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Comparison of Prevalence of Metabolic Syndrome in Obese PCOS Women with Nonobese Pcos Women

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Abstract: ***Objectives: The aim of this study is to compare the prevalence of metabolic syndrome in obese PCOSwomen with nonobese PCOS women. Place of Study: Gynaecology OPD, Sree Balaji medical college and hospital, Chromepet, Chennai. Period of Study: august 2016 to february 2018(18 months). Study Design: Prospective study. Materials and Methods: All reproductive age group women coming to gynaecology out-patient clinic with menstrual irregularities or androgenic features or infertility or obesity are screened for PCOS using Rotterdam criteria. Two hundred and fifty women in reproductive age group, diagnosed as PCOS using rotterdam criteria, are included in the study, after explaining the nature of the study and obtaining informed consent for participating in the study. They are classified into different BMI categories using WHO classification of obesity and then they are subjected to the new IDF criteria for diagnosis of metabolic syndrome. Then the prevalence of MetS is compared between obese PCOS women and nonobese PCOS women. IBM SPSS statistical software version 21 was used for data analysis. P value < 0.05 was considered as statistically significant. Results: In our study the overall prevalence of metabolic syndrome among all PCOS women is 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, only4 (3.8%) people had metabolic syndrome and among people waist circumference more than 80.1 cm, 90 (62.1%) people had metabolic syndrome. Conclusion: In modern era of economically growing world, there is a rising trend of PCOS and increased practice of sedentary behaviour and lack of physical activity. PCOS per se has evolved as a risk factor for MetS, the overall prevalence of MetS in this study being 37.6%. In our study the prevalence of MetS is only 2.6% in normal weight PCOS women when compared to 95.7% in obese PCOS women. Thus it can be concluded that obese PCOS women are at more risk of developing MetS than nonobese PCOS women. So, it creates an important issue when dealing with PCOS patients, especially obese PCOS patients and it is a treating doctor's duty to take it as an opportunity to screen for metabolic syndrome and advice on healthy diet, physical activity, weight reduction.***

1. Introduction

Polycystic ovarian syndrome (PCOS) is one of the most common endocrine disorders in women of reproductive age, affecting 5% to 10% of women worldwide[1]. 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 like infertility, obesity, menstrual abnormalities and hyperandrogenism[2]. The diverse manifestations of PCOS start at an early age when a girl is maturing into a young woman.

Metabolic syndrome(MetS) is another cluster of endocrine disturbances including insulin resistance, dyslipidemia, obesity, and hypertension. The term 'Metabolic Syndrome' (syndrome X, insulin resistance syndrome) is widely used in clinical practice and research. It consists of a constellation of multiple interrelated risk factors of metabolic origin, which arises due to underlying insulin resistance. This in turn promotes the development of atherosclerotic cardiovascular vascular disease. The major features of the metabolic syndrome include central obesity, hypertriglyceridemia, low levels of high-density lipoprotein (HDL) cholesterol, hyperglycemia and hypertension.[1]

There are various emerging definitions for metabolic syndrome. According to the modified American Heart Association/National Heart Lung Blood Institute AHA/NHLBI (ATP III 2005) definition is (3 out of 5 must be present)

1) Waist circumference ≥80 cm in Asian women
2) Blood pressure of ≥130/85mmHg
3) Fasting blood sugar of ≥100 mg/dl
4) Triglycerides of ≥150mg/dl
5) HDL of ≤50 mg/dl

The International Diabetes Federation (IDF) has introduced a new definition, combining both clinical and research needs with a slight modification in the ATP-III definition in 2005 where presence of abdominal obesity was considered mandatory for Metabolic Syndrome diagnosis.

MetS is associated with a two-fold increased risk of cardiovascular disease and a five fold increased risk of type 2 diabetes mellitus when compared to people without the syndrome.

