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ORIGINAL STUDY

Clinical, Hormonal, and Metabolic Characteristics of Kurdish Women With PCOS in Duhok, Iraq: Influence of Body Mass Index

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ABSTRACT

Background: Polycystic ovarian syndrome (PCOS) is characterised by hormonal, metabolic, and reproductive problems, and obesity exacerbates these symptoms. The purpose of this study was to evaluate the metabolic, hormonal, and reproductive profiles of women with PCOS, as well as to investigate how body mass index (BMI) influences these variables.

Methods: A descriptive cross-sectional study was conducted on 113 PCOS-diagnosed women at Azadi Teaching Hospital's Gynaecology Department in Duhok, Iraq. Clinical, biochemical, and hormonal data were gathered, and individuals were divided into two groups depending on their BMI: normal and elevated.

Results: Elevated prolactin (>23.4 ng/mL) was observed in 38.9% of patients, 16.8% had an LH/FSH ratio ≥ 2, and 8.8% had raised testosterone (>0.73 ng/mL). Metabolic disturbances were common: elevated LDL-C (46.0%), low HDL-C (20.4%), elevated fasting blood sugar (21.2%), and dyslipidaemia in a substantial proportion. Women with an elevated BMI exhibited significantly higher total cholesterol, triglycerides, LDL-C, systolic and diastolic blood pressures, and lower HDL-C levels compared to those with a normal BMI (all $p < 0.05$), whereas fasting blood sugar, pulse rate, and hormonal parameters did not differ. Reproductive abnormalities were frequent, including oligomenorrhoea (49.6%), amenorrhoea (38.1%), hirsutism (87.6%), and acne (70.8%). Subfertility was reported in 75.8% of married patients and was significantly higher in women with elevated BMI ($p = 0.009$). A positive family history of PCOS was more common in the elevated BMI group ($p = 0.027$).

Conclusion: PCOS is linked to a variety of clinical and metabolic problems. Even in the absence of severe hormonal abnormalities, an elevated BMI is strongly associated with poor metabolic outcomes and infertility. These findings underscore the importance of BMI-based risk assessment and early metabolic screening in women with PCOS to support appropriate management methods.

Keywords: Polycystic ovary syndrome, Subfertility, Lipid profile, Blood pressure, Hormonal profile

1. Introduction

PCOS represents one of the most frequent and complex endocrine disorders among women of reproductive age. It is defined by the coexistence of chronic anovulation, biochemical and/or clinical signs of androgen excess, and the presence of polycystic ovarian morphology on ultrasound, following the exclusion of other pituitary, adrenal, or thyroid disorders (Fauser, 2004). As per the Rotterdam consensus, the diagnosis is established when at least two of these three criteria are met.

Although the precise etiology of PCOS remains unclear, its pathogenesis is widely recognized as multifactorial, resulting from complex interactions between genetic susceptibility, environmental influences, and possibly transgenerational factors. Among modifiable contributors, obesity plays a central role.

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In a cross-sectional study conducted in Duhok, 150 women with PCOS were assessed, and 90 patients (60%) were found to be obese, highlighting the high prevalence of excessive body weight among Kurdish women with the disorder and reinforcing the critical role of obesity in both the development and exacerbation of PCOS (Teede et al., 2013). This finding is consistent with global evidence showing that PCOS prevalence rises with increasing BMI, from 4.3% in women with a BMI $< 25 kg/m^2$ to 14% in those with a BMI > 30 kg/m^2 (Teede et al., 2013), and that obesity aggravates insulin resistance, dyslipidaemia, and reproductive dysfunction (Lim et al., 2012).

By increasing androgen synthesis and lowering sex hormone-binding globulin (SHBG) concentrations, excess adipose tissue modifies sex steroid metabolism and intensifies hyperandrogenic symptoms (Pasquali, 2006). Consequently, overweight and obese women with PCOS frequently present with more severe clinical characteristics, such as irregular menstruation and hirsutism, compared to their normal-weight counterparts (Glueck and Goldenberg, 2019). Increased adiposity is also associated with poorer metabolic and reproductive outcomes (Glueck and Goldenberg, 2019; Lim et al., 2013). Lifestyle modification remains the mainstay of PCOS management, with dietary control and regular exercise shown to significantly improve hormonal balance and metabolic health (Wadden et al., 2005). However, sustaining weight loss remains a challenge for many patients over the long term.

