

## Original Article

# METABOLIC SYNDROMES IN FEMALES WITH POLYCYSTIC OVARY SYNDROME

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### ABSTRACT

**Background:** One of the most frequent female endocrine disorders is polycystic ovary syndrome. It has a strong association with metabolic syndrome. The objective of this study was to find the frequency of metabolic syndrome in females with polycystic ovary syndrome.

**Material and Methods:** This was a cross-sectional study done in the department of obstetrics and gynecology, Hameed Lateef Hospital Lahore for six months. All the data was taken in form of age, address, and phone number. All diagnosed cases of PCOS were further evaluated for metabolic syndrome. A blood sample was taken with an aseptic measure and was sent to the hospital laboratory for biochemistry analysis. Systolic and diastolic blood pressure was measured by researcher herself and waist circumference was measured with a standard measuring tape.

**Results:** The mean age of all females was  $34.58 \pm 6.54$  years with minimum and maximum ages as 18 and 45 years. There were 80(25.3%) obese and 236(74.7%) non-obese females. The mean systolic and diastolic blood pressure was  $130.05 \pm 12.15$  and  $85.59 \pm 9.40$ . The overall prevalence of metabolic syndrome in females with PCOS was 31.6% (n=100).

**Conclusion:** It is concluded that the frequency of metabolic syndrome was high in females with polycystic ovary syndrome. Hence females with PCOS must be ruled out for metabolic syndrome and they must be considered for first-line treatment to reduce cardiovascular disease and other complications related to metabolic syndrome.

**Key Words:** Infertility, Obesity, Metabolic syndrome, Cardiovascular disease

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## INTRODUCTION

In women of reproductive age, the most prevalent endocrine problem is polycystic ovarian syndrome (PCOS).<sup>1-3</sup>

Chronic hyperandrogenic anovulation, changes in ovarian morphology, and dysfunctional uterine hemorrhage are all symptoms of PCOS.<sup>4</sup> PCOS predisposes women to infertility, endometrial cancer, obesity, dyslipidemia, type 2 diabetes mellitus, cardiovascular disease (CVD), and hypertension.<sup>5-7</sup> Insulin resistance (IR) and hyperinsulinemia are regarded to be important etiological contributors in PCOS.<sup>8,9</sup> PCOS is associated with insulin resistance (IR) in around 60%–80% of women with PCOS and 95% of obese women with PCOS.<sup>4</sup> Almost 12 to 21% of females are affected by PCOS. Metabolic characteristics of women with PCOS are clustered.<sup>10</sup> Clinically, the relationship between IR and PCOS has significant implications, especially since IR is regarded

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to be the underlying pathogenic mechanism in the relationships between glucose intolerance, hypertension, obesity, coronary artery disease, and lipid abnormalities which together comprise the metabolic syndrome (MetS).<sup>8,9</sup> MetS is more common in PCOS individuals who have numerous metabolic disorders. The prevalence of MetS varies between groups, owing to differences in the classification of PCOS or MetS, sampling methodology, control group selection, and age, weight, and race of the participant. IR is a key factor in MetS pathogenesis. However, it is well acknowledged that IR plays a significant role in the genesis of PCOS.<sup>11</sup>

A study reported that 28.8% of the women with PCOS had metabolic syndrome<sup>11</sup> while another study reported that 53.3% cases had metabolic syndrome.<sup>12</sup> Moreover, a local study reported that frequency of Metabolic syndrome was diagnosed in 35.6% of cases of PCOS.<sup>13</sup>

Various studies reported controversial results about the metabolic syndrome prevalence in females with PCOS.<sup>11,12</sup> These contradictory findings highlighted the necessity for further research into metabolic syndrome features in patients with PCOS. If we find a higher frequency of Metabolic syndrome then in the future more focus can be put on early diagnosis and treating the related conditions. As PCOS is one of the leading factors for female infertility and metabolic syndrome has a few components like obesity that can further enhance the risk of infertility and may be one the cause of treatment failure in infertility.<sup>14</sup> So by taking into account these things we can minimize the risk of PCOS and metabolic syndrome.

