International Journal of Reproduction, Contraception, Obstetrics and Gynecology
Chaudhary K et al. Int J Reprod Contracept Obstet Gynecol. 2025 Sep;14(9):3034-3039
www.ijrcog.org
pISSN 2320-1770 | eISSN 2320-1789

DOI: https://dx.doi.org/10.18203/2320-1770.ijrcog20252737

Original Research Article

Prevalence of hyperprolactinemia in polycystic ovary syndrome and its clinical correlates

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Received: 01 July 2025
Revised: 06 August 2025
Accepted: 07 August 2025

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ABSTRACT

Background: Polycystic ovary syndrome (PCOS) affects 5-10% of women of reproductive age. Hyperprolactinemia may co-exist with PCOS due to hypothalamic-pituitary dysfunction or relative hyperestrogenemia, but the association remains unclear.
Methods: This cross-sectional study included 110 women diagnosed with PCOS using Rotterdam criteria. Serum prolactin levels were assessed and correlated with body mass index (BMI), age, menstrual irregularities, and hyperandrogenic features. Statistical analysis was performed using SPSS version 24.
Results: The mean age of participants was 24.05±5.17 years, and mean BMI was 24.63±3.13 kg/m². Hyperprolactinemia (prolactin >25 ng/ml) was found in 57.27% of PCOS patients, with a mean prolactin level of 29.61±16.55 ng/ml. Serum prolactin showed a significant positive correlation with BMI (p=0.0022) and age (p=0.0009). Among hyperandrogenic features, alopecia was significantly associated with hyperprolactinemia (p=0.0231). Oligomenorrhea/amenorrhea was present in 56.57% of those with hyperprolactinemia, but without statistical significance (p=0.8267).
Conclusions: Hyperprolactinemia was prevalent in over half of PCOS patients and correlated positively with BMI and age. Alopecia showed a significant association with elevated prolactin levels. These findings highlight the importance of screening for hyperprolactinemia in PCOS and call for further research into its pathophysiological role.

Keywords: Alopecia, BMI, Hyperandrogenism, Hyperprolactinemia, Menstrual irregularity, PCOS

INTRODUCTION

Polycystic ovary syndrome (PCOS) and hyperprolactinemia (HPRL) are among the most prevalent endocrine disorders affecting women of reproductive age. PCOS, a leading cause of anovulatory infertility, has a prevalence of 5–10%.[1] First described by Stein and Leventhal in 1935, PCOS is characterized by menstrual irregularities, hyperandrogenism, and polycystic ovarian morphology. Since the 1950s, studies have suggested a link between PCOS and HPRL, though the exact nature of their association remains unclear. Some hypothesize that PCOS-induced hypothalamic-pituitary dysfunction leads to a decrease in dopaminergic tone, thereby elevating both prolactin (PRL) and luteinizing hormone (LH).[2] However, whether hyperprolactinemia is a consequence of PCOS or a coincidental finding remains debated. Less than 1% of people in the general population and 5% to 14% of patients who report with secondary amenorrhea have hyperprolactinemia.[3] Among women with PCOS, reported hyperprolactinemia prevalence varies widely (5–65%) due to differing diagnostic criteria.[3] Factors influencing PRL elevation include hypothalamic-pituitary dysfunction, physiological conditions, medication use, and macroprolactin excess.[4] Idiopathic hyperprolactinemia accounts for 29% of cases.[5] Both PCOS and HPRL

contribute to androgen excess; however, in HPRL, androgens originate from the adrenal glands and are treatable with dopamine agonists, whereas in PCOS, they are primarily ovarian.[6] Given the metabolic effects of PRL and PCOS-related insulin resistance, a multidisciplinary approach is essential for PCOS management.

Hyperprolactinemia and PCOS: Pathophysiology and Causes: The interplay between HPRL and PCOS may involve hypothalamic-pituitary dysfunction.[2] PRL elevation in PCOS has been attributed to reduced dopaminergic tone, leading to increased PRL and LH secretion.[2] Conditions causing HPRL include pregnancy, lactation, sleep, nipple stimulation, and pathological causes like pituitary tumors, hypothyroidism, Cushing's disease, and medications (antipsychotics, antidepressants, antihypertensives, and oral contraceptives).[7]

Given the overlap between PCOS and hyperprolactinemia, ruling out HPRL is crucial before confirming a PCOS diagnosis.

