

ORIGINAL ARTICLE

Frequency of Metabolic Syndrome in Patients with Polycystic Ovarian Syndrome

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ABSTRACT

Objective: To study the frequency of metabolic syndrome in patients with polycystic ovarian syndrome.

Study Design: Cross-sectional study.

Place and Duration of Study: The study was carried out at the outpatient Department of Gynecology Unit-II from 1st September 2019 to 25th January 2020.

Materials and Methods: Females aged 18 to 45 years were diagnosed with polycystic ovarian syndrome using Rotterdam criteria. The diagnosis of metabolic syndrome was made upon the Adult Treatment Panel criteria National Cholesterol Education Program Expert Panel, i.e., the presence of any three features like central obesity, dyslipidemia, hypertension, and elevated fasting blood sugar. All procedures were done by the researcher herself, and all data were recorded on a pre-designed questionnaire. Data was analyzed using SPSS version 25.

Results: The average age of the females was 30.98±7.05 years, most of whom were married (96.62%). Out of the total 148 females, 64.83% were diabetic, 29.73% had hypertension, 69.59% had dyslipidemia, and 29% were obese. Out of 148 females with polycystic ovarian syndromes, metabolic syndrome was present in 27.70%. The frequency of metabolic syndrome was significantly higher among obese females compared to normal and overweight with p -value=0.001. However, metabolic syndrome showed no significant association with age, marital status, parity, and duration of polycystic ovarian syndrome ($p>0.05$).

Conclusion: Metabolic syndrome is a prevalent condition in females with polycystic ovarian syndrome and having a high BMI makes it more likely. These findings and systematic investigation can be used to justify a metabolic syndrome screening policy in polycystic ovarian syndrome for early detection and intervention, as well as a healthy future.

Keywords: Metabolic Syndrome, Polycystic Ovarian Syndrome, Rotterdam Criteria.

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Introduction

Globally, polycystic ovarian syndrome (PCOS) is a frequent disorder affecting approximately 10-20% of women of reproductive age group.¹ In the South Asian population, the prevalence of PCOS is 20% to 40% in Pakistan and 8% to 36% in India.²⁻⁴ Its clinical features include amenorrhea or oligomenorrhea, hyperandrogenism, prolonged anovulation, acne, and hirsutism.⁵ These females have the potential to develop endometrial carcinoma, dysfunctional uterine, high blood pressure, diabetes, and cardiovascular and cerebrovascular events.^{5,6}

Many studies revealed a bidirectional association between polycystic ovarian syndrome and metabolic syndrome (MetS).⁶⁻⁹ The frequency of MetS among

females with PCOs is 43% in US, 25% in Hongkong and 8% in Italy.⁸ While, in Pakistan, the prevalence of MetS among PCOs is 47%.⁹ A study also found that females with PCOs had five times greater risk of developing MetS as compared to controls, concluding that PCOs is an independent predictor for MetS.⁷

The metabolic syndrome (MetS) is a group of risk factors that include impaired glucose tolerance, abdominal obesity, hypertension, and/or dyslipidemia, all of which contribute significantly to increased cardiovascular morbidity and mortality, and the development of diabetes mellitus.⁹ Together, PCOs and MetS significantly impact reproductive biology, fertility, and oxidative stress-related vascular problems.⁹⁻¹¹ According to a study, women with PCOs who are infertile and older (>25 years) or have waist ratios greater than 0.85 are more likely to develop MetS.¹²

There is a scarcity of Pakistani data on the prevalence of MetS in females with PCOs, and worldwide data is inapplicable since our society differs from other countries in terms of sociocultural, environmental, and nutritional aspects.¹³ As a result, the current study sought to evaluate the prevalence of MetS in females with PCOs visiting Dr. Ruth KM Pfau Civil Hospital in Karachi, Pakistan. This study will help in the identification of MetS in women with PCOs, allowing for quick treatment and therapeutic lifestyle changes to prevent a cardiovascular event or the onset of diabetes, assuring a healthy future for the high-risk population.

Materials and Methods

This cross-sectional research was carried out at the outpatient Department of Gynecology Unit II, from 1st September 2019 to 25th January 2020. The sample size of 148 females with PCOs was estimated using the WHO sample size calculator by considering the percentage of MetS as 43.4%⁸, based on an error of 8% and 95% confidence level. Females of age 18 to 45 years were diagnosed with PCOs. The Polycystic ovaries (PCOs) are defined using Rotterdam criteria¹³ i.e., the presence of 2 out of 3 of the following features:

Hyperandrogenism: Presence of acne, scanty menstruation, or hirsutism.¹³

Oligo-anovulation: Women whose menstrual

periods are more than 35 days apart or whose cycles are shorter than 21 days.¹³

Polycystic ovaries: Presence of 10 small antral follicles in each ovary or any ovary identified on ultrasound.¹³

Females with known hypo-/hyper-thyroidism, type 1 diabetes mellitus, or any endocrine disease affecting metabolic status and females having hypertension secondary to renal disease were excluded from the study. A non-random consecutive sampling method was employed for the selection of females.

