

Prevalence of metabolic syndrome in Pakistani women with polycystic ovarian syndrome

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Abstract: Metabolic Syndrome (MBS) and polycystic ovarian syndrome (PCOS) have many common features and might share the same pathogenesis. PCOs are mostly identified by insulin resistance with hyperinsulinemia as well as insulin resistance also plays a critical role in the MBS. A total of 225 cases and 200 controls were recruited in the study. The study focuses on these parameters age, body mass index, waist circumference, systolic blood pressure, diastolic blood pressure, fasting blood sugar, triglyceride, high density lipid, insulin, fasting blood sugar/insulin ratio and triglyceride/high density lipid ratio showed a significant difference between PCOS women with and without metabolic syndrome. It is concluded that further investigation is needed to determine the exact role of these component in pathophysiology of PCOS and MBS.

Keywords: Metabolic syndrome, polycystic ovary syndrome, Pakistani women.

Received: June 10, 2013 **Accepted:** August 21, 2013

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INTRODUCTION

The metabolic syndrome refers to a collection of abnormalities that arise from a metabolic source of origin, especially those factors dealing with metabolism that have a direct effect on the heart thus leading to the development of Cardiovascular diseases (CVD) or atherosclerotic CVD (ASCVD) ¹. This particular syndrome is adherent by abdominal obesity and signature atherogenic dyslipidemia ², other characteristic features of this syndrome would be hypertension, the patient suffers from insulin resistance, with or without hyperglycemia, prothrombotic state, and a proinflammatory state ³, a few other special features of this syndrome would include, hyperglycemia followed by abdominal obesity, hypertriglyceridemia, low high-density lipoprotein cholesterol (HDL-C) levels, and a very high elevated blood pressure. PCOS is a hormonal disorder in females affecting more than 15% of fertile women ⁴. Its symptoms can vary individual to individual and during life time. It can impact on her health life style ⁵ as well as cardiovascular related health issues ⁶.

South Asian women phenotypic and metabolic profile with PCOS drives from a large database of an Endocrine Clinic which shows more severe symptoms and insulin resistance are found at younger age in south Asians with anovulation than Europeans⁷. PCOS is a universal disease but the onset of its clinical symptoms and severity varies between world regions and races ⁷. The prevalence of the disease is between 3% to 11% which is conditional on the population studied and the criteria used for its diagnosis ^{8,9,10}.

MBS in women with PCOS is diverse because of ethnicity, different criteria used for assessing the PCOS as well as MBS. Glueck et al found a prevalence of 46% using the ATP III criteria ¹¹. In USA 37% of adolescent girls ¹² and 34.9% of adult females ¹³ to 43% ¹⁴ and 33.4% ¹⁵, have PCOS coupled with metabolic syndrome. In another study at southern Italy carried out by Carmina, the prevalence was 8.2% and 16% using ATP III and WHO criteria respectively ¹⁶. Weerakiet was conducted study in Thailand and found 35.3 % prevalence ¹⁷. However, in Korean Urban population the prevalence was 14.5 % ¹⁸ and 16% in Turkey ¹⁹. Recently findings in Brazil show that 38.4% of Brazilian women ²⁰ suffering from PCOS also have metabolic syndrome. These two complicated syndrome might share same pathogenesis.

MATERIALS AND METHODS

The study was design to determine the prevalence of MBS in PCOS females. It is hypothesized that females with dual disorder might present hyperandrogenism and menstrual cycle irregularity than women with PCOS only. The study was conducted in a multicenter endocrinology clinic over the period of 3 years in Karachi. A total of 500 PCOS cases were reviewed out of them 225 met the inclusion criteria according to the NCEP ATP III criteria ³.

The selected patients were further divided to two groups

Women with PCOS and the MBS (n = 80)

Women with PCOS lacking the MBS (n = 145)

Physical, hormonal, oral glucose tolerance test, fasting blood sugar (FBS), waist circumference (WC), high-density lipoprotein cholesterol (HDL-C) and triglyceride and blood pressure (BP) were measured. Prevalence of the MBS was 43%, nearly 2-fold higher than that reported for age-matched women in the general population ²¹. Women with PCOS and MBS had consistently higher rates of occurrence than general population, despite of body mass index (BMI) and age matched.

RESULTS

By using NCEP ATP III definition the prevalence of the MBS in women with PCOS was 35.6% which is significantly greater than that of the control group 9.5% (P= 0.000) [Table 1].

Table 1: Comparison of prevalence of metabolic syndrome among cases and controls according to ATP III Criteria.

	cases (n= 225)	controls (n= 200)	p-value
Metabolic syndrome	80 (35.6)	19 (9.5)	0.000***
No Metabolic syndrome	145 (64.4)	181 (90.5)	

Results are expressed as frequency (%)

[***p<0.001]

All individual components on a continuous scale (age, body mass index, waist circumference, systolic blood pressure, diastolic blood pressure, fasting blood sugar, triglyceride, high density lipid, insulin, fasting blood sugar/insulin ratio and triglyceride/high density lipid showed a significant difference between PCOS women with and without metabolic syndrome at 95% significance level. There was a significant difference between PCOS women with and without metabolic syndrome in age body mass index (31.96 ± 4.41 vs. 26.99 ± 3.80; p< 0.001), waist circumference (38.69 ± 5.37 vs. 33.10 ± 4.01; p< 0.001), systolic blood pressure (132.31 ± 8.99 vs. 124.28 ± 6.87; p< 0.001), diastolic blood pressure (87.56 ± 6.21 vs. 82.66 ± 4.90; p< 0.001), fasting blood sugar (93.90 ± 13.50 vs. 89.48 ± 9.46; p< 0.005), triglyceride (184.58 ± 24.56 vs. 140.68 ± 16.70; p< 0.001), high density lipid (43.73 ± 3.71 vs. 51.72 ± 6.57; p< 0.001), insulin (27.36 ± 9.53 vs. 21.11 ± 9.21; p< 0.001), fasting blood sugar/insulin ratio (4.13 ± 2.42 vs. 5.41 ± 3.32; p< 0.003) and triglyceride/high density lipid ratio (4.26 ± 0.74 vs. 2.77 ± 0.50; p< 0.001) (Table 2).

