.44, p = 0.021). Positive pregnancy rates were found in 42.7% of the study participants.

Discussion

This investigation aimed to trace the relationship between PCOS, hypothyroidism, reproductive challenges, and their association with infertility (6). Current results reveal a noticeable link between these endocrine disorders and decreased reproductive outcomes. The negative correlation results reveal that TSH levels and ovulation are indirectly proportional to each other which means higher TSH levels disrupt normal conception (7) Moreover, the positive correlation between free T4 levels and fertilization implies the importance of normal thyroid function for reproductive health(8). According to the multiple regression analysis, both hypothyroidism and PCOS significantly predict reproductive outcomes. Increased levels of TSH and PCOS both negatively impact the number of ovulatory cycles similarly and notably increase the probability of infertility by the logistic regression analysis (9) It is crucial to incorporate frequent thyroid function tests in therapeutic practice for women with PCOS, considering the high incidence of elevated TSH levels in this group. Recent medical recommendations that advocate a holistic approach to address PCOS and its co-morbidities promote early intervention that could enhance fertility (10). Thus incorporating thyroid function tests in a comprehensive treatment strategy for PCOS is essential (11). A multidisciplinary approach is required to maximize reproductive health and wellness in women with PCOS (12). The limited sample size of the research restricts its generalizability (13). Future researchers need to have an extensive cohort investigation to validate and understand the topic of this research better. To optimize the results of fertility, combined treatment techniques targeting both disorders should be explored (14).

Conclusion

This study shows a significant relationship between hypothyroidism and polycystic ovarian syndrome in patients having infertility disorders. Both conditions when present together elevate the menstrual irregularities due to TSH and androgen imbalance. Future research should focus on larger cohort studies to validate these findings and explore the efficacy of combined treatment strategies for enhancing fertility in women with PCOS and hypothyroidism

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