Prevalence of metabolic syndrome among reproductive aged women with polycystic ovarian syndrome

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Abstract

Background: Polycystic ovarian syndrome (PCOS) is thought to be the most common endocrine disorder found in women. There is a considerable overlap between many of anthropometric and metabolic abnormalities in PCOS and the features of metabolic syndrome (MetS) that is a collection of cardiovascular risk factors including high blood pressure, central obesity, elevated fasting plasma glucose concentrations, and low levels of high-density lipoprotein (HDL) cholesterol. In present study, we aimed to study prevalence of metabolic syndrome among reproductive aged women with polycystic ovarian syndrome at our tertiary hospital. **Material and Methods:** Present study was a prospective, observational study conducted in cases diagnosed with PCOS, of age between 15 to 40 years. **Results:** In present study, 130 females of reproductive age, diagnosed with PCOS were studied. In present study, prevalence of metabolic syndrome was 16.15%. Most common age group in PCOS patients as well as in metabolic syndrome was 26-30 years. On ultrasound examination 83.08 % patients had features of polycystic ovaries. In present study, waist circumference ($\leq$ 88 cms) was noted in 22.31 %, systolic blood pressure ($\geq$ 130/85 mmHg) was noted in 12.31 % cases, fasting blood sugar level ($\leq$ 110 mg/dl) was noted in 20 % cases, HDL-C (< 50 mg/dl) was noted in 14.62 % cases and triglycerides ($\geq$ 150 mg/dl) was noted in 21.54 % cases. We noted a significant difference in values of Waist Circumference (cms), Fasting blood sugar level (mg/dl), HDL-C (mg/dl) and Triglycerides (mg/dl) between patients of metabolic syndrome and no metabolic syndrome. **Conclusion:** In present study, prevalence of metabolic syndrome was 38.4%. A significant association between waist circumference (> 88 cm), impaired fasting serum glucose, elevated fasting serum triglycerides and fasting high-density lipoprotein (HDL) was noted in patients of metabolic syndrome.
Keywords: Polycystic ovary syndrome, Metabolic syndrome, Dyslipidemia, Fasting blood glucose

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INTRODUCTION

Polycystic ovarian syndrome (PCOS) is thought to be the most common endocrine disorder found in women.[1] Common symptoms include irregular menstrual cycle, polycystic ovaries, hirsutism and clinical features may include infertility, insulin-resistance, impaired glucose tolerance (Type 2 Diabetes), and dyslipidemia. PCOS is characterized by chronic anovulation, oligomenorrhea or amenorrhea, hyperandrogenism and polycystic ovary morphology on pelvic ultrasound.[2] PCOS subjects are often accompanied by obesity, insulin resistance, abnormal glucose metabolism, lipid disorder, hypertension, and other risk factors of cardiovascular disease.[3] 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.[4,5]

There is a considerable overlap between many of anthropometric and metabolic abnormalities in PCOS and the features of metabolic syndrome (MetS) that is a collection of cardiovascular risk factors including high blood pressure, central obesity, elevated fasting plasma glucose concentrations, and low levels of high-density lipoprotein (HDL) cholesterol.[6] In present study, we aimed to study prevalence of metabolic syndrome among reproductive aged women with polycystic ovarian syndrome at our tertiary hospital.

MATERIAL AND METHODS

Present study was a prospective, observational study conducted in Bhaarath Medical College and Hospital, Selaiyur. Study period was of 1 year (from October 2019 to September 2020). Study approval was obtained from institutional ethical committee.

Inclusion criteria

Age between 15 to 40 years, diagnosed with PCOS[7], willing to participate in the study
Patients are diagnosed to have PCOS according following criteria (2 out of 3 must be present)[7]
   A. Oligo-ovulation or anovulation.
   B. Clinical or biochemical signs of hyperandrogenism
   C. Polycystic appearance (presence of 25 follicles of 2–9 mm on cycle 2/3 diagnosed on transvaginal ultrasound in one/both ovaries using 8 MHz probe/or ovarian volume >10 mm^3) on ultrasonography in at least one ovary and exclusion of other etiologies(congenital adrenal hyperplasia, androgen-secreting tumours, Cushing's syndrome.

Exclusion Criteria

1. Women receiving steroid drug, oral contraceptive pills intake in the preceding 3 months
2. Pregnant women
3. Women already diagnosed with diabetes, hyperprolactinemia, hypothyroidism, Cushing's syndrome, congenital adrenal hyperplasia.

