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Study of the Prevalence of Metabolic Syndrome Risk Factors in PCOS-affected Women

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Abstract

Background and Aim: The prevalence of metabolic syndrome in polycystic ovary syndrome has been studied in different populations. Present study was done with an objective to identify women with PCOS at risk of developing the metabolic syndrome and the association of individual metabolic parameters with PCOS.

Material and Methods: A prospective observational study was done at a tertiary care hospital in 200 non pregnant women aged 18-35 years diagnosed with PCOS in OPD of department of Obs & Gyne using Rotterdam's criteria. The study variables included age, menstrual pattern, Blood pressure (SBP/DBP), body mass index (BMI), waist circumference (WC), FG score, PCO pattern on ultrasound, fasting plasma glucose, fasting lipid profile. Metabolic syndrome was diagnosed according to AHA/NHLBI (ATP III 2005) definition. Fisher's exact test and unpaired t test were applied for statistical analysis.

Results: Out of 200 total numbers of confirmed subjects with PCOS, only 46 met the diagnostic criteria for MBS criteria, hence percentage prevalence of metabolic syndrome in PCOS is 23%.Among those who met criteria for Metabolic syndrome, Waist circumference ≥80 cms and serum TGs ≥150mg/dl were the most commonly deranged parameters in all 46 (100%) women followed by HDL≤50mg/dl in 40 (86.9%), FBS ≥110mg/dl 38 (82.60%) and SBP/DBP ≥ 130 / 85 mmHg in 28 (60.8%) women. Acanthosis nigricans were observed 88% of women in PCOS with metabolic syndrome group, which is significantly higher than 62% in PCOS group.

Conclusion: Women with PCOS particularly those with increased BMI, WC (≥88cms), USG morphology of PCOS, acanthosis are important risk factors for association of PCOS with Metabolic syndrome in significantly higher numbers and it is important to initiate screening for the same.

Key Words: body mass index, metabolic syndrome, polycystic ovary syndrome, Waist circumference

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Introduction

Polycystic ovary syndrome (PCOS) is one of the most common endocrine disorders in women, affecting approximately 5% to 8% of premenopausal women.[1] It is characterized by chronic anovulation, oligomenorrhea or amenorrhea, hyperandrogenism, and polycystic ovary morphology on pelvic ultrasound. It also has a metabolic component consisting of hyperinsulinemia and insulin resistance with increased cardiovascular disease risk, which occurs both in lean and obese women with the disorder, and has a strong association with metabolic syndrome.[2-4]

Metabolic Syndrome is another group of endocrine abnormalities, including insulin resistance, dyslipidemia obesity and hypertension. It is associated with a 2 fold increased risk of cardiovascular disease and a 5 fold increased risk of type 2 diabetes. The original National cholesterol education programme Adult treatment panel III (NCEP-ATPIII) criteria 20013 defines metabolic syndrome as the co-occurrence of three or more of the following risk factors: Central obesity with waist circumference ≥88 cm in women, elevated systolic and/or diastolic blood pressure of ≥130/85 mmHg, impaired fasting serum glucose≥ 110mg/dl, elevated fasting serum triglycerides≥150mg/dl, Fasting high density lipoprotein HDL cholesterol < 50 mg/dl. PCOS is essentially a hormonal disorder characterized by insulin resistance and hyperandrogenism. [5]

The prevalence of metabolic syndrome in polycystic ovary syndrome has been studied in different populations. These varied data indicate the need for evaluation of metabolic syndrome in different populations, as it would help in planning screening strategies to prevent long-term effects. Present study was done with an objective to identify women with PCOS at risk of developing the metabolic syndrome and the association of individual metabolic parameters with PCOS.

Material and Methods

A prospective observational study was done at a tertiary care hospital in 200 non pregnant women aged 18-35 years diagnosed with PCOS in OPD of department of Obs & Gyne using Rotterdam's criteria. Metabolic syndrome was diagnosed according to AHA/NHLBI (ATP III 2005) definition. Other aetiologies that could mimic PCOS –Known cases of late-onset congenital adrenal hyperplasia, adrenal tumours, Cushing's syndrome, Pituitary adenoma, women with steroid or oral contraceptive drug intake in the preceding 3 months, previously diagnosed Diabetes I, previously diagnosed with any cardiovascular problems, known cases of Hyperprolactenemia, patients not willing for complete evaluation and patients.

