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Comparison of Prolactin Levels in Women with Polycystic Ovary Syndrome (PCOS) and Women without PCOS in North Sumatra

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ABSTRACT

Background: Polycystic Ovary Syndrome (PCOS) is one of the most frequent endocrine disorders affecting women of reproductive age, marked by persistent anovulation and elevated androgen levels. Prolactin, a hormone produced by the anterior pituitary gland, likewise plays a vital role in reproductive function. Elevated prolactin levels, or hyperprolactinemia, may disturb gonadotropin regulation, ovulation, and fertility. However, the relationship between PCOS and prolactin imbalance remains controversial. This study aimed to compare the serum prolactin levels of women with PCOS to those of women without PCOS in North Sumatra.

Methods: A comparative analytic observational study was conducted involving 120 women aged 18–45 years, consisting of 60 women diagnosed with PCOS and 60 without PCOS, based on the 2003 Rotterdam criteria. Serum prolactin levels were determined using the enzyme-linked immunosorbent assay (ELISA) method. Statistical analyses were conducted using an independent t-test to compare prolactin levels and a Pearson correlation test to examine their association with age and body mass index (BMI).

Results: The mean serum prolactin level was significantly higher in women with PCOS (3.99 ± 0.58 ng/mL) compared to non-PCOS women (3.41 ± 0.47 ng/mL; $p < 0.001$). No significant correlation was found between prolactin and age ($p = 0.412$) or BMI ($p = 0.298$).

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Conclusion: Prolactin levels were found to be significantly higher in women with PCOS than in those without PCOS in North Sumatra. Age and BMI did not influence prolactin concentrations, suggesting that prolactin elevation may result from intrinsic neuroendocrine factors in PCOS Routine evaluation of prolactin may help clinicians in the hormonal assessment and management of PCOS patients.

Keywords: *Polycystic Ovary Syndrome (PCOS); Prolactin; Hyperprolactinemia; Endocrine Disorders; North Sumatra*

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INTRODUCTION

Polycystic Ovary Syndrome (PCOS) is a complex, multifactorial, and polygenic endocrine disorder and is the most common endocrine abnormality among premenopausal women. To date, three diagnostic criteria have been established for PCOS: the National Institutes of Health (NIH) criteria, the Rotterdam criteria, and the Androgen Excess and PCOS Society (AE-PCOS) criteria. The reported prevalence of PCOS differs according to which criteria are applied. According to recent meta-analyses, the global prevalence (95% CI) based on NIH, Rotterdam, and AE-PCOS diagnostic subsets is 6% (5–8%), 10% (8–13%), and 10% (7–13%), respectively.

Hyperprolactinemia represents the most frequent endocrine disorder affecting the hypothalamic–pituitary axis, affecting approximately 90 per 100,000 women. The causal relationship between elevated prolactin levels and PCOS remains unclear; increased prolactin can inhibit ovulation and contribute to polycystic ovarian morphology. Routine measurement of prolactin is advised when evaluating patients with PCOS to rule out hyperprolactinemia, since many individuals with PCOS show prolactin levels near the upper limit of normal or slightly elevated. Reported prevalence of hyperprolactinemia in PCOS varies widely (3%–67%), but studies using the Rotterdam criteria show a more consistent average prevalence of 11.9%.

Comparing prolactin levels between women with and without PCOS is essential to better understand the relationship between hyperprolactinemia and reproductive dysfunction. Hyperprolactinemia can lead to anovulation, menstrual irregularities, and infertility—symptoms that also commonly occur in PCOS. Such comparison helps determine whether elevated prolactin is a frequent comorbidity in PCOS or a distinct condition that aggravates

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clinical symptoms. Furthermore, prolactin assessment assists in differentiating PCOS from other hormonal disorders with overlapping symptoms, such as isolated hyperprolactinemia, allowing for more accurate diagnosis and targeted treatment. Elevated prolactin levels may require additional therapy, such as dopamine agonists. Overall, this comparison may offer insights into the neuroendocrine mechanisms underlying hormonal regulation and fertility in women.