Study was explained to subjects in local language and written consent was taken. A complete clinical history including family history was obtained. Oligomenorrhea was defined as an intermenstrual interval of >35 days and <8 menstrual bleeds in a year. Secondary amenorrhea was defined as absent menstrual bleeding over a period of 90 days. Assessment of hirsutism was done according to the modified Ferriman–Gallwey (mFG) score. Clinical hyperandrogenism was diagnosed with an mFG score >8. Anthropometric measurements, including weight, height, waist circumference (WC) (measured in the horizontal plane midway between the lowest ribs and the iliac crest), body mass index (BMI), systolic blood pressure (SBP), and diastolic BP (DBP), were noted. Blood collection was done after a fasting of 8–10 h for analysis of lipid profile and oral glucose tolerance test. Lipid profile was estimated by using enzymatic colorimetric technique. Metabolic syndrome was diagnosed according to National Cholesterol Education Program [NCEP] Adult Treatment Panel [ATP] III guidelines (3 or more criteria must be present)[8]

1. Waist circumference of >88 cm or >35 inches
2. Fasting plasma glucose of ≥100 mg/dl or 6.1 mmol /l
3. Blood pressure ≥130/85 mm Hg
4. Fasting Triglycerides ≥150 mg/dl or 1.7 mmol/l
5. High Density Lipoprotein [HDL-C] <50 mg/dl or <1.3 mmol/l

Study of the metabolic, clinical, and anthropometric profiles of women with PCOS was done. Findings were entered in Microsoft excel and statistical analysis was done using SPSS version 24. Continuous variables were documented as mean with standard deviation and analyzed using sample t-test. Categorical variables were expressed as proportions and analyzed by Chi-square test.

RESULTS

In present study, 130 females of reproductive age, diagnosed with PCOS were studied. In present study, prevalence of metabolic syndrome was 16.15%. Most common age group in PCOS patients as well as in metabolic syndrome was 26-30 years. On ultrasound examination 83.08 % patients had features of polycystic ovaries.

Table 1: General characteristics

Parameter	Number of Patients (n=130)	Percentage	Patients of Metabolic syndrome (n=21)	Percentage
Metabolic syndrome	21	16.15		
Age (years)				
15-25	19	14.62	2	9.52
26-30	47	36.15	11	52.38
31-35	40	30.77	6	28.57
36-40	24	18.46	2	9.52
USG Findings				
Bilateral PCOS	108	83.08	19	90.48
Normal	22	16.92	2	9.52

In present study, waist circumference (≤ 88 cms) was noted in 22.31 %, systolic blood pressure (≥ 130/85 mmHg) was noted in 12.31 % cases, fasting blood sugar level (≤ 110 mg/dl) was noted in 20 % cases, HDL-C (< 50 mg/dl) was noted in 14.62 % cases and triglycerides (≥ 150 mg/dl) was noted in 21.54 % cases.

Table 2: Distribution of anthropological, clinical and biochemical variables

Variable	Number of Patients (Percentage)	Mean ± SD
Waist Circumference (cms)		84.81 ± 5.42
≤ 88	29 (22.31 %)	
>88	101 (77.69 %)	
Systolic blood pressure (mmHg)		119.24 ± 12.88
≥ 130/85	16 (12.31 %)	
<130/85	114 (87.69 %)	
Diastolic blood pressure (mmHg)		71.63 ± 8.48
Fasting blood sugar level (mg/dl)		102.88 ± 11.92
≤ 110	26 (20 %)	
> 110	104 (80 %)	
Total Cholesterol		167.26 ± 35.43
HDL-C (mg/dl)		46.12±12
< 50	19 (14.62 %)	
≥ 50	111 (85.38 %)	
Triglycerides (mg/dl)		123.54 ± 42.59
≤ 150	28 (21.54 %)	
> 150	102 (78.46 %)	
LDL (mg/dl)		105.83±32.06

We noted a significant difference in values of Waist Circumference (cms), Fasting blood sugar level (mg/dl), HDL-C (mg/dl) and Triglycerides (mg/dl) between patients of metabolic syndrome and no metabolic syndrome. While values of SBP (mmHg), DBP (mmHg), Total Cholesterol and LDL (mg/dl) were comparable in patients of metabolic syndrome and no metabolic syndrome.