The main changes in the modified American heart Association/ National heart lung and Blood Institute definition (ATPIII 2005) include defining the ethnic specific difference in central obesity by using WHO recommendation for waist circumference ≥80 cms in Asian women and reducing threshold for impaired fasting glucose to 100mg% in accordance with the American diabetes Association revised definition. So WC cut off was taken ≥80 cms. Each patient had undergone a detailed clinical examination and a relevant laboratory evaluation. The study variables included age, menstrual pattern, Blood pressure (SBP/DBP), body mass index (BMI),

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waist circumference (WC), FG score, PCO pattern on ultrasound, fasting plasma glucose, fasting lipid profile. WC was measured at the midpoint between the lower margin of the least palpable rib and the top of the iliac crest using a measuring tape. Prevalence of Metabolic syndrome in the study population was the primary outcome.

A pelvic ultrasound for status and morphology of ovary was done using a vaginal probe of 6 MHz of a ultrasound machine. Ovarian volume measurements were carried out by measuring three perpendicular dimensions (volume for a prolate ellipsoid = 0.5 × length × width × thickness). Follicle number was estimated both in longitudinal and antero-posterior crosssections of the ovaries. Those with a mean diameter of 2–9 mm were counted for defining polycystic ovary morphology.

Metabolic syndrome was defined as per the original National cholesterol education programme-Adult treatment panel III (NCEP-ATPIII) criteria 2001. [6]

Results

Out of 200 total numbers of confirmed subjects with PCOS, only 46 met the diagnostic criteria for MBS criteria, hence percentage prevalence of metabolic syndrome in PCOS is 23%. Age wise distribution showed 130 women were in 18-25 years age group and 70 women in >25-35 years age group and calculated percentage prevalence was 21.53% and 25.71% respectively (Table 1). This shows that there is slightly high prevalence in age group >25-35 ye

Among those who met criteria for Metabolic syndrome, Waist circumference ≥80 cms and serum TGs ≥150mg/dl were the most commonly deranged parameters in all 46 (100%) women followed by HDL≤50mg/dl in 40 (86.9%), FBS ≥110mg/dl 38 (82.60%) and SBP/DBP ≥ 130 / 85 mmHg in 28 (60.8%) women (Table 2).

Mean BMI and mean waist circumference were found higher in women with MBS than as compared to those who did not meet criteria for MBS. (p≤0.05) Acanthosis nigricans were observed 88% of women in PCOS with metabolic syndrome group, which is significantly higher than 62% in PCOS group. (p≤0.05) (Table 3)

Hirsuitism was measured using a modified Ferriman Gallaway score at nine body sites, showing that out of 46 subjects with MBS in PCOS, 39 had FG score > 8 whereas 89 subjects in groups without MBS had the same. Hirsutism scores did not differ significantly in women with or without MBS. (p>0.05)

Table 1: Age wise distribution of MBS

Age (in years)	With MBS	Without MBS
18-25(n=130)	28 (21.53%)	102
25-35 (n=70)	18 (25.41%)	52
Total(n= 200)	46	154

Table 2: Prevalence of individual components of the metabolic syndrome in PCOS women

Metabolic Parameter	Number	Percentage (%)
Waist circumference ≥80cm	46	100
HDL-cholesterol<50mg/dl	40	86.9

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Hypertension≥ 130/85	28	60.8
FBS ≥ 110mg/dl	38	69.56

Table 3: Comparison of different variables in PCOS women with and without the metabolic syndrome

Variables	Without MBS	With MBS	P value
Age (yrs)	25.12 ±3.45	25.86±4.60	0.02*
BMI (kg/m2)	21.90±2.45	25.30± 2.47	0.001*
WC(cms)	80.91±1.45	83.90±2.35	0.03*
S. Triglycerides (mg%)	133.05±8.25	160.40±5.41	0.04*
S.HDl (mg%)	53.90±5.12	47.78±5.14	0.001*