Metabolic syndrome (MS), defined by central obesity (waist circumference $\geq$ 102 cm in men and $\geq$88 cm in women), dyslipidaemia (triglycerides $\geq$150 mg/dL, HDL-C $<$ 40 mg/dL), hypertension ($\geq$130/85 mmHg), and impaired glucose regulation (FBS $\geq$ 100 mg/dL), is highly prevalent among women with PCOS and significantly increases the risk of cardiovascular disease and type 2 diabetes (Essah et al., 2007). According to reports, between 40 and 50 percent of PCOS patients have MS, which is much greater than the prevalence among women without the disease (Apridonidze et al., 2005). Evidence from Iraq further underscores this metabolic burden. In Baghdad, approximately half of women with PCOS fulfilled the criteria for MS, with central obesity being the most common feature, over 90% had a waist circumference exceeding 80cm, and more than one-quarter exhibited impaired glucose tolerance, reflecting marked insulin resistance (Lehibi et al., 2011). Similarly, a study from Basra reported that 34.3% of PCOS women had MS compared to 6.1% of controls, along with significantly adverse lipid profiles, including elevated triglycerides and LDL cholesterol and reduced HDL levels (Alwaeely et al., 2011). In addition to metabolic complications, MS in women with PCOS is associated with reproductive challenges, including subfertility, excess body weight, and an increased risk of endometrial hyperplasia (Goodarzi et al., 2011; Mu et al., 2012). Despite the high prevalence of PCOS in Iraq, data on Kurdish women remain scarce. Few studies have comprehensively examined the clinical, reproductive, hormonal, and metabolic characteristics of this population or assessed the impact of BMI. Given the rising prevalence of overweight and obesity among Iraqi women, understanding these associations in Kurdish women from Duhok is essential to guide targeted clinical management and improve patient outcomes. Therefore, this study aims to provide a detailed assessment of the clinical, reproductive, hormonal, and metabolic characteristics of Kurdish women with PCOS in Duhok and to evaluate the impact of elevated BMI on these parameters.

2. Study design and methods

The General Directorate of Health in Duhok granted ethical clearance for the study (Ref. No.: 25092024-8-17). Prior to the start of data collection, signed informed consent was given by each participant. Separate consent was not required for publishing because the study did not use any patient photos or personal information. Between September 2024 and February 2025, the study, which used a descriptive cross-sectional design, was carried out in the Gynaecology Department at Azadi Teaching Hospital in Duhok, Iraq's Kurdistan Region. Based on the 2003 Rotterdam criteria for the diagnosis of PCOS, 113 women between the ages of 18 and 40 were recruited. At least two of the following three characteristics had to be present for the diagnosis: polycystic ovarian morphology on ultrasound, which is defined as the presence of 12 or more follicles measuring 2–9 mm in diameter in one ovary or an ovarian volume exceeding 10 mL; clinical or biochemical hyperandrogenism, which is indicated by hirsutism, acne, or elevated serum testosterone levels; and oligo- or anovulation, which is defined as menstrual cycles lasting more than 35 days or amenorrhoea lasting three months or longer. To minimise confounding variables, women with dyslipidaemia, hypertension, or diabetes mellitus were not included. Additionally excluded were those who had used any ovulation-inducing drugs, anti-androgens, insulin sensitisers, GLP-1 receptor agonists, corticosteroids, lipid-lowering drugs, hormonal agents, ovulation-inducing drugs, or any treatments known to impact endocrine or metabolic function in the six months prior (Fauser, 2004).

Following consent, a structured questionnaire was used to gather sociodemographic and clinical data, such as age, marital and employment status, place of residence, and family history of PCOS. Weight and height were measured without shoes and with very little clothing. BMI was computed by dividing weight (kg) by height squared (m^2). Patients were categorised as either normal weight (18.5–24.9 kg/m^2) or having an elevated BMI ($\geq$25 kg/m^2) in accordance with WHO guidelines. Following a 10-minute rest period, blood pressure was recorded twice while seated using an automatic sphygmomanometer. The systolic (SBP) and diastolic blood pressure (DBP) values were calculated by averaging the two measurements.

