Original Article

# Clinical, hormonal and metabolic factors associated with polycystic ovary syndrome among Pakistani women

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**Objective:** To evaluate the clinical, hormonal and metabolic factors associated with polycystic ovary syndrome (PCOS) among women in tertiary care hospital in Hyderabad, Pakistan.

**Methodology:** This cross-sectional study was carried out at the Nazeer Hussain Medical Complex, Hyderabad from December 2018 to May 2019. Participants were selected using non-probability purposive sampling technique. Females between 16-40 years with or without history of PCOS and menstrual irregularities like Oligomenorrhea, Polymenorrhea, Amenorrhea, etc. were included in the study. Females on oral-contraceptives >4 weeks, insulin-sensitizing agents or hormonal therapy >2 weeks, history of other disorders (gynecological, thyroid etc.) were excluded. Anthropometric, clinical, hormonal and biochemical parameters were measured for all participants. Chi-square and student t-tests were used to analyze the data using SPSS version 23.

**Results:** Study has 200 patients with mean age of 29.23±4.12 years. The prevalence of PCOS was 48.5% using Rotterdam criteria. Menstrual irregularities were the most common presenting complaints. BMI, waist circumference, and systolic blood pressure were higher among the PCOS group. The difference between clinical, biochemical and hormonal parameters among PCOS and no-PCOS participants was statistically significant ($p<0.05$). A positive correlation between increased BMI, increased Luteinizing /Follicle-stimulating hormone ratio and serum testosterone was observed.

**Conclusion:** Women having PCOS were mostly obese with BMI>30Kg/m$^2$. Irrespective of their weights, these patients exhibits hormonal as well as metabolic abnormalities and menstrual irregularities. (Rawal Med J 202;45:817-821).

**Keywords:** Body mass index, menstrual irregularities, polycystic ovary syndrome.

## INTRODUCTION

Polycystic ovarian syndrome (PCOS) or Stein Leventhal syndrome is the most commonly occurring endocrine/metabolic disorder characterized by multiple cysts in one or both ovaries of reproductive age female.[1] Although the etiology is unclear, genetic immersion has been identified as the key factor supported by the fact that its incidence among first-degree relatives is five to six times higher than the general population.[2] Many other disorders like hyperinsulinemia, metabolic syndrome, type 2 diabetes, obesity, weight gain, hypercholesterolemia, dyslipidemia and risk of developing cardiovascular diseases (CVD) are associated with PCOS.[3]

PCOS is characterized by chronic-anovulation, menstrual irregularities and clinically evident hyper-androgenism making it one of the most common causes of infertility worldwide, owing to which it is also termed poetically as "thief of womanhood".[4] From 5-55% of women have PCOS.[5] Pakistan is amongst the countries where data regarding the complications related to PCOS is scarce. However, descriptive studies conducted in different parts of the country reported a high prevalence (45-55%) of PCOS and infertility.[6] Therefore, the objective of the current study was to evaluate the clinical, hormonal and metabolic factors associated with PCOS among women in tertiary care hospital.

## METHODOLOGY

This cross-sectional study was conducted at the

Nazeer Hussain Medical Complex (NHMC), Hyderabad from December 2018 to May 2019. ISRA University Ethical Review Board approved the study and an informed consent was taken from all participants. Females between 16-40 years with or without history of PCOS and menstrual irregularities like Oligomenorrhea, Polymenorrhea, Amenorrhea, etc. were included in the study. While females on oral-contraceptives >4 weeks, insulin-sensitizing agents or hormonal therapy >2 weeks, history of other disorders (gynecological, thyroid etc.) were excluded. Participants were selected using a non-probability purposive sampling technique while the sample size was calculated for a power of 80% with a level of significance at 0.05, a confidence level of 95% and margin of error set at 7% to be 200.

Individual basis interviews of participants were conducted and socio-demographic, personal, medicinal, family, gynecological/obstetric histories, etc. were collected using a written questionnaire. Participants with menstrual cycle > 35 days and < 21 days or variation of > 4 days between regular cycles were used as confirmatory symptoms of menstrual irregularities.[6]

Modified Ferriman Gallwey (MFG) scoring method and the Global Acne Grading System (GAGS) were used for Hirsutism and Acne scoring.[7] Rotterdam consensus was used for the diagnosis of PCOS. According to the RC, at least two out of three conditions (after excluding other etiologies) i.e. clinical and/or hyperandrogenism, amenorrhea or oligo-menorrhea and appearance of single or multiple cysts on ultrasonography is confirmatory of having PCOS.[8] Ultrasound scans (abdominal and pelvis) was conducted for the size and number of ovarian cysts. The presence of ≥12 follicles in at least one of the two ovaries is confirmatory of PCOS.[6] Biochemical and hormonal parameters including a lipid profile, sugar level, testosterone level, follicle-stimulating hormone (FSH) level and luteinizing hormone (LH), etc. were analyzed at ISRA university diagnostic laboratory.