The study was carried out after obtaining approval from the ethical committee of Dow University of Health Sciences, Karachi, Pakistan (ERC#2019-29). Written informed consent was taken from the eligible females before starting data collection. Females were requested for follow-up with 10 hours of fasting to give 5ml venous samples for fasting lipid profiles and fasting blood sugar. Anthropometric measurements were taken. The diagnosis of metabolic syndrome was made upon criteria National Cholesterol Education Program Expert Panel (NCEP)- Adult Treatment Panel III (ATP criteria) i.e. presence of any three of the following features:

Central obesity (waist circumference greater than 88cm or waist-to-hip ratio greater than 0.85).¹⁴

Dyslipidemia, high triglycerides (greater than 150mg/dL), and low high-density lipoproteins (less than 45mg/dL).¹⁴

Hypertension (SBP > 135mmHg and DBP > 85mmHg on a single event or already taking anti-hypertensive).¹⁴

Elevated fasting blood sugar (fasting blood sugar reading greater than 100mg/dL checked in a capillary blood sample on a single event).

Females diagnosed with MetS were given proper consultation. All procedures were done by the researcher herself, and all data were recorded on a pre-designed questionnaire.

Data was analyzed using SPSS version 25. Mean, and SD were reported for age, parity, weight, height, BMI, blood pressure, duration of disease, FBS, LDL, HDL, and triglycerides. Frequency and percentage were reported for marital status, oligo-anovulation, hyperandrogenism, acne, hirsutism, polycystic ovaries on ultrasound, diabetes, hypertension, dyslipidemia, BMI categories, and MetS. Effect

modifiers like age, parity, duration of disease, marital status, and BMI categories were addressed through stratification using the chi-square test/Fisher exact test was applied. A p -value equal to or less than 0.05 was taken as significant.

Results

The average age of the females was 30.98 ± 7.05 years, and most of them were married (96.62%). Another descriptive analysis is displayed in Table 1. In a total of 148 females with polycystic ovarian

syndrome, MetS was present in 27.70% as presented in Figure 1. The frequency of MetS was significantly higher among obese females compared to normal and overweight, with p -value=0.001. Moreover, the metabolic syndrome MetS was common in age 30 years and above, married females, parity 1 to 2, and duration of PCOs ≤ 5 . However, MetS frequency in PCO patients showed no significant association with age, marital status, parity and duration of PCOS ($p > 0.05$). (Table 2).

Table 1: Descriptive analysis of study variables (n=148)

Variables	
Age (Years)	30.98±7.05
Parity	1.93±1.07
Weight (kg)	72.5±12.6
Height (cm)	162.29±8.86
BMI (kg/m ²)	27.45±4.01
SBP (mmHg)	133.8±9.07
DBP (mmHg)	84.16±4.46
Duration of PCOS (Years)	5.82±1.81
LDL	127.3±48.03
HDL	47.14±13.91
Triglycerides	192.62±63.36
FBS	104.56±19.76
Marital status	
Married	143 (96.62%)
Unmarried	5 (3.38%)
Oligo-anovulation	
Yes	61 (41.22%)
No	87 (58.78%)
Hirsutism	
Yes	131 (88.51%)
No	17 (11.49%)
Acne	
Yes	108 (72.97%)
No	40 (27.03%)
Polycystic ovaries on US	
Positive	125 (84.46%)
Negative	23 (15.54%)
Dyslipidemia	
Yes	103 (69.59%)
No	45 (30.41%)

Hypertension	
Yes	44 (29.73%)
No	104 (70.27%)
Diabetes	
Yes	96 (64.86%)
No	52 (35.14%)
BMI categories	
Normal	39 (26.35%)
Overweight	66 (44.59%)
Obese	43 (29.05%)
Data presented as Mean±SD or n (%)	