Prevalence of obesity and diabetes mellitus is India is also on the rise owing to urbanization and change in lifestyle. The prevalence of metabolic syndrome in South Asians varies with region, extent of urbanization, lifestyle patterns, and socioeconomic and cultural factors. Recent data shows that about one-third of the urban population in large cities in India have the metabolic syndrome.

PCOS is one of the major risk factor for metabolic syndrome. Since insulin resistance has its metabolic effect both on adolescent and adults, PCOS forms a key for search of metabolic syndrome.[1]PCOS being a sedentary life style and obesity related disorder and obesity, sedentary life style, PCOS being major risk factors for MetS, obese women with PCOS falls into further high risk group to develop metabolic syndrome.

Hence, the purpose of doing this study is to find out the prevalence of metabolic syndrome using the International Diabetes Federation (IDF) criteria in obese women with PCOS and nonobese women with PCOS presenting in our

hospital, so that appropriate life style modifications, pharmacological and non pharmacological intervention would help in combating and preventing the major deadly cardiovascular disease, stroke etc. Due to higher risk of metabolic syndrome in our ethnic population more stringent criteria of metabolic syndrome defined by the IDF is used in this study.

2. Materials and Methods

A prospective study was planned on women with PCOS. All reproductive age group women coming to gyanaecology out-patient clinic with menstrual irregularities or androgenic features or infertility or obesity are screened for PCOS using Rotterdam criteria. Diagnostic criteria for PCOS according to Rotterdams ESHRE/ASRM- sponsored PCOS Consensus Workshop Group 2003 (2 out of 3 must be present)[1]

a) Oligoovulation or anovulation
b) Clinical or biochemical signs of hyperandrogenism
c) Polycystic appearance on ultrasonography in atleast one ovary and exclusion of other etiologies (congenital adrenal hyperplasia, androgen-secreting tumours, Cushing's syndrome.)

Two hundred and fifty women in reproductive age group, diagnosed as PCOS using rotterdam criteria, who satisfy my inclusion criteria were included in the study, after explaining the nature of the study and obtaining informed consent for participating in the study. They are classified into different BMI categories using WHO classification of obesity-

	BMI (KG/M2)
Under Weight	< 18.5
Normal Weight	18.5 – 24.9
Over Weight	25 – 29.9
Obese Class I	30 – 34.9
Obese Class II	35 – 39.9
Obese Class III	>40

All PCOS women are subjected to the new IDF criteria for diagnosis of metabolic syndrome. **The New International Diabetes Federation (IDF) definition :** According to the new IDF definition, for a person to be defined as having the metabolic syndrome they must have: Central obesity (defined as waist circumference with ethnicity specific values,≥80 cm for south asian women) plus any two of the following four factors:

Raised Triglycerides	≥150 mg/dL (1.7mmol/L) Or specific treatment for this lipid abnormality
Reduced HDL Cholesterol	< 40 mg/dL (1.03 mmol/L) in males < 50 mg/dL 91.29 mmol/L) in females Or specific treatment for this lipid abnormality
Raised blood Pressure	Systolic BP ≥130 mg/dL or diastolic BP ≥85 mm Hg or treatment of previously diagnosed hypertension
Raised fasting Plasma glucose	(FPG) ≥100 mg/dL (5.6 mmol/L) Or previously diagnosed typed 2 diabetes If above 5.6 mmol/L or 100 mg/dL, OGTT is strongly recommended but is not necessary to define presence of the syndrome,

* If BMI is > 30 kg/m2, Central obesity can be assumed and waist circumference does not need to be measured."

Method of Examination

During clinical examination, height was recorded to the nearest 0.5 cm and weight was taken on a platform type machine, the accuracy of which was checked each time before weighing. The weight was recorded in kg with the female wearing minimal garments and body mass index (BMI-kg/m^2) was calculated in each case form height and weight measurements.

The waist circumference was taken with a 1 cm wide inch tape measure in a horizontal plane, midway between the inferior margin of the ribs and the superior border of the iliac crest.

A single reading of blood pressure was measured using a standard sphygmomanometer after appropriate period of rest, in sitting position.