**Statistical Analysis:** Statistical analysis was performed using SPSS version 23. Chi-square and student t-tests were applied to analyze the statistical significance which was set at p-value <0.05. Pearson's correlation coefficient was applied to look for the correlation between BMI and hormonal and biochemical parameters.

## RESULTS

The overall response rate in the study was 87% i.e. 200 out of 230 agreed for participation. The mean age participants was 29.23±4.12 years while the mean age of menarche was 13.61± 2.61. (Table1) Based on the Rotterdam criteria, 97 participants had PCOS showing prevalence of 48.5%. Ultrasound findings revealed that mean number of follicles in the right and left ovary was 9.72±3.21 and 12.44±2.34, respectively. The difference between clinical parameters and anthropometric measures between participants in PCOS and no-PCOS groups was statistically significant (p<0.05) (Table 2).

**Table 1. General information of study participants (n=200).**

| Variables | N | (%) |
|---|---|---|
| Age | | |
| <30 years | 107 | (53.5) |
| 30-40 years | 93 | (46.5) |
| Marital Status | | |
| Unmarried | 78 | (39) |
| Married | 122 | (61) |
| Family History of PCOS | | |
| Yes | 49 | (24.5) |
| No | 151 | (75.5) |
| Fertility status | | |
| Nulliparous | 118 | (59.0) |
| Parous | 82 | (41.0) |
| Age of Menarche | | |
| <13 years | 89 | (44.5) |
| ≥13 years | 111 | (55.5) |

**Table 2. Clinical and anthropometric parameters of participants.**

| Clinical parameters | Groups | | P-value |
|---|---|---|---|
| | PCOS (n=97) | No PCOS (n=103) | |
| | N (%) | N (%) | |
| Menstrual Irregularities<br>Oligo-menorrhea<br>Poly-menorrhea<br>Amenorrhea | *55(56.7)*<br>39<br>11<br>05 | - | - |
| ^Infertility | 31(31.6) | 14(13.6) | 0.001* |
| ^Hirsutism | 35(36.0) | 12(11.6) | 0.000* |
| ^Acne | 41(42.2) | 29(28.1) | 0.03* |
| ^Hair loss/ Alopecia | 11(11.3) | 18(17.4) | 0.21$^{ns}$ |
| ^Mood swings/ depressive feelings | 27(27.8) | 13(12.6) | 0.000* |
| $^{€}$Systolic blood Pressure (mmHg) | 119.4±14.71 | 112.7±11.61 | 0.000* |
| $^{€}$Diastolic blood pressure (mmHg) | 71.9±7.61 | 69.23±8.17 | 0.01* |
| Anthropometric measures | mean (±SD) | mean(±SD) | |
| $^{€}$Weight (Kg) | 78.2±18.41 | 57.42±12.45 | 0.000* |
| $^{€}$Height (cm) | 151.35±10.31 | 150.16±6.34 | 0.23* |
| $^{€}$BMI (kg/m$^2$) | 31.57±8.04 | 22.38±5.78 | 0.000* |
| $^{€}$Waist circumference (cm) | 79.71±13.12 | 56.84±12.71 | 0.002* |