Table 3: comparison of anthropological, clinical and biochemical variables

Variable	Mean ± SD		P value
	No metabolic syndrome	Metabolic syndrome	
Waist Circumference (cms)	83.18 ± 6.12	91.28 ± 3.84	<0.001
SBP (mmHg)	116.32 ± 14.22	121.24 ± 12.12	0.42
DBP (mmHg)	68.26 ± 8.48	70.62 ± 6.34	0.64
Fasting blood sugar level (mg/dl)	92.12 ± 14.26	118.2 ± 12.66	<0.001
Total Cholesterol	166.16 ± 30.24	171.26 ± 32.86	0.066
HDL-C (mg/dl)	56.28 ± 10.28	44.82 ± 8.48	<0.001
Triglycerides (mg/dl)	109.34 ± 32.18	138.24 ± 40.22	<0.001
LDL (mg/dl)	115.28 ± 30.06	108.32 ± 34.20	0.076

DISCUSSION

PCOS is a multisystem endocrinopathy in women of reproductive age with the ovarian expression of various metabolic disturbances and a wide spectrum of clinical features such as infertility, obesity, menstrual abnormalities, and hyperandrogenism.[9] The major features of the metabolic syndrome include central obesity, hypertriglyceridemia, low levels of high-density lipoprotein (HDL) cholesterol, hyperglycemia and hypertension.[10] While India has one of the highest prevalence of MetS, background rates vary according to the degree of urbanization, region, socioeconomic and dietary factors. In a cross-sectional study from Tamil Nadu noted prevalence of 18 % of PCOS[11] and proportion of PCOS was higher in urban women in comparison to the rural women. A similar study conducted in Mumbai,

prevalence of PCOS was 22.5 %[12]. The prevalence of MetS in the Indian PCOS populations is reported to be 37.5%, with central obesity as one of its significant predictors.[13] In a study by N. Prema, 146 women aged 15 to 40 years diagnosed with PCOS, prevalence of metabolic syndrome was 38.4%. The occurrence of metabolic syndrome was more in the age group 26 to 35 years (62.33%).[14] Jeengar P[15] studied 50 women with features of PCOS compared with 50 women having normal pelvic study. 58% of PCOS women met criteria of metabolic syndrome as compared to 36% patients of control group. Waist circumference, systolic and diastolic blood pressures, fasting glucose had a significantly higher value among those with PCOS in comparison to those without the PCOS. Bommireddy P[16], noted overall prevalence of metabolic syndrome among all PCOS women was 37.6%. The prevalence of MetS is only

2.6% in normal weight PCOS women when compared to 95.7% in obese PCOS women. Among the PCOS people with waist circumference up to 80cm, only 3.8% people had metabolic syndrome and among people waist circumference more than 80.1 cm, 62.1% people had metabolic syndrome. Thus obese PCOS women are at more risk of developing MetS than nonobese PCOS women. Meghnatreesa A *et al.*,[17] studied 250 women in reproductive age group, diagnosed as PCOS. The prevalence of individual components of MetS was: waist circumference >80 cm in 58%, high-density lipoprotein (HDL)-cholesterol level <50 mg/dL in 34.40%, fasting glucose concentrations of 100 mg/dL in 34.4%, triglyceride level >150 mg/dL in 12.8%, and blood pressure ≥130/85 mmHg in 3.6%. Prevalence of MetS was 37.6%. Also prevalence of MetS among PCOS patients increased gradually from 30.2% at age <25 years to 51.5% at age >30 years. The prevalence of MetS increases as body mass index increases in the PCOS population, i.e., 2.6%, 37%, and 95.7% for normal, overweight, and obese women, respectively. There was statistically significant difference between MetS and waist circumference, serum triglycerides, serum HDL, fasting blood sugar, systolic blood pressure, and diastolic blood pressure. Early diagnosis and treatment can help control the symptoms and prevent long-term problems. There is no cure for PCOS, but controlling it lowers risks of infertility, miscarriages, diabetes, heart disease, and uterine cancer. Behaviour and life style modifications are important part of treatment for PCOS. Medical nutrition therapy (MNT) can help women with PCOS make and maintain the lifestyle changes needed to help reduce symptoms and prevent complications. Almost all the approaches that are commonly employed to correct insulin homeostasis in MS and obese patients, such as lifestyle modification for weight reduction, bariatric surgery, thiazolidinediones and metformin have beneficial effects on ovulation and also control hyperandrogenemia in PCOS women.[18]

CONCLUSION

In present study, prevalence of metabolic syndrome was 38.4%. A significant association between waist circumference (> 88 cm), impaired fasting serum glucose, elevated fasting serum triglycerides and fasting high-density lipoprotein (HDL) was noted in patients of metabolic syndrome.

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