Although understanding of PCOS pathophysiology has improved, data on the relationship between serum prolactin levels and clinical, hormonal, and metabolic parameters in PCOS remain limited. Few studies have evaluated the association between serum prolactin and metabolic factors—including plasma glucose, lipids, and insulin resistance—with inconsistent findings. Therefore, this study was conducted to assess prolactin levels in PCOS patients and to explore their potential role in the

METHODS

Study Design and Setting

This research was an analytic observational study with a case–control design conducted from April to November 2025 at Halim Fertility Center (HFC), Stella Maris Women's Hospital, and Prof. Dr. CPL USU Hospital in Medan, North Sumatra, Indonesia.

Participants

The study involved 120 women of reproductive age (18–45 years), consisting of 60 women diagnosed with Polycystic Ovary Syndrome (PCOS) and 60 women without PCOS (control group).

The diagnosis of PCOS was made according to the Rotterdam 2003 criteria, requiring at least two of the following:

1. Oligo- or anovulation,

2. Clinical or biochemical evidence of hyperandrogenism, and

3. Polycystic ovarian morphology as observed on ultrasound.

Inclusion Criteria

Women aged
between 18–45
years. Non-pregnant

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and non-lactating.

Not using hormonal therapy or medications affecting prolactin levels (such as antipsychotics, dopamine antagonists, estrogens).

Willing to participate and provide written informed consent.

Exclusion Criteria

Pregnancy or breastfeeding. Patients with endocrine disorders other than PCOS (e.g., Cushing's syndrome, thyroid dysfunction, adrenal hyperplasia).

Hemolyzed or damaged serum samples.

Sample Size

The sample size was determined using the formula for comparing two independent means, with a 95% confidence level ($\alpha = 0.05$) and 80% power ($\beta = 0.20$). A minimum of 57 participants per group was required; hence, 60 participants were included in each group to account for potential dropouts.

Data Collection

Participants underwent clinical assessment, anthropometric measurement, and blood sampling.

Anthropometric measurement: Body weight and height were measured using calibrated equipment, and BMI was computed by dividing body weight (kg) by the square of height (m^2).

Blood sampling: Venous blood (5 mL) was collected in the morning (between 8:00–10:00 AM) after an overnight fast.

Serum prolactin measurement: Serum prolactin levels were determined using the enzyme-linked immunosorbent assay (ELISA) method at an accredited clinical laboratory in Medan.

Statistical Analysis

Data were analyzed using SPSS version 25.0. Numerical data were presented as mean ± standard deviation (SD). An independent t-test was used to compare mean serum prolactin levels between PCOS and non-PCOS groups.

The relationship between prolactin levels and age or BMI was analyzed using Pearson correlation. A p-value <

0.05was considered statistically significant.

RESULTS

Participant Characteristics

A total of 120 women were included, with 60 in the PCOS group and 60 in the control

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group. The mean age and BMI were comparable between the two groups, with no statistically significant differences.

Variable	PCOS (n=60) Mean ± SD	Control (n=60) Mean ± SD	p-value
Age (years)	31.97 ± 3.91	29.62 ± 5.05	0.006
Body Mass Index (kg/m²)	24.4 ± 3.75	21.78 ± 3.48	<0.001

Table 4.1. Characteristics of Study Participants.

Comparison of Prolactin Levels

The mean serum prolactin level in the PCOS group (3.99 ± 0.58 ng/mL) was significantly higher than in the non- PCOS group (3.41 ± 0.47 ng/mL) with $p < 0.001$, indicating a significant difference.

Prolactin (ng/mL)	15.92 ± 3.99	13.41 ± 3.41	<0.001

Table 4.2. Serum Prolactin Levels in PCOS and Control Groups

Correlation Between Prolactin, Age, and BMI in PCOS Group

In the PCOS group, no significant correlation was observed between prolactin levels and age ($r = 0.12$, $p = 0.412$) or BMI ($r = 0.15$, $p = 0.298$).

