Section: Obstetrics and Gynaecology

Original Research Article

METABOLIC SYNDROME AND INSULIN RESISTANCE SYNDROME AMONG POLYCYSTIC OVARY SYNDROME

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Abstract

Background: Polycystic ovary syndrome (PCOS) has a high prevalence of metabolic syndrome, which has long-term consequences such as cardiovascular disease, diabetes mellitus type II, sleep apnoea, cancers, and psychological problems. The study aims to analyse the prevalence of metabolic syndrome in women with polycystic ovarian syndrome. **Materials and Methods:** This cross-sectional study was conducted on reproductive-age women with PCOS attending Gynecology OPD at Tirunelveli Medical College and Hospital for 18 months. One hundred twenty women were selected, and written informed consent was obtained from all the study participants. All the Reproductive-age women diagnosed with PCOS attending Gynaecology OPD were interviewed with a pre-tested semi-structured questionnaire, and a detailed history of the symptoms was collected. **Result:** Among 120 study populations, the mean age was 26.88 ± 4 (18 to 38). 50.00% of them were menstrual irregularities, 40.00% of them were primary infertility, and 8.33% of them were secondary infertility. 84.17% had menstrual Symptoms, 14.17% had acanthosis, 18.33% had hirsutism, and 37.50% had Metabolic syndrome. The difference in age group, menstrual Symptoms, acanthosis, and hirsutism between study groups was statistically significant. The difference in mean weight, height, and weight circumference between the study group was statistically significant. The difference in mean total cholesterol, FBS and DBP between study groups was not statistically significant. **Conclusion:** It is necessary to screen all women with PCOS for metabolic syndrome due to age, central obesity, high blood pressure, HDL levels, elevated FBS, TGL, and consistent USG findings.

INTRODUCTION

Polycystic ovarian syndrome (PCOS) is associated with chronic anovulation, insulin resistance and androgen excess. It is considered one of the most common endocrinopathies among reproductive-age women. It affects approximately 6-10% of reproductive-age women.[1,2] Some clinical manifestations of PCOS are oligomenorrhea, amenorrhea, hyperandrogenism, hirsutism and chronic anovulation. Women with this syndrome are at elevated risk of metabolic syndrome (MBS: X syndrome & insulin resistance syndrome). Metabolic syndrome is a constellation of metabolic abnormalities that confers an advanced risk of cardiovascular disease and diabetes mellitus. Although insulin values are not used to diagnose either PCOS or MBS, insulin resistance and compensatory hyper-insulinemia are the key pathogenic factors in the pathogenesis of these disorders.[3]

Metabolic syndrome's prevalence in PCOS patients is higher than in the general population. USA studies confirmed the prevalence of MBS in PCOS women (43- 46%) was nearly two-fold more elevated than that reported for aged-matched women in the general population.[4] Two different analyses which were conducted in Iran country had some controversy. The first study by Lankarani et al. showed that the criteria for Metabolic syndrome are frequently present in young women with PCOS and are more valuable as a prognostic factor than insulin resistance. Meanwhile, they also suggested evaluating insulin resistance in older women with PCOS.[5]

Long-term health consequences of the syndrome are currently being investigated. Still, multiple studies indicate that women with the syndrome are at increased risk for the development of glucose intolerance or frank type 2 diabetes mellitus (DM2), hypertension, dyslipidemia [decreased plasma high-density lipoprotein cholesterol (HDL-C) and

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increased plasma triglycerides], and atherosclerosis. It has been postulated that the insulin resistance of PCOS contributes to these long-term comorbidities. Insulin resistance also appears to play a pathogenic role in metabolic syndrome.[6]

Polycystic ovary syndrome affects 4–20% of women of reproductive Age.[7] Insulin resistance appears important in the pathogenesis of PCOS and subsequent metabolic syndrome. The prevalence of the metabolic syndrome is as high as 33% in women with PCOS. It has long-term consequences such as cardiovascular disease, diabetes mellitus type II, sleep apnoea, cancers, and psychological problems.[8] Conventionally, management of polycystic ovarian syndrome has focused on infertility, anovulation and hirsutism; thus, clinicians need to be aware of the metabolic syndrome. The iniquity of the health burden of metabolic syndrome defines that accurate detection and early intervention are essential. Therefore, the study aims to analyse the prevalence of metabolic syndrome in women with polycystic ovarian syndrome.

MATERIALS AND METHODS

This cross-sectional study was conducted on reproductive-age women with PCOS attending Gynecology OPD at Tirunelveli Medical College and Hospital for 18 months.

One hundred twenty women were selected, and written informed consent was obtained from all the study participants.

Inclusion Criteria

Patients in the reproductive age group (18 – 45 years) with polycystic ovarian syndrome. Patients selected according to ROTTERDAM criteria: 2 out of 3 criteria needed, such as hyperandrogenism – hirsutism, Oligo-and/or anovulation – (menstrual irregularities, infertility), polycystic ovaries – by ultrasound findings were included.

Exclusion Criteria

Patients with age > 45 years, and Hypothyroidism / Hyperthyroidism, secondary causes of androgen excess. Use of OC Pill in the preceding three months and chronic diseases like SLE, diabetes mellitus, hypertension, and cardiovascular disease were excluded.