Aim

To evaluate the association of Hyperprolactinemia and PCOS.

Objectives

Primary

To find the prevalence of hyperprolactinemia in PCOS patients.

Secondary

To assess the correlation between BMI and serum prolactin level in PCOS patients. To assess the correlation between age and serum prolactin level in PCOS patients. To assess the correlation between oligomenorrhea/amenorrhea and serum prolactin level in PCOS patients. To assess the correlation between features of hyperandrogenism (hirsutism, acne, alopecia) and serum prolactin level in PCOS patients.

METHODS

This cross-sectional observational study was conducted in the Department of Obstetrics and Gynecology at Tata Motors Hospital, Jamshedpur, from June 2022 to April 2024. The study aimed to evaluate the association between hyperprolactinemia and polycystic ovarian syndrome (PCOS).

Study population and sample size

Women aged 18–35 years with menstrual irregularities and diagnosed with PCOS based on the Rotterdam 2003 criteria were included. The required sample size was calculated as 107 using a 95% confidence level and a 5% margin of error, but 110 participants were enrolled.

Inclusion criteria

Non-pregnant women diagnosed with PCOS using the Rotterdam 2003 criteria, who gave informed consent. Patients with or without galactorrhoea were included, as it is a known clinical manifestation of hyperprolactinemia. The presence or absence of galactorrhoea was noted during clinical evaluation.

Exclusion criteria

Pregnancy or lactation, hypothyroidism, kidney failure, liver failure, prolactinoma (serum prolactin ≥100 ng/ml), medication use affecting prolactin levels (e.g., antipsychotics, antidepressants), history of chest wall surgery or trauma, patients with established galactorrhoea secondary to pituitary adenomas or systemic causes were excluded to avoid confounding.

Data collection and clinical assessment

Participants were recruited from the outpatient department after obtaining ethical clearance and informed consent. A detailed medical history, including menstrual cycle patterns (e.g., oligomenorrhoea, amenorrhoea, menorrhagia), last menstrual period, and features of hyperandrogenism (hirsutism, acne, alopecia), was recorded. The type of menstrual abnormality was documented in each case. Oligomenorrhoea was defined as cycles >35 days, and menorrhagia as heavy or prolonged bleeding exceeding 7 days or >80 ml.

Body mass index calculation

BMI = Weight (kg) / Height² (m²).

Ultrasound evaluation

All participants underwent transabdominal and/or transvaginal ultrasound to assess ovarian morphology, follicle count, and ovarian volume.

Serum prolactin measurement

Blood samples were collected in a fasting state in the early morning. Patients were advised to avoid stress and sexual activity 48 hours before sampling. Prolactin samples were ideally collected 3–4 hours after waking to reduce the impact of circadian variation, as per endocrinology guidelines. Serum prolactin levels were measured using the Electrochemiluminescence Immunoassay (ECLIA) method.

Diagnostic criteria

Rotterdam criteria (2003) for PCOS (Two out of Three Required). Oligo-anovulation, clinical or biochemical

hyperandrogenism, polycystic ovarian morphology on ultrasound (ovarian volume >10cc, antral follicle count >12).

Hirsutism assessment

A modified Ferriman-Gallwey Score ≥8 was used to diagnose hirsutism in Indian women.

Statistical analysis

Data was entered in Microsoft Excel and analyzed using SPSS version 24. Results were expressed as mean±standard deviation or percentages. Appropriate statistical tests were used. Statistical significance was determined at $p<0.05$.

Ethical Considerations

Ethical approval was obtained from the Institutional Ethics Committee. Written informed consent was collected from all participants, ensuring confidentiality. This methodology ensures a systematic approach to studying the association between hyperprolactinemia and PCOS while maintaining scientific rigor.

RESULTS

This study analyzed various demographic and clinical parameters among a cohort of 110 patients.