All patients had venous blood samples taken after an 8–12 hour overnight fast, ideally on the second or third day of their menstrual cycle or after progestin-induced withdrawal bleeding in amenorrhoeic women. Using the DiaSorin LIAISON® chemiluminescent immunoassay analyser, hormonal tests were conducted for prolactin, total testosterone, luteinizing hormone (LH), and follicle-stimulating hormone (FSH). The Cobas c501 analyser (Roche Diagnostics, Germany) was used to test metabolic parameters, including fasting blood sugar (FBS), total cholesterol (TC), triglycerides (TG), high-density lipoprotein cholesterol (HDL-C), and low-density lipoprotein cholesterol (LDL-C). As shown in Tables 1 and 2, normal reference values were taken from the Duhok Central Laboratory, and all laboratory analyses adhered to the standard operating procedures of the manufacturers to guarantee analytical accuracy.

IBM SPSS Statistics version 25 (Armonk, NY, USA) was used for statistical processing. The Shapiro-Wilk test was used to confirm that the data were normal. While non-normally distributed data were reported as median and interquartile range and analysed using the Mann–Whitney U test, regularly distributed variables were expressed as mean ± standard deviation (SD) and compared using the independent-samples t-test. The Chi-square test was used to analyse categorical data, and a p-value of less than 0.05 was considered statistically significant.

3. Results

The participants were predominantly from urban areas (61.9%). Most were unmarried (70.8%) and either not employed (47.8%) or students (35.4%). 40.7% reported a family history of PCOS. The median age was 24 years (IQR: 20–30). Regarding BMI, 66.4% were overweight or obese (BMI $\geq$ 25 kg/m^2), while 33.6% had a BMI < 25 kg/m^2 (median BMI: 27.1 kg/m^2, IQR: 23.7–32.0). A summary of hormonal findings is presented in Table 1. Elevated serum prolactin levels (>23.4 ng/mL) were detected in 44 patients (38.9%), while 19 (16.8%) exhibited an LH/FSH ratio $\geq$ 2 and 10 (8.8%) had increased total testosterone concentrations (>0.73 ng/mL). Regarding metabolic parameters (Table 2), 24 women (21.2%) had FBS $\geq$ 100 mg/dL, including 23 (20.4%) with prediabetes (100–125 mg/dL) and 1 (0.9%) with diabetes ($\geq$126 mg/dL). Elevated total cholesterol (TC) was observed in 19 (16.8%) patients, of whom 17 (15.0%) had borderline high (201–239 mg/dL) and 2 (1.8%) had high TC ($\geq$240 mg/dL). Similarly, 18 (15.9%) had elevated triglycerides (TG > 150 mg/dL), mostly in the borderline high range (151–199 mg/dL). Low HDL-C (<40 mg/dL) was present in 23 (20.4%), while 16 (14.2%) exhibited protective HDL-C levels ($\geq$60 mg/dL). Elevated LDL-C (>100 mg/dL) was reported in 52 (46.0%) patients, including 37 (32.7%) with near-optimal (100–129 mg/dL), 14 (12.4%) borderline high (130–159 mg/dL), and 5 (4.4%) high ($\geq$160 mg/dL).

Regarding hemodynamic parameters, 15 (13.3%) participants had elevated SBP (130–139 mmHg), and

Table 1. Distribution of hormonal parameters among women with polycystic ovary syndrome.

Parameter	Category (Range)	Frequency (%)	Descriptive Statistics
LH (mIU/L)	Normal (2.4–12.6)	100 (88.5%)	5.12 (3.52–8.82)
	High (>12.6)	13 (11.5%)	
FSH (mIU/L)	Normal (3.5–9.2)	106 (93.8%)	5.90 ± 2.00†
	High (>9.2)	7 (6.2%)	
LH/FSH Ratio	Normal (<2)	94 (83.2%)	1.00 (1.00–1.00)
	High ($\geq$2)	19 (16.8%)	
Prolactin (ng/mL)	Normal (6.2–23.4)	69 (61.1%)	19.70 (14.53–27.43)
	High (>23.4)	44 (38.9%)	
Testosterone (ng/mL)	Normal (0.05–0.73)	103 (91.2%)	0.34 (0.24–0.52)
	High (>0.73)	10 (8.8%)	

Values are presented as median (interquartile range) unless otherwise indicated. † Data are presented as mean ± standard deviation. FSH: Follicle-Stimulating Hormone; LH: Luteinizing Hormone; LH/FSH Ratio: ratio of luteinizing hormone to follicle-stimulating hormone; mIU/L: milli-international units per liter; ng/mL: nanograms per milliliter.

Table 2. Distribution and descriptive statistics of metabolic and cardiovascular parameters in the study population.