Fasting blood sample of about 6 ml was obtained from the patient for estimation of fasting plasma glucose, high density lipoprotein cholesterol(HDL-c) and triglycerides levels. Plasma glucose was measured by hexokinase/glucose oxidase peroxidase method. HDL-C and triglyceride levels were measured by enzymatic colorimetric method.

Chi square test/ Fisher's exact test was used to test statistical significance. Quantitative variables were compared between people with and without metabolic syndrome by independent sample t-test. IBM SPSS statistical software version 21 was used for data analysis. P value < 0.05 was considered as statistically significant.

3. Results

A total of 250 PCOS women are included in the final analysis.The mean of Height was 154.48 ± 3.42. The mean of weight was 64.44 ± 13.97 The mean of BMI was 26.95 ± 5.7 Minimum level was 20.and maximum level was 40.83 in the study population. (95% CI 26.24 to 27.66)**.** The mean of Waist circumference was 87.67 ± 11.17 Minimum level was 69.and maximum level was 118 in the study population. (95% CI 86.28 to 89.06)**.** (Table1) Among the study population 76(30.40%) people had normal weight, 27(10.80%) people were overweight, 94(37.60%) people had pre obesity, 46(18.40%) people had obesity and 7(2.80%) people had morbid obesity. (Table2)

Table 1: Descriptive analysis of anthropometric parameters in study population (N=250)

Parameter	Mean ± SD	Median	Min	Max	95% C.I	
					Lower	Upper
Height in cm	154.48 ± 3.42	155.00	143.00	164.00	154.05	154.91
Weight in kg	64.44 ± 13.97	62.00	45.00	98.00	62.70	66.18
BMI	26.95 ± 5.7	25.55	20.00	40.83	26.24	27.66
Waist circumference	87.67 ± 11.17	86.50	69.00	118.00	86.28	89.06

Table 2: Descriptive analysis of BMI categories in the study population (N=250)

BMI categories	Frequency	Percentages
18.5-22.9(normal)	76	30.40%
23- 24.9(overweight)	27	10.80%
25- 29.9(pre obesity)	94	37.60%
30-39.9(obesity)	46	18.40%
40 and above(morbid obesity)	7	2.80%

The prevalence for individual components of MetS were waist circumference >80 cm in 58%, high-density lipoprotein 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 mm Hg in 3.6%, as shown in Table 3. Three or more of these individual criteria were present in 94 (37.6%) of the patients ie., we found a prevalence of metabolic syndrome of 37.6%, which constitutes more than a third of the PCOS women, as shown in Table 4.

Table 3: Descriptive analysis of diagnostic parameters in the study population (N=250), according to new IDF criteria for diagnosis of MetS

Parameter	Frequency	Percentage
WC category		
Up to 80cm	105	42.00%
80.1 cm and above	145	58.00%
BMI		
Up to 30	198	79.20%
30.1 and above	52	20.80%
TGL category		
Up to 150 mg/dl	218	87.2%
150.1 mg/dl and above	32	12.80%
FBS category		
Up to 100 mg/dl	164	65.60%
More than 100.1 mg/dl	86	34.40%
HDL category		
Up to 49.9 mg/dl	86	34.40%
50 mg/dl and above	164	65.60%
DBP category		
Up to 85 mmHg	129	51.6%
86 mmHg and above	121	48.4%
SBP category		
Up to 130mmHg	241	96.40%
131 mmHg and more	9	3.6%

Table 4: Descriptive analysis of metabolic syndrome in the study population (N=250)

Metabolic syndrome	Frequency	Percentages
Metabolic syndrome	94	37.60%
No metabolic syndrome	156	62.40%

The prevalence of metabolic syndrome increases as BMI increases in the PCOS population. Though the prevalence is not much different between overweight(23-24.9) and pre-obese(25-29.9%), there is 95.7% prevalence is obese PCOS(30-39.9) and 85.7% prevalence is morbidly obese PCOS(40 and above), with P value 0.001 making it statistically significant, as shown in Table5.

