

## Study of Lipid Profile in Obese and Lean Women with Polycystic Ovarian Syndrome in a Tertiary Hospital of Northeast India

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Conflict of interest: Nil

### Abstract:

**Introduction:** PCOS is a one of the most common endocrine disorders in women of reproductive age group. It affects 5%-10% women worldwide. In India, prevalence of PCOS is around 3.7% to 22.5%. PCOS has 2 phenotypes- the obese and the lean, the latter being a much less common presentation of the disease. Both these groups present with visceral adiposity hence, they have deranged metabolic profile.

**Aim and Objective:** To compare the lipid profile of obese and lean women with polycystic ovary syndrome (PCOS).

**Method:** It is a hospital-based comparative cross-sectional study of 60 PCOS women (30 in obese group and 30 in lean group) in the age group of 18-40 years in Department of Obstetrics and Gynaecology, at a tertiary hospital of NE, India. PCOS women were selected according to Revised Rotterdam Criteria (2003).

**Results:** The mean Total cholesterol, LDL cholesterol was higher in the obese group. Whereas, the mean HDL cholesterol was higher in the lean group. The difference in triglyceride in both the group was not statistically significant.

**Conclusion:** Obese PCOS is said to have a more atherogenic lipoprotein pattern but we cannot rule out the fact that even lean PCOS women have deranged lipid profile compared to normal control. PCOS patients have a more atherogenic lipid profile which is related to obesity, but lean PCOS patients should also be screened as there are differences of lipid profile from non PCOS women.

**Keywords:** Polycystic ovarian syndrome (PCOS), Revised Rotterdam Criteria, Obese PCOS, Lean PCOS.

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### Introduction

Polycystic ovarian syndrome is a commonly prevalent endocrinological disease condition which is responsible for infertility and pregnancy related abnormalities in women of reproductive age group. [1] Prevalence of PCOS worldwide is around 5%-10%. [2] In India, prevalence is around 3.7% to 22.5%. [3]

Currently PCOS is defined by Revised Rotterdam criteria (2003) [4] according to which any two of the following are sufficient to make the diagnosis of PCOS

1. Biochemical or clinical hyperandrogenism,
2. Ultrasonographic appearance of polycystic ovarian with exclusion of other relevant disorders.
3. Evidence of oligo-anovulation

Presently the sonographic definition of PCOS requires the presence of twenty and more follicles measuring about 2-9 mm in diameter in either of the ovary, and or increased in ovarian volume (>10

cm<sup>3</sup>). Even a single ovary meeting these criteria is sufficient enough to affix the PCOS diagnosis. [5]

PCOS is a heterogeneous endocrinopathy that exhibits problems related to both metabolism and reproduction. The aberrant feedback process by ovarian oestrogen and the hypothalamus pituitary ovarian axis are known to be linked to it. This result in an increase ratio of LH to FSH release, elevated serum levels of LH, and elevated serum testosterone. [6]

Many of the PCOS women experience abnormalities in their lipid and glucose metabolism, which may indicate a systemic inflammatory response. [7] Both peripheral gynoid obesity and central android obesity target metabolically significant organs including the liver and visceral fat and are linked to differential HPA regulation. [8]

PCOS women have a high waist to hip ratio because of increase tendency of dyslipidemia. The centrally placed adipocytes directly influence the blood lipid.

It has been found that the adipokines are responsible for the inflammation in PCOS because centrally distributed adipose tissue has the ability to produce a variety of adipokines into the bloodstream to exacerbate inflammation. [9,10] Also high levels of free fatty acids (FFAs) in blood are more commonly seen in obese PCOS patients. [11]

**Methodology**

This was a hospital-based comparative cross-sectional study at Department of Obstetrics and Gynaecology, at a Tertiary hospital of NE, India between June, 2023 to April, 2024. Patients who attended Gynaecology OPD between 18-40 years of age diagnosed to have PCOS according to Revised Rotterdam’s criteria were included in the study after obtaining a written informed consent.