Parameter	Category (Range)	Frequency (%)	Median (25–75 percentile)
FBS (mg/dL)	74–99 (Normal)	89 (78.8%)	91.00 (86.00–99.00)
	100–125 (Prediabetes)	23 (20.4%)	
	≥126 (Diabetes)	1 (0.9%)	
TC (mg/dL)	≤200 (Desirable)	94 (83.2%)	160.00 (139.50–189.00)
	201–239 (Borderline high)	17 (15.0%)	
	≥240 (High)	2 (1.8%)	
TG (mg/dL)	≤150 (Normal)	94 (83.2%)	97.00 (77.00–132.50)
	151–199 (Borderline high)	16 (14.2%)	
	≥200 (High)	3 (2.7%)	
HDL-C (mg/dL)	<40 (Low)	23 (20.4%)	44.30 (40.45–54.00)
	40–59 (Normal)	74 (65.5%)	
	≥60 (Protective)	16 (14.2%)	
LDL-C (mg/dL)	<100 (Optimal)	57 (50.4%)	99.00 (76.50–115.50)
	100–129 (Near optimal)	37 (32.7%)	
	130–159 (Borderline high)	14 (12.4%)	
	≥160 (High)	5 (4.4%)	
SBP (mmHg)	<130 (Normal)	98 (86.7%)	112.00 (103.00–122.00)
	130–139 (Elevated)	9 (8.0%)	
	≥140 (Hypertension)	6 (5.3%)	
DBP (mmHg)	<85 (Normal)	100 (88.5%)	71.00 (65.00–78.00)
	85–89 (Elevated)	4 (3.5%)	
	≥90 (Hypertension)	9 (8.0%)	
Pulse Rate (bpm)	60–100 (Normal)	96 (85.0%)	85.00 (78.00–94.50)
	>100 (Tachycardia)	17 (15.0%)	

SBP: Systolic Blood Pressure, DBP: Diastolic Blood Pressure, TC: Total Cholesterol, TG: Triglycerides, HDL-C: High-Density Lipoprotein Cholesterol, LDL-C: Low-Density Lipoprotein Cholesterol, mmHg: millimeters of mercury, mg/dL: milligrams per deciliter, bpm: beats per minute.

6 (5.3%) had hypertension (SBP ≥ 140 mmHg). For DBP, 4 (3.5%) had elevated (85–89 mmHg) and 9 (8.0%) had hypertension (≥90 mmHg). Tachycardia (pulse > 100 bpm) was observed in 17 (15.0%) women.

Several metabolic and cardiovascular parameters showed statistically significant differences when categorised by BMI (normal BMI: n = 38; elevated BMI: n = 75) (Table 3). Higher BMI women had significantly lower HDL-C [43.30 mg/dL (12.0) vs. 53.00 mg/dL (20.9); p = 0.002], as well as higher TC [168.00 mg/dL (44) vs. 146.50 mg/dL (41); p = 0.016], TG [109.00 mg/dL (IQR 69) vs. 84.00 mg/dL (42); p < 0.001], and LDL-C [102.00 mg/dL (34) vs. 83.50 mg/dL (42.3); p = 0.003]. The raised BMI group also had greater DBP and SBP: DBP [74.00 mmHg (14) vs. 68.00 mmHg (11); p = 0.031] and SBP [117.00 mmHg (IQR 20) vs. 106.00 mmHg (19); p = 0.008]. For FBS, pulse rate, and hormonal measures such as LH, FSH, LH/FSH ratio, prolactin, and testosterone, no significant intergroup differences were found (p > 0.05 for all).

Menstrual irregularities were prevalent; just 12.4% of women reported regular cycles, while 49.6% reported oligomenorrhea and 38.1% reported amenorrhoea. 75.8% of married women, who made up 29.2% of the total, were subfertile. 87.6% of patients had hirsutism, and 70.8% had acne, indicating the prevalence of clinical signs of hyperandrogenism (Fig. 1). Table 4 shows that women with increased BMI (88.0%) had subfertility at a considerably higher rate than women with normal BMI (12.0%) (p = 0.009). Similarly, the increased BMI group had a greater percentage of a positive family history of PCOS (78.3%) compared to the normal BMI group (21.7%) (p = 0.027).