Table 2: Comparison of characteristics of PCOS women with and without metabolic syndrome

COMPONENTS	METABOLIC SYNDROME	NO METABOLIC SYNDROME	P-value
AGE IN YEARS	31.96 ± 4.41	31.83 ± 5.23	0.853
BMI (kg/m ²)	29.05 ± 3.05	26.99 ± 3.80	0.000** *
WAIST CIRCUMFERENCE	38.69 ± 5.37	33.10 ± 4.01	0.000** *
SYSTOLIC BP	132.31 ± 8.99	124.28 ± 6.87	0.000** *
DIASTOLIC BP	87.56 ± 6.21	82.66 ± 4.90	0.000** *
FASTING BLOOD SUGAR	93.90 ± 13.50	89.48 ± 9.46	0.005**
HDL	43.73 ± 3.71	51.72 ± 6.57	0.000** *
INSULIN	27.36 ± 9.53	21.11 ± 9.21	0.000** *
TRIGLYCERIDE	184.58 ± 24.56	140.68 ± 16.70	0.000** *
FBS/INSULIN RATIO	4.13 ± 2.42	5.41 ± 3.32	0.003** *
TRIGLYCERIDE/HDL RATIO	4.26 ± 0.74	2.77 ± 0.50	0.000** *

[***p<0.001]

Greater proportion of overweight and obese participants who participate in this study were having metabolic syndrome. Majority, 45.5% of the study subjects who were obese had metabolic syndrome compared to 12% of the obese subjects who do not have metabolic syndrome. The difference in proportion was highly significant (p < 0.000***) at 95% confidence interval (Table 3).

Table 3: BMI stratified prevalence of metabolic syndrome among study subjects with and without metabolic syndrome

BMI GROUP	METABOLIC SYNDROME (%)	NO METABOLIC SYNDROME (%)	P-VALUE
UNDER WEIGHT	0 (0)	17 (5.2)	0.000***
NORMAL WEIGHT	9 (9.1)	130 (39.9)	
OVER WEIGHT	45 (45.5)	140 (42.9)	
OBESE	45 (45.5)	39 (12.0)	

Under weight: <18.5 kg/m²

Normal weight: 18.5-24.9 kg/m²

Over weight: 25-29.9 kg/m²

Obese: > 30 kg/m²

Results are expressed as frequency (%)

[***p<0.001]

DISCUSSION

The consequences of the PCOS are not limited to reproductive axis; females with this syndrome are at higher risk for the development of metabolic and cardiovascular complication that is related to metabolic syndrome¹¹.

Ehrmann and colleagues estimated the prevalence in white females and observed that there were no MBS observed with a BMI less than or equal to 27 kg/m²¹⁵. Dokras and colleagues compared the prevalence of MBS among 129 women with PCOS compared with 177 female controls. Overall, 93% of the participants were white. The prevalence of MBS in the PCOS women was 34.9% (47.3% adjusted for age), compared with 6.8% (4.3% adjusted for age) in controls (p value < 0.001).

It has been observed that there is considerable differences in the prevalence of MBS in PCOS, depend on the population, ethnicity criteria apply to identify the MBS²². For example, using ATP III criteria, the MBS was evident in 34% of Caucasian, 26% of African- American, 31% of Hispanic, 50% of Asian and 43% of PCOS women with mixed ancestral origin^{11, 13, 14, 15, 16, 20}. The significant increase in the prevalence of MBS in PCO patients should be taken seriously, and the PCOS patients should screen properly for diagnosis of MBS¹⁴.

The prevalence of MBS in different age groups was examined (Table 2). Age is one of the major risk factor for MBS¹³. As the age increases the age specific MBS is also increased in both PCOS patients and control. Higher BMI infers to obesity, which is a important determinant of insulin resistance and also separately a risk for MBS. The study disclosed that 53.6% (45 out of 84) of the obese participants were diagnosed with Metabolic Syndrome. All obese women ironically, did not have MBS and also MBS was found in PCOS women with normal weight. This observation educate that the presence of PCO itself a risk factor for MBS and both obesity and PCO have additional influence in the production of the MBS.

Result of current investigation are in conformity with the study conducted by Apridonidze and coworkers¹⁴, they found higher occurrence of the MBS in PCOS patients (Third National Health and Nutrition survey) while stratified by age and BMI. The BMI and waist circumference was positively and significantly correlated in PCOS patients. Obesity has a role in pathophysiology of MBS because it is associated with hypertension, hyperglycemia and dyslipidemia¹³. Importantly, in our study, PCOS women with BMI \geq 30 Kg/m² were about 5 times more likely to have the MBS compared with PCOS

women having normal weight (BMI<25kg/ m²). This finding is in agreement with Ehrmann study¹⁵ (Table 3).

CONCLUSION

Women with PCOS and MBS are at higher risk for cardiovascular complications due to increased insulin levels which could be a common pathogenesis for these syndromes. They showed different characteristics in all studied parameters from general population i.e. age, body mass index, waist circumference, systolic blood pressure, diastolic blood pressure, fasting blood sugar, triglyceride, high density lipid, insulin, fasting blood sugar/insulin ratio and triglyceride/high density lipid ratio.

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