Patients known to have premature ovarian failure, congenital adrenal hyperplasia, androgen-secreting tumor; Cushing’s syndrome, uterine disorders (e.g., Asherman’s syndrome, Mullerian agenesis) and chromosomal anomalies were excluded from the study. Patients who have received any medication known to affect carbohydrate metabolism for at least 3 months or women taking oral contraceptive pills. Also, pregnant and lactating women and women known to have hyperprolactinemia, hyperandrogenism due to some other causes were excluded from the study. Women who had had ovarian cysts or ovarian tumors as determined by ultrasound examination were also excluded. These PCOS women were then further divided into two groups: one who was lean and others who were overweight and obese based on the Asian criteria. Group A includes lean

PCOS-Patients with BMI<23 kg/m<sup>2</sup>; Group B includes obese and overweight women with PCOS-Patients with BMI ≥23 kg/m<sup>2</sup>. Overnight 8-10 hours fasting blood specimens were obtained from all participants for measurement lipid profile and compared for both the groups. Lipid profile including total cholesterol (TC), high-density lipoprotein (HDL), low density lipoprotein (LDL), and triglyceride (TG) was checked. Pelvic ultrasonography for unmarried women and transvaginal ultrasonography for married women was also performed

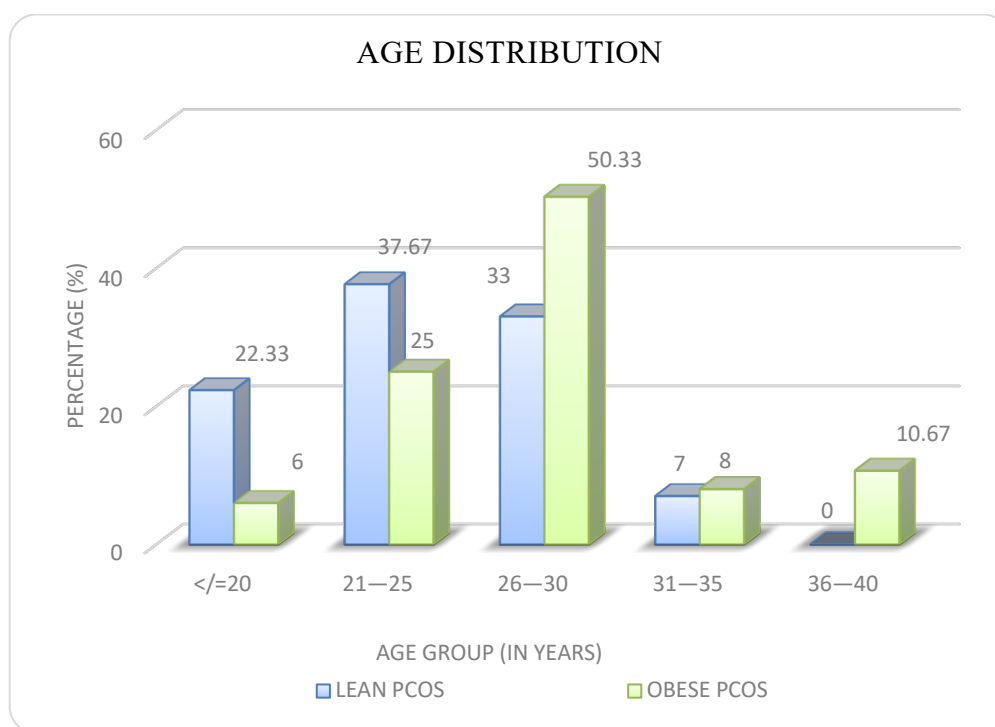
**Statistical Methods**

The statistical analysis of data was performed using the computer program, Statistical Package for Social Sciences (SPSS for Windows, version 20.0. Chicago, SPSS Inc.) And Microsoft Excel 2010. Results on continuous measurements were presented as mean ± standard deviation were compared using student t test. Discrete data were expressed as number (%) and were analyzed using Chi square test and Fischer’s exact test (where the cell counts were <5 or 0). For all analyses, the statistical significance was fixed at 5% level (p value <0.05).

**Results**

**Distribution of PCOS Women According to Age:**

There was a significant difference observed in the age distribution among obese and lean PCOS group. Most of the lean PCOS women belonged to age group of 21-25yrs and obese PCOS were more common among older age group like 26-30yrs. It was observed that older age group women did not present with lean PCOS.



**Figure 1: Age Distribution**

### Comparison of Lipid Profile

**Serum Cholesterol:** The mean serum cholesterol of obese group  $202 \pm 14.36$  mg% was higher than lean group with mean value of  $180 \pm 5.87$  which was statistically significant.