4. Discussion

The most prevalent endocrine condition in women of reproductive age is PCOS, which is most commonly reported in those under 35. It is most likely caused by the normalisation of ovarian shape with age. Consistent with the findings of Akshaya and Bhattacharya, the majority of patients in this study were aged between 21 and 30 years, with a median age of 24 years (S. and Bhattacharya, 2016). Multiple Iraqi studies have similarly documented a high burden of excess weight among women with PCOS, with most cohorts reporting higher mean BMI values or increased rates of overweight and obesity compared with non-PCOS controls (Hb et al., 2020; Al-Quraishy et al., 2022; Juhi, 2025). In the present study, nearly two-thirds of

Table 3. Comparison of clinical, hormonal, and metabolic parameters between normal weight and overweight/obese women with PCOS.

Parameter	Normal BMI (n = 38)	Elevated BMI (n = 75)	p-value
SBP (mmHg)	106.00 (19.00)	117.00 (20.00)	0.008*
DBP (mmHg)	68.00 (11.00)	74.00 (14.00)	0.031*
Pulse Rate (bpm)	84.00 (19.00)	86.00 (17.00)	0.157
FBS (mg/dL)	89.50 (11.00)	92.00 (14.00)	0.233
Testosterone (ng/mL)	0.35 (0.34)	0.34 (0.27)	0.918
Prolactin (ng/mL)	22.80 (19.26)	18.25 (12.83)	0.061
LH (mIU/L)	5.14 (6.44)	5.12 (4.70)	0.564
FSH (mIU/L)	5.61 ± 2.46	6.17 ± 2.41	0.869†
LH/FSH Ratio	1.05 (0.91)	0.91 (1.12)	0.720
TC (mg/dL)	146.50 (41.00)	168.00 (44.00)	0.016*
TG (mg/dL)	84.00 (42.00)	109.00 (69.00)	<0.001*
HDL-C (mg/dL)	53.00 (20.90)	43.30 (12.00)	0.002*
LDL-C (mg/dL)	83.50 (42.30)	102.00 (34.00)	0.003*

Values are presented as median (interquartile range), with comparisons made using the Mann–Whitney U test. †Data are presented as mean ± standard deviation, with comparisons made using the independent t-test. *p-value < 0.05 was considered statistically significant. BMI: Body Mass Index, SBP: Systolic Blood Pressure, DBP: Diastolic Blood Pressure, FBS: Fasting Blood Sugar, LH: Luteinizing Hormone, FSH: Follicle-Stimulating Hormone, TSH: Thyroid-Stimulating Hormone, fT4: Free Thyroxine, TC: Total Cholesterol, TG: Triglycerides, HDL-C: High-Density Lipoprotein Cholest, LDL-C: Low-Density Lipoprotein Cholesterol (mg/dL), bpm: beats per minute, ng/mL: nanograms per milliliter, mIU/L: milli-international units per liter, mmHg: millimeters of mercury, mg/dL: milligrams per deciliter.