* indicates statistically significance at p≤0.05

Discussion

Metabolic syndrome is characterized by three main interrelated abnormalities: elevated plasma glucose, dyslipidemia, and elevated blood pressure, which directly contribute to a pro-thrombotic and pro-inflammatory state, predisposing to the development of atherosclerotic cardiovascular disease and type 2 diabetes mellitus.[7] Hyperinsulinemia and insulin resistance are the common underlying metabolic abnormalities seen in PCOS and metabolic syndrome. Insulin resistance with elevated circulating insulin levels induces unfavorable changes in the lipid metabolism and increased androgen production from the theca cells. Androgen excess may support the presence of an unfavorable metabolic state leading to dyslipidemia and central distribution of fat (android pattern). In obese women, excess insulin and androgens may contribute to the development of the PCOS and metabolic syndrome.[8] The android pattern of fat distribution may be the result as well as the cause of hyperandrogenism, setting up a vicious circle of hyperinsulinism, hyperandrogenism, central adiposity, and metabolic abnormalities.[9]

Prevalence of metabolic syndrome in PCOS was 23.5%, which was low as compared to 42% in study conducted by Dey Ramprasad et al [10] and 33.4% according to study by Ehrmann et al [11] but as compared to study done by A.J. Goverde et al [12] (15.9%) it is higher. This difference in prevalence could be due to age group in our study (18-35) as in Dey Ramprasad et al [10] was 15-35 years. The prevalence of metabolic syndrome was significantly associated with increasing BMI. The prevalence of metabolic syndrome in Indians varies according to the region, the extent of urbanization, lifestyle patterns and cultural factors.[13] Hahn et al. established a prevalence of metabolic syndrome of 33.8% in German women with PCOS (International Diabetes Federation criteria) and found that the prevalence rate increased with obesity and age[14] In a study on Brazilian women with PCOS, the prevalence of metabolic syndrome was found to increase with BMI: 3.2%, 19.2%, and 52.3% for normal, overweight, and obese women, respectively.[15] In our study, the prevalence of metabolic syndrome also increased with both age and BMI. Among the individual metabolic parameters waist circumference ≥80cms and serum Triglyceride ≥150mg/dl were the most commonly deranged parameters found in all 31 women who met the criteria for

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metabolic syndrome. Dey et al [10] found low HDL cholesterol and hypertension to be the most common parameters. Each defining criterion was evaluated for its value to either confirm or exclude chances of MBS. In our study waist circumference above the threshold of 80 cm was found in all cases (100%) of metabolic syndrome which differs from study done by Dey Ramprsad et al [10] (34%) which used cut off value of 88cms. Also, when same is compared to study by Ehrmam et al[11] it was 80%.

Screening all infertile women with PCOS would be ideal but is not always practical, especially in a low-resource scenario. Identifying risk factors for screening would be an alternate strategy. Our results suggest that women having any of the following risk factors: age more than 25 or with central obesity waist–hip ratio >0.85, are at a greater risk of having the metabolic syndrome. However, the results need to be cautiously interpreted as the present study has certain limitations. The study was done at a tertiary care centre without use of a control group of non-PCOS women for comparison and the sample size was estimated taking a precision of 9% of the true value. A larger sample size will be required for a more precise estimate of the prevalence of metabolic syndrome.

Conclusion

Women with PCOS particularly those with increased BMI, WC (≥88cms), USG morphology of PCOS, acanthosis are important risk factors for association of PCOS with Metabolic syndrome in significantly higher numbers and it is important to initiate screening for the same. From a clinical point of view, it may be questioned whether all women diagnosed with PCOS should be screened for metabolic abnormalities or whether screening for these abnormalities could be limited to only those women particularly at risk. It was found that a combination of waist circumference offers the best selection criterion for the screening of presence of metabolic syndrome in subjects with polycystic ovarian syndrome. The present study highlights the need for comprehensive screening for metabolic syndrome in women with PCOS attending infertility clinic.

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