## MATERIAL AND METHODS

This was a cross-sectional study done in the department of obstetrics and gynecology, Hameed Lateef Hospital Lahore for 6 months after approval of synopsis. Non-probability consecutive sampling technique was used. 316 females with PCOS were taken according to a previous study.<sup>8</sup> The inclusion criteria for our study were females aged 18-45 years, diagnosed female with PCOS while

the exclusion criteria were women with non-classical congenital adrenal hyperplasia, Cushing syndrome, thyroid dysfunction, hyperprolactinemia (Prolactin >25 ng/ml), and androgen-producing tumors. All collected data was taken after taking informed consent from the department of obstetrics and gynecology, Hameed Lateef Hospital Lahore. Their basic data was taken in form of age, address, and phone number. All diagnosed cases of PCOS were further evaluated for metabolic syndrome. Blood samples were taken with aseptic measures and were sent to the hospital laboratory for biochemistry analysis. Systolic and diastolic blood pressure was measured by research herself and Waist circumference with a standard measuring tape. Metabolic syndrome was labeled as per operational definition. All data was collected on predesigned Performa. SPSS version 22 was used for entering and analyzing data. Data analysis was performed in form of mean  $\pm$  standard deviation for quantitative data such as age, weight, height and BMI, Systolic / diastolic blood pressure, fasting plasma glucose, triglycerides, HDL cholesterol, and Waist circumference. Frequency and percentages were used for categorical data such as metabolic syndrome. To address affect modifiers data were stratified for age, obesity, marital status. Post stratified Chi-square test was applied by taking P-value  $\leq$  0.05 as significant.

## RESULTS

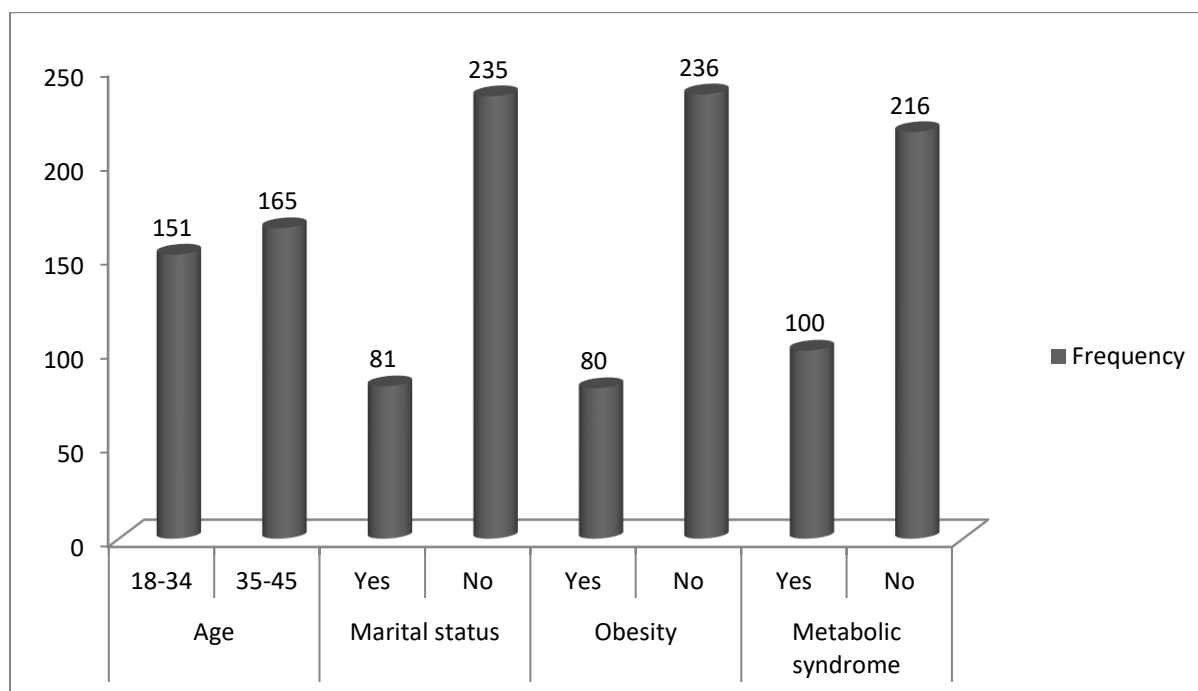
In this study, a total of 316 female patients with PCOS were included. The mean age of all females was  $34.58 \pm 6.54$  years with minimum and maximum age of 18 and 45 years. (Table 1) There were 151(47.8%) females who were 18-34 years old and 165(52.2%) females were 34-45 years old. (Figure 1) There were 235(74.4%) married and 81(25.6%) females were unmarried. (Figure 1) The mean weight, height, and BMI were  $82.96 \pm 21.10$ ,  $1.75 \pm 0.20$ , and  $26.77 \pm 3.88$  respectively. The mean waist circumference was  $67.36 \pm 4.39$ . (Table 1) There were 80(25.3%) obese and 236(74.7%)

