

ORIGINAL RESEARCH

Prevalence of metabolic syndrome in women with polycystic ovarian syndrome at TMC & Dr. BRAM Teaching Hospital, Tripura**¹Dr. Arindam Mallik, ²Dr. Anirban Bhowmik, ³Dr. Bappaditya Som, ⁴Dr. Ankita Bhattacharjee**¹Assistant Professor, ³Associate Professor, ⁴Senior Resident, Department of Obst & Gynae, TMC & Dr Bram Teaching Hospital, India²Assistant Professor, Department of Medicine, TMC & Dr Bram Teaching Hospital, India**Corresponding author**

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Abstract**Introduction-** One of the most prevalent endocrine disorder in women, PCOS can cause metabolic syndrome, infertility, monthly irregularities, and psychiatric abnormalities. The aim of this study was to assess the prevalence of metabolic syndrome in women with PCOS.**Material & methods-** The cross sectional study was conducted among 200 subjects diagnosed with PCOS at a tertiary care center during the six months of study period. Patients underwent clinical and laboratory assessments for the diagnosis of metabolic syndrome. SPSS version 25.0 was used to analyze the data.**Results** – Maximum subjects were in age group of 26-30 years (34%) and least were greater than 30 years (12%).14% subjects had metabolic syndrome. There was no significant difference in prevalence of metabolic syndrome with respect to Type of phenotype and age. There was significant association between metabolic syndrome and BMI, BP and FBS (P<0.05).**Conclusion** – In this study, it was discovered that PCOS patients had higher rates of the metabolic syndrome and its individual elements, including BMI, blood pressure, and fasting blood glucose. Early detection and prompt therapies, such as lifestyle adjustments, will stop metabolic consequences including cardiovascular illnesses and type II diabetes mellitus because the risk of MetS rises with age and BMI.**Keywords** – Blood Pressure, BMI, Fasting Blood Glucose, Metabolic Syndrome, PCOS, Women**Introduction**

One of the most prevalent endocrine illnesses in women, polycystic ovarian syndrome (PCOS) affects 4% to 10% of reproductive age women. [1] Chronic anovulation, oligomenorrhea or amenorrhea, hyperandrogenism, and polycystic ovary morphology on pelvic ultrasonography are its defining features. It also has a metabolic component that includes hyperinsulinemia, insulin resistance, and a higher risk of cardiovascular disease. Both lean and obese women who have the illness experience these metabolic symptoms, and there is a clear link between them and metabolic syndrome. [2-4]

Another group of endocrine disorders known as the metabolic syndrome include insulin resistance, dyslipidemia, obesity, and hypertension. [5] It is linked to a five-fold greater risk of type 2 diabetes and a two-fold increased risk of cardiovascular disease.[6] This

demonstrates the significance of early identification of metabolic syndrome and insulin resistance in women with polycystic ovarian syndrome and the subsequent implementation of preventive therapies.

Menstrual abnormalities, infertility, acne, hirsutism, and alopecia are some of the clinical signs of PCOS. [7] The numerous criteria that have been used to diagnose polycystic ovarian syndrome include the National Institute of Health 1990 criteria, the Androgen Excess Society criteria, and the Rotterdam criteria 2003, which is the most often used criteria. [8]

The Rotterdam criteria continues to be the most widely used and accepted criteria for PCOS and were once again unanimously supported in the 2018 International Evidence-Based Guideline for the Assessment and Management of PCOS [9]

Rotterdam criteria 2003 (ESHRE/ASRM) [10]

1. An irregular menstrual cycle (anovulation or oligoovulation).
2. Signs of hyperandrogenism [Clinical - hirsutism symptoms as determined by the Ferriman-Gallwey scale, with a score greater than or equal to 8 and with or without acne or male pattern baldness, or the quantity of testosterone ingreater than 60 ng/dl of blood].
3. Ovarian ultrasonography showing 12 or more follicles, each measuring a 2 to 9 mm diameter or an ovarian volume greater than 10cubic mm.

A PCOS diagnosis requires at least two of the aforementioned factors to be accomplished.

There are four phenotypes of PCOS depending upon Rotterdam's criteria [11]

Phenotype A - Increased androgen levels (Hyperandrogenism) + Anovulation or Oligoovulation + USG features of PCOS

Phenotype B - Increased androgen levels (Hyperandrogenism) + Anovulation or Oligo-ovulation

Phenotype C - Increased androgen levels (Hyperandrogenism) + USG features of PCOS

Phenotype D - Anovulation or Oligo-ovulation + USG features of PCOS

The metabolic syndrome is defined by the National Cholesterol Education Programme Adult Treatment Panel III (NCEP – ATP III) guidelines as the co-existence of three or more of the following risk factors as of 2001. (i) elevated systolic and/or diastolic blood pressure of 130/85 mmHg, (ii) central obesity with a waist circumference of 88 cm in women, (iii) impaired fasting serum glucose of >110 mg/dL, (iv) elevated fasting serum triglycerides of 150 mg/dl and (v) fasting high-density lipoprotein (HDL)< 50 mg/dl.[12]