All the Reproductive-age women diagnosed with PCOS attending Gynaecology OPD were interviewed with a pre-tested semi-structured questionnaire, and a detailed history of the symptoms was collected. To assess the status of the metabolic syndrome, these women were measured with the following, such as waist circumference > 88cm (measures central obesity), blood pressure – (both Systolic and diastolic blood pressure), fasting lipid profile – (includes TGL and HDL), fasting blood sugar – to screen for fasting hyperglycemia, BMI – another parameter for central obesity.

National cholesterol education programme adult treatment panel III (NCEPATP III) guidelines define metabolic syndrome as having three or more of the following abnormalities: such as waist circumference in females > 88 cm, fasting serum glucose level at least 110mg/dl, fasting serum triglycerides level at least 150mg/dl, serum high-density lipoprotein cholesterol (HDL-C) < 50 mg/dl and blood pressure at least 130/85mmHg.

All data were collected on a structural data form (sample enclosed) and analysed for descriptive statistics. Metabolic syndrome (study group) was considered as the primary outcome variable. Age, menstrual Symptoms, acanthosis, hirsutism, HLD, LDL, TGL, Cholesterol, fasting blood sugar, and blood pressure were considered explanatory variables.

Descriptive analysis was carried out by mean and standard deviation for quantitative variables and frequency and proportion for categorical variables. Data was also represented using appropriate diagrams like bar and pie diagrams. Categorical outcome variables and explanatory variables were assessed by using the chi-square test.

The association between categorical explanatory variables and quantitative outcomes was assessed by comparing the mean values. Independent sample t-test was used to determine statistical significance. P-value < 0.05 was considered statistically significant.

RESULTS

Among 120 study populations, the mean age was 26.88 ± 4 (18 to 38). 40.00% of the age group was between 18 - 25 years, 41.67% were 26 - 30 years, and 18.33% of the age group was 31 - 35 years. 50.00% of them were menstrual irregularities, 40.00% of them were primary infertility, and 8.33% of them were secondary infertility [Table 1].

Table 1: Demographic data of the study

		Frequency	Percentages
Age group	18 - 25 years	48	40.00%
	26 - 30 years	50	41.67%
	31 - 35 years	22	18.33%
Presentation	Hirsutism	2	1.67%
	Menstrual irregularities	60	50.00%
	Primary infertility	48	40.00%
	Secondary infertility	10	8.33%
Menstrual Symptoms	Yes	101	84.17%
	No	19	15.83%
Acanthosis	Yes	17	14.17%

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	No	103	85.83%
Hirsutism	Yes	22	18.33%
	No	98	81.67%
Metabolic Syndrome	Yes	45	37.50%
	No	75	62.50%

84.17% had menstrual Symptoms, 14.17% had acanthosis, 18.33% had hirsutism, and 37.50% had Metabolic syndrome [Table 1].

Table 2: Comparison of age group, menstrual Symptoms, acanthosis, and hirsutism between metabolic syndrome

		Metabolic syndrome		P-value
		Yes	No	
Age group	18 - 25 Years (N=48)	12 (25%)	36 (75%)	0.002
	26 - 30 Years (N=50)	18 (36%)	32 (64%)	
	31 - 35 Years (N=22)	15 (68.18%)	7 (31.82%)	
Menstrual Symptoms	Yes (N=101)	32 (31.68%)	69 (68.32%)	0.002
	No (N=19)	13 (68.42%)	6 (31.58%)	
Acanthosis	Yes (N=17)	14 (82.35%)	3 (17.65%)	<0.001
	No (N=103)	31 (30.1%)	72 (69.9%)	
Hirsutism	Yes (N=22)	13 (59.09%)	9 (40.91%)	0.021
	No (N=98)	32 (32.65%)	66 (67.35%)	

Table 3: Comparison of mean of anthropometric measurement and parameters between metabolic syndrome.

	Metabolic syndrome		P-value
Height	154.56 ± 3.19	154.49 ± 3.64	0.925
Weight	76.2 ± 13.46	57.33 ± 8.65	<0.001
BMI	31.96 ± 5.66	23.91 ± 2.98	<0.001
Waist Circumference	97.02 ± 9.48	82.09 ± 8.4	<0.001
S.TGL	123.71 ± 26.12	108.87 ± 13.52	<0.001
S.HDL	45.84 ± 5.71	54.82 ± 4.35	<0.001
S.LDL	106.95 ± 20.37	91.77 ± 11.05	<0.001
Total Cholesterol	165.47 ± 27.52	159.81 ± 12.67	0.128
FBS	102.31 ± 18	88.96 ± 13.68	<0.001
Diastolic Blood Pressure	97.47 ± 20.79	88.21 ± 19.83	0.017
Systolic Blood Pressure	112.58 ± 19.77	105.73 ± 21.79	0.087

Of those age groups between 18-25 Years, 12 (25%) had metabolic syndrome, and those aged between 26-30 Years, 18 (36%) had metabolic syndrome. For those age groups between 31-35 Years, 15 (68.18%) had metabolic syndrome. The difference in age group proportion between study groups was statistically significant (p-value 0.002).