non-obese females. (Figure 1)The mean systolic and diastolic blood pressure was  $130.05 \pm 12.15$  and  $85.59 \pm 9.40$ . The mean fasting plasma glucose was  $94.81 \pm 15.10$ , the mean Triglycerides was  $142.92 \pm 17.66$  and the mean HDL was  $57.84 \pm 6.63$ . (Table 1) According to operational definition 100(31.6%), females had metabolic syndrome while 216(68.4%) of the females

did not have metabolic syndrome. (Figure 1) When data were stratified for age, marital status, and obesity, it was found that the frequency of metabolic syndrome was statistically the same in both the age groups and marital status, p-value > 0.05 while it was higher in obese females, p-value < 0.05. (Table 2)

**Table-1:** Demographic and biochemistry profile of patients

Parameter	Mean	S.D	Range	Minimum	Maximum
Age (years)	34.58	6.54	27.00	18.00	45.00
Weight (kg)	82.96	21.10	65.00	58.00	123.00
Height (m)	1.75	0.20	0.80	1.37	2.17
Body mass index	26.77	3.88	16.45	19.17	35.62
Waist circumference	67.36	4.39	15.00	60.00	75.00
Systolic blood pressure	130.05	12.15	50.00	110.00	160.00
Diastolic blood pressure	85.59	9.40	50.00	70.00	120.00
Fasting plasma glucose	94.81	15.10	60.00	80.00	140.00
Triglycerides	142.92	17.66	60.00	120.00	180.00
HDL cholesterol	57.84	6.63	32.00	35.00	67.00



**Figure-1:** Frequency of patients according to age, obesity, marital status and metabolic syndrome

**Table-2:** Frequency of metabolic syndrome after stratifying for age, marital status and obesity

Parameter		Metabolic syndrome		p-value
		Yes	No	
Age groups (years)	18-34	43(28.5%)	108(71.5%)	0.247
	35-45	57(34.5%)	108(65.5%)	
Marital status	Married	71(30.2%)	164(69.8%)	0.35
	Un-married	29(35.8%)	52(64.2%)	
Obesity	Yes	38(47.5%)	42(52.2%)	0.001
	No	62(26.3%)	174(73.7%)	

## DISCUSSION

The frequency of metabolic syndrome has been investigated in several countries in patients with polycystic ovarian syndrome. According to the previous study, the metabolic syndrome prevalence was 43% in the United States, 24.9% in China and 1.6% in Czech women.<sup>15</sup> These disparate findings highlight the need of assessing metabolic syndrome in various populations to aid in the development of screening techniques to avoid long-term consequences.<sup>16,17</sup> In the current study the mean age, BMI, and waist circumference were  $34.58 \pm 6.54$  years,  $26.77 \pm 3.88$ , and  $67.36 \pm 4.39$ . There were 80(25.3%) obese and 236(74.7%) non-obese females. A previous study reported comparable mean age, BMI, and waist circumference.<sup>18</sup>

In the current study according to operational definition 100(31.6%), females had metabolic syndrome while 216(68.4%) of the females did not have metabolic syndrome. A previous study reported that MetS prevalence in women with PCOS was 28.8%<sup>11</sup> while another study reported that 53.3% of cases had Metabolic syndrome.<sup>12</sup> The findings of the current study are not matching with these two studies. Moreover, we found almost similar frequency to another local study that reported that frequency of Metabolic syndrome was diagnosed in 35.6% cases of PCOS.<sup>13</sup> Another study also reported high (46.4%) metabolic syndrome prevalence in women with PCOS in Pakistan.<sup>19</sup> Another study done in Tehran reported that the metabolic syndrome prevalence was 19.7%.<sup>18</sup> It was also confirmed in the current

study the metabolic syndrome was high in obese females and it increases with age and BMI. Similarly, another study reported 30.5% metabolic syndrome prevalence in cases of PCOS. They reported a strong association between metabolic syndrome prevalence and age, BMI of the patients with PCOS.<sup>20</sup>