Demographic characteristics

The majority of the study population (69.09%) was unmarried, while 40.91% were married. A statistically significant difference was observed in marital status distribution ($p<0.0001$). The age distribution revealed that the highest proportion of patients (35.45%) belonged to the ≤20 year age group, with the mean age calculated as 24.05±5.17 years. However, there was no statistically significant difference in age distribution ($p>0.05$).

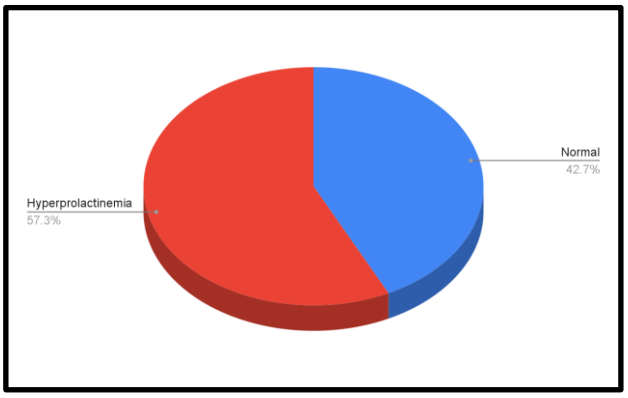

Figure 1: Serum prolactin level among the study population.

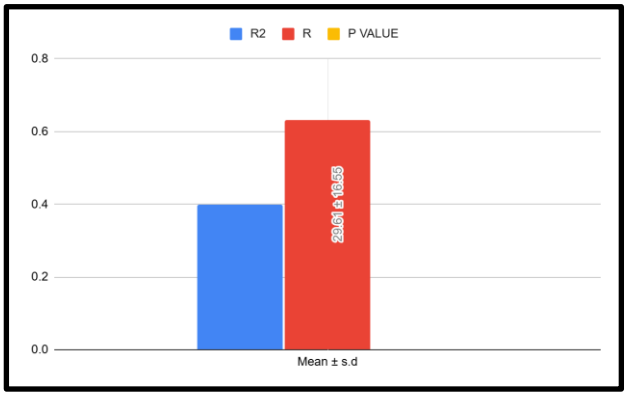

Figure 2: Correlation between serum prolactin levels with the BMI of the study population.

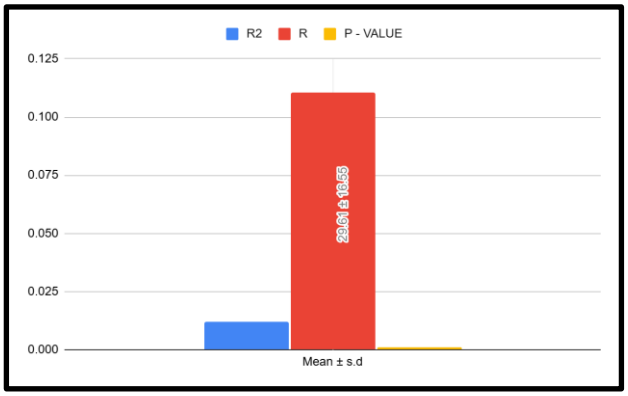

Figure 3: Correlation between serum prolactin levels with age among the study population.

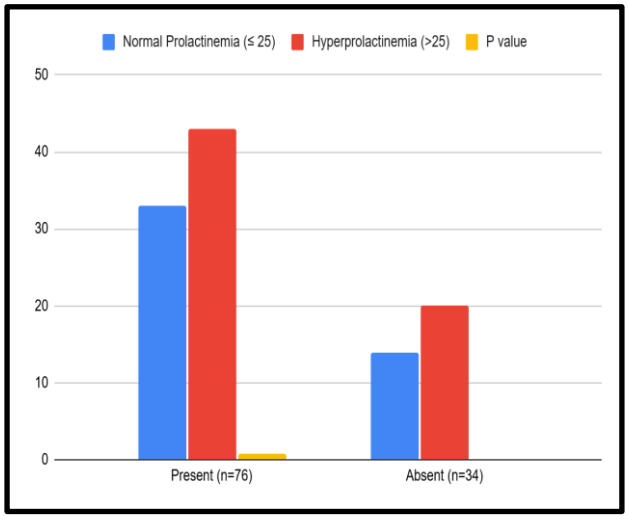

Figure 4: Comparison of serum prolactin level with oligomenorrhea/ amenorrhea (PMC status) among the study population.