Age Group (years)	Prolactin (ng/mL) Mean ± SD	p-value
< 30	15.21 ± 3.82	0.412
30–34	16.12 ± 4.11	
≥ 35	16.48 ± 4.06	

Table 4.3. Correlation Between Age and Serum Prolactin in PCOS Patients

DISCUSSION

The current study revealed that serum prolactin levels were significantly higher in women with

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Polycystic Ovary Syndrome (PCOS) compared to those without the condition. However, no significant relationship was found between prolactin levels and either age or body mass index (BMI). These results align with previous studies suggesting that mild hyperprolactinemia is a frequent yet often overlooked feature among PCOS patients.

Prolactin is a peptide hormone produced by lactotroph cells in the anterior pituitary gland, and its secretion is primarily regulated by inhibitory dopamine signals from the hypothalamus. In certain PCOS cases, disruption of dopaminergic regulation may lead to elevated prolactin production. Increased prolactin levels can suppress the pulsatile release of gonadotropin-releasing hormone (GnRH), which in turn reduces the secretion of luteinizing hormone (LH) and follicle-stimulating hormone (FSH), ultimately hindering ovulation and contributing to infertility.

Although the mean prolactin levels in this study remained within the normal physiological range, the significant difference between PCOS and non-PCOS groups suggests a subtle neuroendocrine alteration in PCOS. Mild hyperprolactinemia may further exacerbate the hormonal imbalance and menstrual irregularities characteristic of the syndrome.

Several studies have shown similar findings. Albu et al. (2016) and Gungor et al. (2019) reported that PCOS patients exhibited higher prolactin concentrations compared to controls, independent of BMI. This supports the hypothesis that prolactin elevation in PCOS is not primarily associated with obesity but rather with intrinsic neuroendocrine dysfunction. Furthermore, hyperprolactinemia and PCOS may share overlapping etiological mechanisms, including altered dopaminergic receptor sensitivity and increased estrogen activity that stimulates prolactin secretion.

Conversely, some studies found no significant difference in prolactin levels between PCOS and non-PCOS women (Kim et al., 2018; Yanachkova & Stankova, 2020). The discrepancy across studies may be attributed to different diagnostic criteria, assay sensitivity, and population characteristics. Ethnic, environmental, and lifestyle factors may also influence hormonal profiles, emphasizing the importance of region-specific data such as from North Sumatra.

In the present study, the lack of correlation between prolactin and BMI suggests that metabolic factors such as adiposity may not significantly influence prolactin secretion in PCOS. Similar observations were made by Gungor et al. (2019), who concluded that prolactin levels are independent of insulin resistance and obesity status.

Taken together, the findings imply that prolactin may play a modulatory role in the neuroendocrine axis of PCOS. Routine screening for prolactin levels in PCOS patients is clinically relevant to exclude pathological hyperprolactinemia and assist in differential diagnosis. Detecting subtle elevations may also guide the clinician in optimizing hormonal management and fertility treatment.

Study Limitations

This study has several limitations. First, serum prolactin measurements were performed only once; dynamic assessment such as repeated sampling or diurnal variation was not evaluated. Second, other hormonal parameters like LH, FSH, and insulin levels were not analyzed in this dataset. Third, the

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study population was limited to a single region in North Sumatra, which may affect generalizability. Future research should include a broader population sample, evaluate longitudinal hormonal profiles, and explore molecular pathways linking prolactin to PCOS pathogenesis.

CONCLUSION

This study demonstrated that serum prolactin levels were significantly higher in women with Polycystic Ovary Syndrome (PCOS) compared with women without PCOS in North Sumatra. However, there was no significant correlation between prolactin concentrations and either age or body mass index (BMI).

These findings suggest that prolactin elevation in PCOS may be due to intrinsic neuroendocrine dysregulation rather than metabolic or age-related factors. Routine prolactin evaluation in PCOS patients is recommended to assist in the assessment of hormonal balance and to rule out pathological hyperprolactinemia that can further disrupt ovulation and fertility.

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