In several populations, the frequency of metabolic syndrome in polycystic ovary syndrome has been investigated. According to reports, the incidence is 43% in the US, 28.4% in Brazil, 24.9% in Chinese women from Hong Kong, and only 1.6% in Czech women. [13, 14]

These contradictory data point to the necessity of assessing the prevalence of metabolic syndrome in various communities, since doing so would aid in the development of screening plans for mitigating long-term impacts.

Hence the aim of present study is to assess the prevalence of metabolic syndrome in women with PCOS.

Material & methods

The present cross sectional study was conducted at TMC& Dr. BRAM Teaching Hospital, Tripura, a tertiary care center during the six months of study period. Ethical permission was taken from institutional ethical committee before commencement of study.

The sample size has been calculated using the following formula for calculating sample size in Observational studies measuring proportions, $n = \{[(Z^2_{1-\alpha/2}) \times PQ] \div d^2\}$ [15]

Considering the proportion of metabolic syndrome is 14.3% (P) [16], at 5% level of significance. An absolute error of 5% was considered and thus the sample size of 188 is calculated, and rounded up to 200.

Patients were selected on the basis of following eligibility criteria-

Inclusion criteria

1. PCOS women diagnosed by Rotterdam criteria.
2. Age between 15 to 45 years.

Exclusion criteria

1. Pregnant women
2. Women with known Hypothyroidism, Hypertension, Hyperprolactinemia, Cushing's syndrome, Type I and Type II Diabetes mellitus and Hepatic or renal diseases.
3. Women on oral contraceptive pills, anti-diabetic drugs, antihypertensive drugs and lipid lowering drugs.

Women who had a history of PCOS underwent a thorough history review that covered their menstrual, medical, marital, obstetric, and personal histories. Acne, Acanthosisnigricans, male pattern alopecia, hirsutism, height, weight, BMI, systolic and diastolic blood pressure, waist, hip, and waist hip ratio were all checked during a thorough clinical examination. Galactorrhoea (Hyperprolactinemia) screening was performed on all of the patients, and Cushing's and the thyroid were clinically examined and ruled out. A modified Ferriman-Gallwey score of more than or equal to 8 was used to determine if a person was hirsute.

A complete gynecological examination was performed, including per abdominal, bimanual and speculum examination where it is indicated. Unmarried girl or women were excluded from bimanual and speculum examination.

On the second day of the menstrual cycle, ultrasonography was done to look for the characteristics of PCOS. More than 12 peripherally organized follicles with an average diameter of 2 to 9 mm or an ovarian volume greater than 10 cm³ were deemed to have PCOS morphology.

Women with PCOS had been diagnosed using Rotterdam PCOS diagnostic criteria [10]. Two out of three should be present – 1) Oligoovulation/anovulation (amenorrhea or oligomenorrhoea), 2) Clinical and/or biochemical signs of hyperandrogenism (hirsutism/ acne/ alopecia/ elevated levels of free or total testosterone) and 3) Polycystic ovaries on USG. After diagnosing PCOS, women had been categorised as per PCOS phenotype depending upon Rotterdam criteria (Phenotype A - Increased androgen levels (Hyperandrogenism), Anovulation or Oligoovulation, USG features of PCOS, Phenotype B - Increased androgen levels(Hyperandrogenism), Anovulation or Oligo-ovulation, Phenotype C - Increased androgen levels (Hyperandrogenism), USG features of PCOS, Phenotype D - Anovulation or Oligo-ovulation, USG features of PCOS)[11]

Metabolic Syndrome has been diagnosed using NCEP diagnostic criteria [12]. Three out of five should be present – 1) Fasting plasma glucose \geq 110 mg/dl, 2) Systolic blood pressure $>$ 130 mm of Hg or diastolic BP $>$ 85 mm of Hg, 3) Waist circumference $>$ 88 cm, 4) Serum triglyceride \geq 150 mg/ dl and 5) HDL cholesterol \leq 50 mg/dl.

The data were collected in structured proforma and analysed with relevant statistical methods.

RESULTS: Out of all the 200 patients diagnosed with PCOS maximum subjects were in age group of 26-30 years (34%) and least were greater than 30 years (12%) as seen in table 1.

Table 1 showing age parameters of patients with PCOS

Age group (in years)	Frequency (%)
<20	48(24)
21 – 25	60(30)
26-30	68(34)
>30	24(12)

Prevalence of metabolic syndrome among PCOS patients was found to be 14% as shown in table 2.