Body mass index

Regarding BMI classification, 53.64% of patients had a normal BMI, 40.91% were overweight, 4.55% were classified as obese, and only 0.91% were underweight. The

mean BMI was 24.63±3.13 kg/m², with no statistically significant difference in BMI distribution (p>0.05).

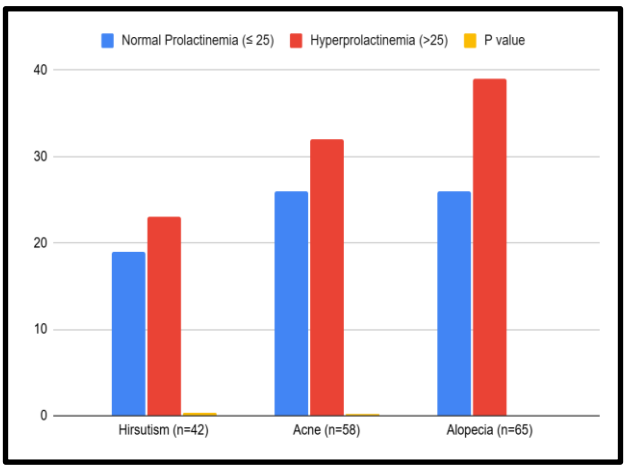

Figure 5: Comparison of serum prolactin level with clinical features of hyperandrogenism among the study population.

Serum prolactin levels and correlations

Prevalence of hyperprolactinemia

Hyperprolactinemia (S.PRL >25 ng/ml) was observed in 57.27% of patients, while 42.73% had normal prolactin levels. The mean S.PRL level was 29.61±16.55 ng/mL, with a significant difference in prolactin level distribution (p=0.0314).

Relation with body mass index

A positive correlation was found between BMI and serum prolactin levels (R=0.6329, p=0.0022), indicating that prolactin levels increased with higher BMI.

Relation with age

A significant positive correlation was also observed between serum prolactin levels and age (R=0.1104, p=0.0009).

Menstrual irregularities

Oligomenorrhea/Amenorrhea was present in 69.09% of patients, and a significant difference was found in its prevalence (p<0.0001). The association between prolactin levels and oligomenorrhea/amenorrhea was not significant (p=0.8267).

Relation with features of hyperandrogenism

Among clinical features of hyperandrogenism, alopecia was the most common (59.09%), followed by acne (52.73%) and hirsutism (38.18%). However, the differences in hyperandrogenic manifestations were not statistically significant (p>0.05).No significant differences were observed in prolactin levels when compared with hirsutism (p=0.3858) or acne (p=0.2675). However, a statistically significant association was found between hyperprolactinemia and alopecia (p=0.0231).

Table 1: Demographic parameters among the study population (n=110).

Parameters		No. of patients	%
Marital status	Married	45	40.9
	Unmarried	65	69.09
Age (in years)	<20 year	39	35.45
	21–25	26	23.64
	26–30	33	30
	31–35	12	10.91
BMI (kg/m²) classification	<18.5 (underweight)	01	0.91
	18.5–24.99 (Normal weight)	59	53.64
	25.0–29.9 (overweight)	45	40.91
	≥30.0 (Obesity class)	05	4.55
Parity distribution	P0	76	69.09
	P1	13	11.82
	P2	18	16.36
	>P2	03	2.73
Oligomenorrhea/Amenorrhea (PMC status)	Present	76	69.09
	Absent	34	39.91
Clinical features of hyperandrogenism	Hirsutism	42	38.18
	Acne	58	52.73
	Alopecia	65	59.09
S.PRL level	Normal Prolactinemia (≤25)	47	42.73
	Hyperprolactinemia (>25)	63	57.27

DISCUSSION

Polycystic ovarian syndrome (PCOS) is a multifactorial disorder impacting ovulation, androgen levels, and insulin sensitivity, making it a major cause of infertility. It is characterized by menstrual irregularities, hyperandrogenism (manifesting as hirsutism, acne, and alopecia), and insulin resistance. While hyperprolactinemia is also linked to anovulation, its association with PCOS remains unclear due to the complexity of both conditions. This study investigated serum prolactin levels in PCOS patients, comparing clinical characteristics between those with normal and elevated prolactin levels. Results indicated that over half of the participants had raised prolactin levels, with a significant positive correlation between body mass index (BMI) and serum prolactin levels. Additionally, PCOS patients exhibiting hyperandrogenic features, particularly alopecia, showed higher prolactin levels than those without such symptoms.