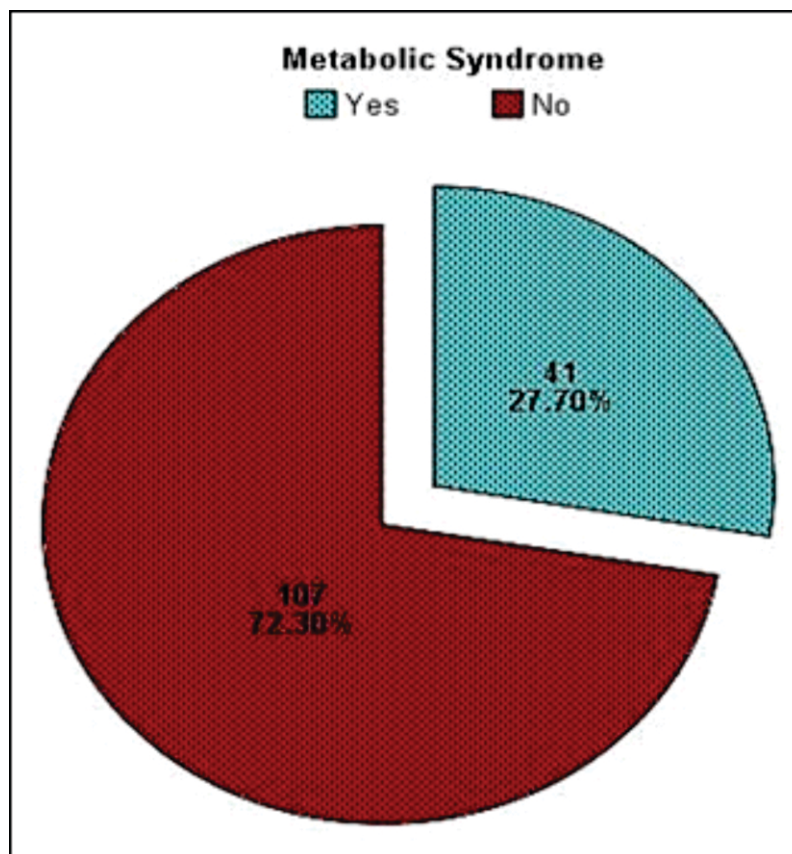


Fig 1: Frequency of the metabolic syndrome in females with polycystic ovarian syndrome (n= 148)

Discussion

The metabolic syndrome (MetS) is characterised by three interconnected abnormalities: high blood pressure, central obesity, dyslipidemia, and insulin resistance, all of which have been linked to the development of cardiovascular events and type II diabetes mellitus.^{15,16} The most prevalent metabolic abnormalities found in females with PCOs are hyperinsulinemia and insulin resistance, which affect

approximately 70% of them.¹⁷ In meta-analyses based on different populations revealed that females with PCOs were at higher risk of MetS as compared to females without PCOs.¹⁷⁻²⁰ A recent study found that females with PCOs were five times more likely to acquire MetS than controls.⁷ As a result, it is critical to evaluate insulin resistance or MetS in women with PCOS in order to implement prompt therapies and lifestyle adjustments.²¹

Table 2: Stratified analysis of metabolic syndrome with respect to effect modifiers

	Metabolic syndrome		p-value
	Yes	No	
Age Groups (Years)			
≤ 30	18(24%)	57(76%)	0.38
>30	23 (31.5%)	50 (68.5%)	
Marital status			
Married	40(97.6%)	103(96.3%)	0.695
Unmarried	1 (2.4%)	4(3.7%)	
Duration of PCOs (years)			
≤ 5	22 (53.7%)	51(47.7%)	0.514
>5	19(46.3%)	56 (52.3%)	
Parity			
0	2 (4.9%)	9 (8.4%)	0.643
1-2	31 (75.6%)	82 (76.6%)	
≥3	8 (19.5%)	16 (15%)	
BMI categories			
Normal	8 (19.5%)	31 (29%)	0.001*
Obese	23 (56.1%)	20 (18.7%)	
Overweight	10 (24.4%)	56 (52.3%)	

In the current study, we discovered that 27.7% of females with PCOs had MetS. This is lower than the last survey done in Pakistan (47%).⁹ In a study conducted by Mehrabian et al. in Iran, the prevalence of MetS was 25% among females with PCOs.²² Another study conducted in South India by Mandrelle et al. revealed that 38% of the females with PCOs had MetS.¹² MetS is estimated to affect 43% of females with PCOs in the United States, 25% in Hong Kong, 28% in Brazil, 8% in Italy, and 2% in the Czech Republic.⁸ The large variability in MetS prevalence among PCOs between nations may be attributable to genetic, environmental, nutritional, and lifestyle variables.

Previous studies conducted at the South Asian population revealed that the incidence of MetS increases with age.^{12,22} A study conducted by Hahn et al. in Germany also reported that the prevalence of MetS significantly increases with age.²³ They also reported a significant association between MetS and obesity.²³ Soares et al. conducted a similar study in Brazil and concluded that MetS prevalence increases with BMI and found that 52.3% of the obese females

with PCOs had MetS.²⁴ Women with PCOs had higher BMI, blood pressure, and waist circumference than controls in research done in Italy by Carmina et al. They discovered that 26% of the women with PCOs had a BMI of more than 30, and 37% were overweight.²⁵ In the current study, we found no significant correlation between age and MetS in females with PCOs, but a significant association was found between MetS and obesity.

There were a few limitations of the current study. We have included a small number of females with PCOs. Therefore, we cannot generalize the results. Secondly, this was a cross-sectional study, so we were unable to assess the cause-effect relationship between MetS and PCOs. More prospective research studies with larger sample sizes should be undertaken in the future, and confounders such as dietary and lifestyle variables should also be investigated.

Conclusion

The metabolic syndrome (MetS) is a prevalent condition in females with polycystic ovarian syndrome, and having a high BMI makes it more

likely. These findings and systematic investigation can be used to justify a metabolic syndrome screening policy in PCOS for early detection and intervention, as well as a healthy future.

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