**Serum LDL:** Similarly difference in LDL was also found to be statistically significant with a mean LDL of obese group  $143 \pm 7.68$  and lean group having  $127.54 \pm 6.57$  which was statistically significant.

**Serum HDL:** HDL value of lean group  $55.65 \pm 9.62$  was more than the obese group  $40 \pm 7.34$ .

The obese group thus had a more atherogenic lipid profile compared to the lean group.

**Serum Triglycerides:** Differences between serum triglyceride levels of lean and obese PCOS women were not significant.

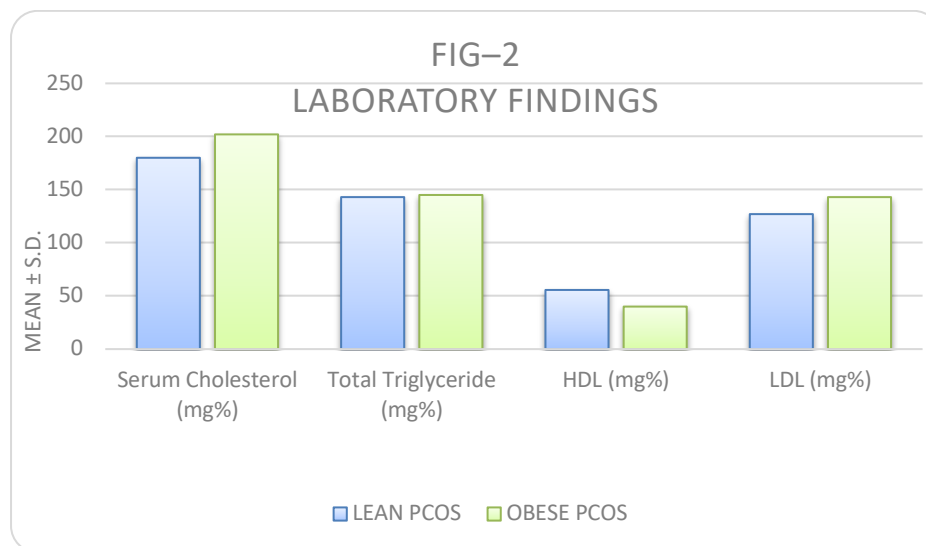


Figure 2:

### Discussion

In the present study, the mean serum cholesterol of obese group  $189.37 \pm 14.35$  mg% was found to be higher than lean group having mean value of  $172.04 \pm 5.97$  and the difference was statistically significant. Similarly difference in LDL was also found to be statistically significant with a mean LDL of obese group  $139.73 \pm 7.77$  and lean group having  $123.53 \pm 5.47$ . But the HDL value of lean group  $54.65 \pm 9.52$  was more than the obese group  $51.80 \pm 9.34$ . Similar findings were from the study of Akshaya S et al, were 14 (28%) PCOS women had deranged lipid profile out of whom 3 (13.6%) were lean PCOS and 11 (39.3%) were obese PCOS. The difference of deranged lipid profile was statistically significant between the two groups with a p value of 0.045. [12]

However, the study of Panda SR et al compared total cholesterol level and triglyceride level among obese and non-obese PCOS patients. It was found that the difference is statistically not significant but the serum levels of total cholesterol and triglyceride were statistically significant when compared to weight matched healthy adults. [13] A higher mean TC/HDL cholesterol and LDL cholesterol/HDL cholesterol were observed in PCOS compared to controls in the study by Xiang SK et al. [14]

The studies compared here show almost similar results with raised serum cholesterol and serum triglyceride level in obese group compared to the lean group

Thus in general it can be inferred that obese PCOS is said to have a more atherogenic lipoprotein pattern but we cannot rule out the fact that even lean PCOS women have deranged lipid profile compared to normal control.

### Conclusion

PCOS patients have a more atherogenic lipid profile which is related to obesity but lean patients should also be screened as there are differences of lipid profile from non PCOS women.

Our study has shown that even though BMI is being identified as a poor indicator, it remains to be the most easily available method of classification of obesity. At the same time the fact remains that if BMI is used as the sole indicator, there is increased chance of missing out the normal weight obese individuals with PCOS.

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