^: Chi2 test applied. $^{€}$: Student t-test. *(p<0.05). ns: Not significant

**Table 3. Biochemical and hormonal parameters of participant.**

| Biochemical parameters | Groups | | P-value |
|---|---|---|---|
| | PCOS (n=97) | No-PCOS (n=103) | |
| | (mean±SD) | (mean±SD) | |
| Total Cholesterol (mg/dl) | 179.9±32.0 | 171.5±27.0 | 0.04* |
| Triglyceride (mg/dl) | 100.6±24.3 | 80.6±22.9 | 0.000* |
| LDL (mg/dl) | 107.9±22.9 | 102.5±19.7 | 0.07 $^{ns}$ |
| HDL (mg/dl) | 44.4±13.8 | 47.7±9.0 | 0.04* |
| FBG (mg/dl) | 99.1±11.2 | 95.8±7.5 | 0.01* |
| 2-hour post 75g R.B.G (mg/dl) | 91.9±9.4 | 85.6±8.5 | 0.000* |
| Hormonal Parameters | (mean±SD) | (mean±SD) | |
| LH (mIU/ml) | 8.1±5.7 | 6.3±4.7 | 0.01* |
| FSH (mIU/ml) | 4.6±5.4 | 6.7±2.8 | 0.000* |
| LH/FSH ratio | 1.7/1 | 0.8/1 | - |
| Total testosterone (pg/dl) | 4.6±3.6 | 2.8±1.9 | 0.000* |
| Prolactin (µIU/ml) | 23.6±8.2 | 14.6±7.5 | 0.000* |
| Cortisol (ug/dl) | 12.7±5.5 | 11.4±6.7 | 0.13 $^{ns}$ |
| Fasting insulin ((µIU/dl) | 15.7±6.0 | 12.2±4.9 | 0.000* |

**Table 4. Correlation between hormonal and biochemical parameters with BMI.**

| Parameters | r value | P-value |
|---|---|---|
| LH/FSH ratio | 0.377 | 0.001* |
| Testosterone | 0.469 | 0.000* |
| Cortisol | 0.035 | 0.51$^{ns}$ |
| Fasting insulin | 0.159 | 0.01* |
| FBG | 0.228 | 0.03* |

A statistically significant difference (p<0.05) in levels of biochemical and hormonal parameters of participants in PCOS and no-PCOs groups was observed (Table 3). A significantly positive correlation between BMI, LH/FSH ratio and serum testosterone was observed among the study participants. While a weak positive correlation of BMI with fasting insulin, serum cortisol and FBG was observed (Table 4).

## DISCUSSION

Geographical diversity and the role of environmental factors, as well as dietary habits, is the main factor in the variation of global prevalence of PCOS.[9] The prevalence of PCOS in this study was 48.5%. This is lower than reported by Zandi et al (60.2%) who used NIH criteria.[10] A study from Karachi, Pakistan by Zafar et al reported that 54.4% of their participant had PCOS using Rotterdam consensus.[6] The study by Tehrani et al from Iran reported 14.6% and 7.1% prevalence using Rotterdam and NIH criteria, respectively. Dissimilarities in the prevalence of PCOS in different studies may be due to a lack of consensus on diagnostic criteria used by the researchers. A positive family history of PCOS in first-degree relatives was prevalent among 24.5% of participants in this study. Consistent findings were reported by Memon et al, where the mothers of 23% of participants also had a history of PCOS. This may due to the genetic predisposition in the case of PCOS.[11]

Menstrual irregularities (Oligomenorrhea, Polymenorrhea, Amenorrhea) were the most common presenting complaints of the participants having PCOS that is 56.7% in the present study. These findings are consistent with Maslyanskaya et al, who reported that the majority of their participants presented with abnormal uterine

bleeding and menorrhagia.[12] Infertility was observed in 31.6% participant with PCOS. Consistent findings were reported in a study by Zafar et al where 33.7% of participants with PCOS were infertile.[6]

Psychological issues like depression, mood swings, anxiety, etc. are commonly present along with PCOS. These may be due to abnormal androgen and insulin levels. Mood-swings/depressive feelings were found among 27.8% of our study participants. These findings are almost twice as higher than reported (14%) by Singh et al.[13] Waist circumference and abdominal fat are linked with insulin resistance which is one of the major complications of PCOS.[14]

PCOS was observed higher among obese participants as the association between BMI and waist circumference with PCOS comparison with their counterparts. These findings are consistent with Memon et al and Gupta et al.[11,14] In the present study, we found that Pakistani women with PCOS had lower FSH levels but higher free testosterone than their counterparts. This is similar to by Al-Mulhim et al.[15] The mean LH level in the participants with PCOS was 8.1±5.7 mIU/ml in the current study, consistent with the findings by Kumar et al and Nahar et al.[16,17] A significantly positive correlation between BMI, LH/FSH ratio and serum testosterone was observed in the present study.

## CONCLUSION

Women having PCOS were mostly obese with BMI>30Kg/$m^2$. Irrespective of their weight, PCOS patients exhibit the menstrual irregularity, the most common clinical manifestation followed by metabolic and hormonal disturbances.

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