A previous study used a multivariate logistic regression analysis to find significant predictors of metabolic syndrome. According to the findings, 37.5 percent of participants had metabolic syndrome. Diabetes mellitus was found in 5.8% of the patients, 8.3 % had abnormal fasting glucose, and 11.7 % had an abnormal glucose test. In 93.3 % of PCOS patients, dyslipidemia was found. The occurrence of metabolic syndrome was substantially related to age and a waist-hip ratio of less than 0.85 among all risk variables. As a result, infertile women with PCOS, especially those over the age of 25 or who have central obesity are at an increased chance of experiencing metabolic syndrome and must be provided diagnostic tests.<sup>21</sup>

PCOS is no longer considered simply as a disease of ovary. Now researchers growing awareness of the multisystem features of this disease.<sup>22</sup> Small sample size was the major limitation of our study. A study based on a large sample size should be conducted to get better results.

## CONCLUSION

It is concluded that the frequency of metabolic syndrome was high in females with polycystic ovary syndrome. Hence females with PCOS must be ruled out for

metabolic syndrome and they must be considered for first-line treatment to reduce cardiovascular disease and other complications related to metabolic syndrome.

### AUTHOR'S CONTRIBUTION

NM: Article writings  
 AA: Data collection  
 SA: Main idea and data collection  
 SN: Data analysis  
 SAA: Data analysis  
 SJ: Data analysis

### REFERENCES

- Louwers YV, Laven JS. Characteristics of polycystic ovary syndrome throughout life. *Therapeutic Advances in Reproductive Health*. 2020 Mar;14:2633494120911038. doi:<https://doi.org/10.1177%2F2633494120911038>
- Maqbool M, Gani I, Geer MI. Polycystic ovarian syndrome-a multifaceted disease: a review. *International Journal of Pharmaceutical Sciences and Research*. 2019;10(3):1072-9. doi: 10.13040/IJPSR.0975-8232.10(3).1072-79
- Vulcan T, Filip GA, Lenghel LM, Suci T, Ilut P, Procopciuc LM. Polymorphisms of Vitamin D Receptor and the Effect on Metabolic and Endocrine Abnormalities in Polycystic Ovary Syndrome: A Review. *Hormone and Metabolic Research*. 2021 Sep 20. doi: 10.1055/a-1587-9336
- Kumar A, Barki S, Raghav V, Chaturvedi A, Kumar KH. Correlation of Vitamin D with metabolic parameters in polycystic ovarian syndrome. *J Family Med Prim Care*.. 2017 Jan;6(1):115. 10.4103/2249-4863.214985.
- Tehrani FR, Simbar M, Tohidi M, Hosseinpanah F, Azizi F. The prevalence of polycystic ovary syndrome in a community sample of Iranian population: Iranian PCOS prevalence study. *Reprod Biol Endocrinol*. 2011;9:39. doi:10.1186/1477-7827-9-39.
- Pasquali R, Gambineri A. New perspectives on the definition and management of polycystic ovary syndrome. *J Endocrinol Invest*. 2018 Oct;41(10):1123-35. <https://doi.org/10.1007/s40618-018-0832-1>
- De Sousa SM. Metabolic syndrome, diet and exercise. *Best Practice & research. Clin Obstet Gynaecol*. 2016 Feb 10;37:140-51. doi: 10.1016/j.bpobgyn.2016.01.006 .
- Sobti S, Dewan R, Ranga S. Metabolic syndrome and insulin resistance in PCOS phenotypes. *Int J Reprod Contracept Obstet Gynecol*. 2017 Oct 28;6(11):5067-73. DOI: <http://dx.doi.org/10.18203/2320-1770.ijrcog20175027>.
- Moini A, Javanmard F, Eslami B, Aletaha N. Prevalence of metabolic syndrome in polycystic ovarian syndrome women in a hospital of Tehran. *Iran J Reprod Med*.. 2012 Mar;10(2):127.
- Ranasinha S, Joham AE, Norman RJ, Shaw JE, Zoungas S, Boyle J, Moran L, Teede HJ. The association between Polycystic Ovary Syndrome (PCOS) and metabolic syndrome: a statistical modeling approach. *Clin. endocrinol*. 2015 Dec;83(6):879-87 <https://doi.org/10.1111/cen.12830>..
- Zahiri Z, Sharami SH, Milani F, Mohammadi F, Kazemnejad E, Ebrahimi H, Heirati SF. Metabolic syndrome in patients with polycystic ovary syndrome in Iran. *Int J Fertil Steril*. 2016 Jan;9(4):490. doi: 10.22074/ijfs.2015.4607
- Shabir I, Ganie MA, Zargar MA, Bhat D, Mir MM, Jan A, Shah ZA, Jan V, Rasool R, Naqati A. Prevalence of metabolic syndrome in the family members of women with polycystic ovary syndrome from North India. *Indian J Endocrinol Metab*. 2014 May;18(3):364. doi: 10.4103/2230-8210.131186.
- Anjum N, Zohra S, Arif A, Azhar A, Qureshi M. Prevalence of metabolic syndrome in Pakistani women with polycystic ovarian syndrome. *Pak J Biochem Mol Biol*. 2013;46(3):97-100.
- Bañuls C, Rovira-Llopis S, de Marañón AM, Veses S, Jover A, Gomez M, Rocha M, Hernandez-Mijares A, Victor VM. Metabolic syndrome enhances endoplasmic reticulum, oxidative stress and leukocyte-endothelium interactions in PCOS. *Metabolism*. 2017 Jun 1;71:153-62. <https://doi.org/10.1016/j.metabol.2017.02.012>.
- Li R, Yu G, Yang D, Li S, Lu S, Wu X, Wei Z, Song X, Wang X, Fu S, Qiao J. Prevalence and predictors of metabolic abnormalities in Chinese women with PCOS: a cross-