Table 2 shows prevalence of metabolic syndrome among PCOS patients

Metabolic syndrome	Frequency (%)
Present	28 (14)
Absent	172 (86)

In this study among Type A phenotype, 4% had metabolic syndrome, among Type B 4% had metabolic syndrome, among Type C phenotype, 5% had metabolic syndrome and among type D phenotype, 5% had metabolic syndrome. There was no significant difference in prevalence of metabolic syndrome with respect to Type of phenotype as shown in table 3.

Table 3 shows association between metabolic syndrome and phenotype

Metabolic syndrome	Type A	Type B	Type C	Type D	P value
Present	4 (1)	4 (1)	10 (5)	10 (5)	0.871
Absent	74 (37)	28 (14)	32 (16)	38 (19)	

Association between metabolic syndrome and age was calculated and it was found that 10% patients with age less than 25 years had metabolic syndrome and 4% patients with age 26-35 years had metabolic syndrome. There was no significant difference in prevalence of metabolic syndrome with respect to age as shown in table 4.

Table 4 shows association between metabolic syndrome and age

Metabolic syndrome	Age (in years)		P value
	<25	26-35	
Present	20 (10)	8 (4)	0.764
Absent	88 (44)	84 (42)	

In this study there was significant association between metabolic syndrome and BMI, BP and FBS. There was no significant association between metabolic syndrome and other factors such as acne, acanthosis, WC, WHR, HDL and TGL as shown in table 5.

Table 5 shows association between metabolic syndrome and different parameters

Different parameters	Metabolic syndrome		P value
	Present	Absent	
Acne	4 (2)	28 (14)	1.243
Acanthosis	4 (2)	12 (6)	0.675
BMI	8 (4)	16 (8)	0.004
Blood pressure	8 (4)	20 (10)	0.002
FBS	12 (6)	16 (8)	0.001
WC	12 (6)	8 (4)	0.784
WHR	0 (0)	4 (2)	0.432
HDL	4 (2)	16 (8)	0.321
TGL	4 (2)	24 (12)	0.465

Discussion

Early diagnosis of metabolic syndrome in PCOS patients will stop the development of diabetes and cardiovascular issues in the future.

Present study found a prevalence of metabolic syndrome of 14%, which is comparable to a study by Madani et al [17] that found a prevalence of 19.7%. MetS occurs in different places around the world. A study by Bhattacharya SM [18] on a group of Indian women with PCOS revealed a prevalence of metabolic syndrome of 47.5%, whereas a study by Lal M et al [19] revealed a prevalence of 22%. This disparity in prevalence is brought on by differences in racial and ethnic composition as well as in the diagnostic standards used to identify metabolic syndrome.

The frequency of metabolic syndrome among distinct PCOS phenotypes was not statistically significant. However, metabolic syndrome was more common in Phenotype C and D (6%). In contrast, in a research by Sobti S et al [20] the prevalence of phenotype A (56%) was higher than that of other phenotypes, followed by phenotype D (15%) and A (12%). This variety results from varying subjective opinions about how to evaluate the hirsutism.

In this study, 4% of the women with metabolic syndrome were between the ages of 26 and 35, while 10% were under the age of 25. Similar research was done by Varghese et al [21] and found that the frequency was 29.4% in those between the ages of 26 and 35, and 9.5% in people under the age of 25. This suggests that growing older is a significant risk factor for PCOS women to acquire metabolic syndrome.

In our study, the prevalence of metabolic syndrome rises with BMI. There were while in a research by Madani et al, 16.6% of 16 obese PCOS patients with metabolic syndrome and 3.2% of normal BMI participants were obese. [17]

In our investigation, all parameters related to metabolic syndrome markers were analyzed as seen in Aghade et al's study [22]. The association of metabolic syndrome with BMI, blood pressure and fasting blood glucose were found to be significant with $p < 0.05$ which was comparable to study done by Das et al [23] and Mandrelle et al [24].

There are some limitations in this study. It was not possible to determine the prevalence of metabolic syndrome in PCOS with accuracy because the study had a smaller number of participants. To precisely pinpoint the long-term relationship between metabolic syndrome and PCOS, additional large-scale research are required.

Conclusion

Metabolic syndrome was shown to be 14% more common in PCOS women. All PCOS women with metabolic syndrome had elevated waist circumference, raised BP and high density lipoproteins. Increased fasting blood glucose was the next prevalent finding that was identified. These results can be utilized to create a MetS screening program for PCOS women. Patients with PCOS can lower their risk of developing cardiovascular problems and type 2 diabetes mellitus by having a clinical examination and estimating their serum lipid profile. In order to prevent the late problems of metabolic syndrome in all PCOS women, regardless of age, early screening, appropriate health education, and prompt intervention such lifestyle adjustments including a healthy diet and exercise are required.

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