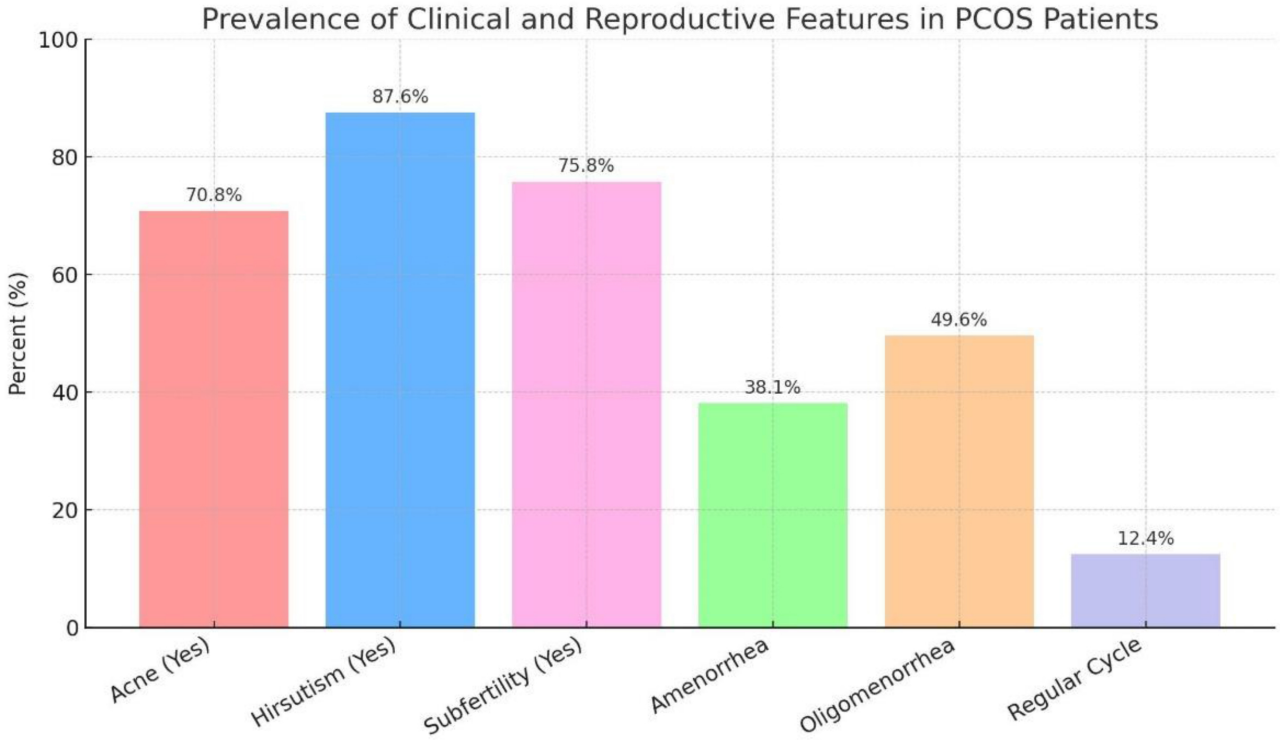

Fig. 1. Prevalence of clinical and reproductive features in women with PCOS.

participants had a BMI ≥ 25 kg/m^2, reflecting a substantial prevalence of excess weight within this population. This pattern aligns with international findings, including the study by Nahar et al. in Bangladesh, where more than half of the women with PCOS were classified as overweight or obese (Nahar et al., 2017). Obesity contributes to androgen excess via theca cell dysfunction and hypothalamic–pituitary–

Table 4. Comparison of clinical and reproductive variables across BMI groups in women with PCOS.

Variable	Category	Frequency (%)		p-value
		Normal BMI	Elevated BMI	
Menstrual Cycle	Amenorrhea	9 (20.9%)	34 (79.1%)	0.081
	Oligomenorrhea	23 (41.1%)	33 (58.9%)	
	Regular	6 (42.9%)	8 (57.1%)	
Subfertility	Absent	35 (39.8%)	53 (60.2%)	0.009
	Present	3 (12.0%)	22 (88.0%)	
Hirsutism	Absent	5 (35.7%)	9 (64.3%)	0.860
	Present	33 (33.3%)	66 (66.7%)	
Acne	Absent	9 (27.3%)	24 (72.7%)	0.358
	Present	29 (36.3%)	51 (63.7%)	
Family History of PCOS	Absent	28 (41.8%)	39 (58.2%)	0.027
	Present	10 (21.7%)	36 (78.3%)	

Values are presented as frequency (%). Comparisons between groups were performed using the Chi-square test.

ovarian (HPO) axis disturbances, often producing a high LH/FSH ratio and impaired follicular development (Harada, 2022). Obesity contributes to the enhancement of androgen production by increasing LH activity, thereby intensifying the hyperandrogenic state (Glueck and Goldenberg, 2019).

An LH/FSH ratio $\geq$ 2 was observed in 16.8% of patients, similar to the 16% reported previously (Najem et al., 2008). Elevated LH (11.5%) and testosterone (8.8%) were lower than the 27% and 44% reported by Sj et al. (2017), while hyperprolactinaemia was higher (38.9% vs. 13%) (Sj et al., 2017). No significant differences in LH, FSH, LH/FSH ratio, prolactin, or testosterone were found between BMI groups, consistent with previous findings (Sj et al., 2017) but contrasting studies by Kumar et al. and Nahar et al., who reported elevated androgens in overweight women (Nahar et al., 2017; Kumar et al., 2016).

Regarding reproductive features, Spandana and Shetty found that 59% of their patients had oligomenorrhoea, while 37% experienced regular cycles (Sj et al., 2017). In our cohort, menstrual irregularities were even more pronounced, with oligomenorrhoea affecting 49.6% and amenorrhoea 38.1% of women, indicating a slightly greater burden of menstrual dysfunction. An Iraqi study also reported a high prevalence of menstrual disturbances in PCOS, with 72% of patients experiencing irregular cycles and 57.3% exhibiting oligomenorrhoea (Juhi, 2025). Another investigation identified abnormal uterine bleeding and menorrhagia as frequent presentations, reaffirming the central role of menstrual disturbances in PCOS across populations (Maslyanskaya et al., 2017). In the current study, menstrual irregularities, including oligomenorrhoea and amenorrhoea, were more common among patients with elevated BMI, although the association did not reach statistical significance. Akshaya and Bhattacharya also reported a similar lack of significant difference between BMI groups (S. and Bhattacharya, 2016).