Of those who had menstrual Symptoms, 32 (31.68%) had metabolic syndrome, and those who did not have menstrual Symptoms, 13 (68.42%) had metabolic syndrome. The difference in the proportion of menstrual Symptoms between study groups was statistically significant (p-value 0.002).

Of those with acanthosis, 14 (82.35%) had metabolic syndrome. Of those who did not have acanthosis, 31 (30.1%) had metabolic syndrome. The difference in the proportion of acanthosis between study groups was statistically significant (p-value <0.001).

Of those with hirsutism, 13 (59.09%) had metabolic syndrome. Of those who did not have hirsutism, 32 (32.65%) had metabolic syndrome. The difference in the proportion of hirsutism between the study group was statistically significant (p-value <0.021). [Table 2]

The difference in mean height between the study group was not statistically significant (p-value 0.925). The difference in mean weight, height, and weight circumference between the study group was statistically significant (p-value <0.001).

The difference in mean of S.TGL, S.HDL, and S.LDL between the study group was statistically significant (p-value <0.001). The difference in mean total cholesterol between study groups was not statistically significant (p-value 0.128).

The mean SBP between study groups was statistically insignificant (p-value 0.087). The difference in mean FBS and DBP between the study group was statistically significant (p-value <0.05).

DISCUSSION

Polycystic Ovarian Syndrome (PCOS) is a multifactorial, polygenic and multisystem endocrine disorder affecting women of reproductive age. Our study assessed the prevalence and pattern of metabolic syndrome components in women with polycystic ovarian syndrome.

Our Present study shows that 37.5% of women with metabolic syndrome had PCOS. This is closely related to the 33.4% and 47.3% prevalence observations by Ehrmann et al,[9] and Dokras et al,[10] respectively. Apridonidze et al,[11] found a 43 percent prevalence rate in a study of 106 women with PCOS. They also demonstrated that the majority of PCOS women present clinically. Glueck et al,[12] reported a 46% incidence of metabolic syndrome in 138 women with confirmed PCOS.

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In our study, 31 years and above age group has 68.2% metabolic syndrome. The age-adjusted prevalence of MBS has shown that women between 25-35 years have the highest MBS prevalence (54%).[13,14] Studies by Dey et al,[15] also show a high prevalence of 71.5% in the same age group.

In our study population, the mean FBS for those with metabolic syndrome was 102.31 ± 18, the mean DBP was 97.47 ± 20.79, and the mean SBP was 112.58 ± 19.77. The difference in mean SBP between study groups was not statistically significant (p-value 0.087). The mean FBS and DBP difference between study groups was statistically significant (p-value <0.05).

Indu et al,[14] found that, with a significant p-value of 0.04, there was an association between USG findings and PCOS. This suggests that USG can be a helpful modality in diagnosing PCOS. 31.6% had a high SBP of > 130mm of Hg, while 37.3% had a high DBP of > 85mm of Hg and a 100% significant association of high BP with PCOS. 87.8% of the cases had a fasting level of more than 110, which shows a significant association between fasting blood sugar level and metabolic syndrome (p-value<0.001).

In our study population, those who had metabolic syndrome, the mean S.TGL was 123.71 ± 26.12, the mean S.HDL was 45.84 ± 5.71, the mean S.LDL was 106.95 ± 20.37, the mean total cholesterol was 165.47 ± 27.52. The difference in mean of S.TGL, S.HDL, and S.LDL between the study group was statistically significant (p-value<0.001). The difference in the mean of total cholesterol between study groups was not statistically significant. (p-value=0.128). Indu et al,[14] revealed that 84.8% of the cases had HDL<50, whereas 76.6% had HDL>50 in control, which shows a significant association between HDL and metabolic syndrome (p<0.0001). Bharatbha et al,[16] have also found similar positive associations with a low HDL (<50 mg/dL) being seen in 91.7 % of cases studied.

In our study, for those who had metabolic syndrome, the mean height was 154.56 ± 3.19, the mean weight was 76.2 ± 13.46, the mean BMI was 31.96 ± 5.66, the mean waist circumference was 97.02 ± 9.48. The difference in mean weight, height, and weight circumference between the study group was statistically significant. (p-value<0.001). The difference in mean height between study groups was not statistically significant (p-value 0.925). A similar study was found by Essah et al,[17] that among their cohort of 394 women with PCOS, women in the highest quartile for BMI had a 14-fold increased chance of having Metabolic Syndrome.

CONCLUSION

In the current study, the prevalence of metabolic syndrome was 37.5 percent, accounting for over one-third of the women diagnosed with PCOS. This implies that it is mandatory to screen all women with PCOS for features of metabolic syndrome. According to our findings, age above 30 years and central obesity (waist–hip ratio >0.85) were identified as risk factors for metabolic syndrome. There is an association between PCOS and high blood pressure, HDL levels, elevated FBS, TGL, and consistent USG findings. These findings can be used to develop a screening policy for metabolic syndrome, particularly in low-resource settings in developing countries.

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