Among the people with waist circumference up to 80cm, 4 (3.8%) people had metabolic syndrome and among people waist circumference more than 80.1 cm, 90 (62.1%) people had metabolic syndrome. The difference between WC category and metabolic syndrome was statistically significant. (P value <0.001), as shown in Table 6.

Table 5: Comparison of metabolic syndrome with BMI distribution (N=250)

BMI distribution	Metabolic syndrome				Chi square	P-value
	Yes		No			
	Frequency	Percentage	Frequency	Percentage		
Normal weight(N=76)	2	2.6%	74	97.4%	113.0	<0.001
Over weight(N=27)	10	37%	17	63%		
Pre obese (N=94)	32	34%	62	66%		
Obese (N=46)	44	95.7%	2	4.3%		
Morbid obese (N=7)	6	85.7%	1	14.3%		

Table 6: Comparison of metabolic syndrome with WC category (N= 250)

WC category	Metabolic syndrome				Chi square	P-value
	Yes		No			
	Frequency	Percentage	Frequency	Percentage		
Up to 80cm (N=105)	4	3.8%	101	96.2%	88.10	<0.001
80.1 cm and above (N=145)	90	62.1%	55	37.9%		

4. Discussion

The prevalence of MetS among PCOS patients was higher in our study when compared with other Asian studies like studies performed in Thailand by Weerakiat et al. in 2007, Pantasri et al. in 2010,and in Iran by Ashraf Moini et al. in 2012 which revealed that the prevalence was 35.3%, 24.3%, 22.7%[4,5,6] respectively. The possible explanation for this is that the mean BMI and WC in our study was higher compared to the other studies. Similar findings were observed in some Indian studies conducted in Mangalore and in vellore in which MetS was identified in 53.3%[7] and 37.5%[3] of PCOS patients respectively.

The mean weight of PCOS patients with MetS in our study was 82.7kg ±11.9 SD. Obesity has been implicated in the pathophysiology of MetS due to its association withhypertension, hyperglycemia and dyslipidemia. Dokras et al. highlighted the factors which determine the increased risk for MetS in PCOS patients. He stated that obesity could increase the probability that PCOS patients would exhibit MetS.[8] A more recentstudy revealed that prevalence of MS among PCOS increased from 0% in women with BMI <23kg/m² to 54.5% in those with BMI ≥30kg/m².

Based on the clinical profile, most of the PCOS in the current study were overweight or obese, and those with MetS had greater mean for BMI. The same trend was observed in the other parameters such as blood pressure and waist circumference. PCOS patients with MetS have pre-hypertension range of blood pressure which put them at more risk of developing the CVD and cerebrovascular disease. Different studies revealed that prevalence of MS among PCOS increased with increasing BMI.[3,6,7](Table 7)

Table 7: Comparison between Prevalence of MetS in PCOS women with BMI ≤ 24.9 and BMI ≥ 30 among different Studies

Name of the Study	Prevalence of MetS in PCOS Women With BMI ≤ 24.9	Prevalence of MetS in PCOS Women With BMI ≥ 30
Kavita M et al.	15.7%	60%
Ashraf Moni et al.	5.5%	41.5%
Jisha Varghese et al.	36.4%	69.2%
Deepika et al.	34.8%	95%
Our study	39.6%	95.7%

5. Conclusion

In modern era of economically growing world, there is a rising trend of PCOS and increased practice of sedentary behaviour and lack of physical activity. PCOS per se has evolved as a risk factor for MetS, the overall prevalence of MetS in this study being 37.6%. In our study the prevalence of MetS is only 2.6% in normal weight PCOS women when compared to 95.7% in obese PCOS women. Thus it can be concluded that obese PCOS women are at more risk of developing MetS than nonobese PCOS women. So, it creates an important issue when dealing with PCOS patients, especially obese PCOS patients and it is a treating doctor's duty to take it as an opportunity to screen for metabolic syndrome and advice on healthy diet, physical activity, weight reduction.

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