- sectional study. *BMC Endocr Disord* 2014;14:76. doi: 10.1186/1472-6823-14-76.
16. Fazleen NE, Whittaker M, Mamun A. Risk of metabolic syndrome in adolescents with polycystic ovarian syndrome: A systematic review and meta-analysis. *Diabetes Metab. Syndr: Clin Res Rev.* 2018 Nov 1;12(6):1083-90. <https://doi.org/10.1016/j.dsx.2018.03.014>.
17. Khorshidi A, Azami M, Tardeh S, Tardeh Z. The prevalence of metabolic syndrome in patients with polycystic ovary syndrome: a systematic review and meta-analysis. *Diabetes Metab. Syndr: Clin Res Rev.* 2019 Jul 1;13(4):2747-53. <https://doi.org/10.1016/j.dsx.2019.06.008>.
18. Madani T, Hosseini R, Ramezanali F, Khalili G, Jahangiri N, Ahmadi J, Rastegar F, Zolfaghari Z. Metabolic syndrome in infertile women with polycystic ovarian syndrome. *Arch Endocrinol Metab.* 2016 Feb 23;60:199-204. <https://doi.org/10.1590/2359-3997000000135>.
19. Anjum S, Askari S, Riaz M, Basit A. Clinical Presentation and Frequency of Metabolic Syndrome in Women With Polycystic Ovary Syndrome: An Experience From a Tertiary Care Hospital in Pakistan. *Cureus.* 2020 Dec 2;12(12). doi: 10.7759/cureus.11860
20. Abdelazim IA, Elsawah WF. Metabolic syndrome among infertile women with polycystic ovary syndrome. *Asian Pac. J. Reprod.* 2015 Mar 1;4(1):44-8. [https://doi.org/10.1016/S2305-0500\(14\)60057-9](https://doi.org/10.1016/S2305-0500(14)60057-9).
21. Mandrelle K, Kamath MS, Bondu DJ, Chandy A, Aleyamma TK, George K. Prevalence of metabolic syndrome in women with polycystic ovary syndrome attending an infertility clinic in a tertiary care hospital in south India. *J Hum Reprod Sci.* 2012 Jan;5(1):26. doi: 10.4103/0974-1208.97791.
22. Li Y, Chen C, Ma Y, Xiao J, Luo G, Li Y, Wu D. Multi-system reproductive metabolic disorder: significance for the pathogenesis and therapy of polycystic ovary syndrome (PCOS). *Life sciences.* 2019 Jul 1;228:167-75. doi: <https://doi.org/10.1016/j.lfs.2019.04.046>