In this study, 75.8% of married women reported having subfertility, and this condition was far more common in those with higher BMIs than in women of normal weight. This observation is consistent with research by Nahar et al. (2017), who found that 74% of women with PCOS experienced subfertility. That is in contrast to the lower rates reported in earlier studies (S. and Bhattacharya, 2016; Zafar et al., 2019), which found that 33.7% and 42% of individuals, respectively, were subfertile, with the latter finding no discernible difference across BMI categories. These results underscore how obesity negatively impacts fertility in women with PCOS and stress the significance of focused therapies, including weight loss, to enhance reproductive outcomes.

More than half of the patients also reported a family history of PCOS, with a higher frequency among women who were overweight or obese, consistent with earlier reports (S. and Bhattacharya, 2016). This underscores the importance of early screening and lifestyle modification in women with a genetic predisposition to PCOS to prevent or mitigate obesity-related complications. Clinical manifestations of hyperandrogenism, such as hirsutism and acne, were prevalent in this cohort and occurred more frequently than those documented by Sj et al. (2017). Compared with previous Iraqi data, the prevalence was slightly lower (Juhi, 2025), yet these features remain among the most characteristic clinical signs of PCOS. Although these features were more pronounced in women with higher BMI, the differences were not statistically significant, similar to the findings of Akshaya and Bhattacharya (S. and Bhattacharya, 2016).

It is becoming more widely acknowledged that young women with PCOS frequently have dyslipidemia as a metabolic disorder (Vine et al., 2023).

Nearly half of the patients in the current study had elevated LDL-C levels, with median values exceeding those found in previous studies (Mu et al., 2012; Nahar et al., 2017), indicating a higher risk of cardiovascular disease. Approximately one-fifth of patients had impaired FBS, which is higher than the prevalence found by Sj et al. (2017) and suggests an early trend toward metabolic impairment. An unfavourable metabolic profile was further exacerbated by the prevalence of low HDL-C values. TC, TG, and LDL-C concentrations were significantly higher in women with higher BMIs, whereas HDL-C levels were lower. Although these parameters differed significantly between groups, most values, particularly SBP, DBP, and LDL-C, remained within accepted physiological reference ranges. This pattern suggests that higher BMI in women with PCOS is associated with early metabolic alterations that may precede overt cardiometabolic disease, reflecting a shift toward increased risk even before clinical thresholds are exceeded. These results are consistent with earlier studies showing that obesity exacerbates dyslipidemia in PCOS, increasing the risk of cardiovascular disease and metabolic syndrome (Bennal et al., 2014; Qasim and Rasool, 2025).

Furthermore, women with higher BMI had significantly higher SBP and DBP, supporting earlier findings that obesity, insulin resistance, hyperandrogenism, and autonomic instability all contribute to hypertension in PCOS (Marbaniang, 2023). Comparisons with previous studies confirm both consistent patterns and population-specific differences, highlighting the importance of targeted interventions, particularly weight management, to improve clinical, reproductive, and metabolic outcomes. This study's strengths include its focus on Kurdish women and the comprehensive assessment of hormonal, metabolic, and reproductive characteristics. However, the unequal group sizes (Normal BMI, n = 38; Elevated BMI, n = 75), along with the cross-sectional design and relatively small sample size, may limit the generalizability of the findings and the statistical power of comparisons between groups.

5. Conclusion

Menstrual irregularities, subfertility, and hyperandrogenism were highly prevalent among women with PCOS, accompanied by metabolic disturbances such as dyslipidaemia, elevated fasting blood glucose, and hypertension. Women with elevated BMI exhibited more pronounced metabolic alterations, including worsened lipid profiles, higher blood pressure, and increased subfertility, highlighting the substantial impact of excess weight on both cardiometabolic and reproductive outcomes. While BMI influenced metabolic and clinical characteristics, it did not have a statistically significant effect on hormonal markers, underscoring the need for further investigation in this population.

Competing interests

The authors declare no conflicts of interest.

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