Findings align with previous research. Davoudi et al identified idiopathic hyperprolactinemia in 13% of PCOS patients.[2] Mahboobifard et al reported serum prolactin levels in PCOS patients to be 1.5 times higher than controls.[3] A meta-analysis by Naz et al suggested that mild hyperprolactinemia could be a diagnostic marker of PCOS.[11] Similarly, Hassan et al observed significantly elevated serum prolactin levels among infertile PCOS patients.[12] Regarding BMI, this study found a significant positive correlation with prolactin levels, similar to observations by Lavanya et al who proposed prolactin as a diagnostic marker in obese PCOS patients.[13] Conversely, Hasan et al reported a negative correlation between BMI and prolactin levels.[14] Age also showed a positive correlation with prolactin levels, consistent with Lavanya et al.[13]

Menstrual irregularities, including oligomenorrhea and amenorrhea, were more common in PCOS patients with hyperprolactinemia. Moreover, hyperandrogenic symptoms such as hirsutism, acne, and alopecia were more frequent in PCOS patients with elevated prolactin levels. A study by Moria et al also demonstrated increased DHEA-S levels in hyperprolactinemic patients, which declined after treatment.[15] Pathophysiological Link Between HPRL and Hyperandrogenism: The mechanism by which hyperprolactinemia contributes to hyperandrogenic features in PCOS is multifactorial. Elevated prolactin levels suppress gonadotropin-releasing hormone (GnRH) pulsatility, leading to altered LH and FSH secretion patterns. This disruption may promote preferential LH stimulation of the ovarian theca cells, enhancing androgen synthesis.[12] Additionally, prolactin can increase adrenal androgen production by modulating ACTH sensitivity, particularly dehydroepiandrosterone sulfate (DHEAS) levels.[1] Studies, including Moria Y et al. (2019), observed increased DHEA-S secretion in hyperprolactinemic patients, which declined upon dopamine agonist therapy.[1] Moreover, prolactin is known to reduce the activity of aromatase, an enzyme responsible for converting androgens to estrogens, thereby favoring androgen accumulation.[6] These hormonal imbalances may explain the observed association between elevated prolactin and clinical signs such as alopecia and hirsutism in PCOS.

Limitations

Study was done at a single center so the study population was less as well as ethnically similar population was studied. All ultrasounds were done on the same machine but were done by different people. So, that may have caused some variation. A study with a larger study population needs to be done. Many causes of hyperprolactinemia were ruled out on the basis of history taking due to which there may be some recall bias. Patients with serum prolactin level higher than 100 ng/ml were excluded from the study as they had a higher chance of prolactinoma for which MRI imaging could not be done at our center.

CONCLUSION

This study demonstrates a high prevalence of hyperprolactinemia (57.27%) among patients with PCOS. A statistically significant positive correlation was observed between serum prolactin levels and both BMI (p=0.0022) and age (p=0.0009). Features of hyperandrogenism, including hirsutism, acne, and alopecia, were more prevalent in patients with hyperprolactinemia, with a significant association observed in those with alopecia (p=0.0231). While oligomenorrhea/amenorrhea was common among patients with hyperprolactinemia (56.57%), the association was not statistically significant (p=0.8267). These findings suggest that hyperprolactinemia may play a role in the clinical manifestations of PCOS and highlight the importance of evaluating prolactin levels in this patient population.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Chaudhary K, Ghosh S, Mitra P, Pradhan A. Prevalence of hyperprolactinemia in polycystic ovary syndrome and its clinical correlates. Int J Reprod Contracept Obstet Gynecol 2025;14:3034-9.