

Section **Gynaecology**

**Original** Article

## Prevalence and Predictors of Metabolic Syndrome in Polycystic Ovarian Syndrome in Uttarakhand

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### ABSTRACT

**Background:** Woman with polycystic ovarian syndrome (PCOS) are at increased risk of developing Metabolic syndrome (MS). MS is a clustering of factors known to increase the risk of diabetes mellitus and cardiovascular disease. Aim of this present study was to determine the prevalence and predictors of MS in PCOS women of Uttarakhand. **Methods:** This prospective observational study was conducted in department of Obstetrics & Gynecology, SHRU from May 2016 till May 2017. A total of 200 women, diagnosed with PCOS between the ages of 15-40 years were involved (by Rotterdam's criteria). Clinical and biochemical parameters for MS, were defined by National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) criteria. Statistical analysis were performed with descriptive analytical methods using SPSS software version 16. **Results:** The prevalence of MS in PCOS was 22% (44 cases). The rate of central obesity, FBS more than 110mg/dl, triglycerides more than 150mg/dl, high density lipoproteins cholesterol levels (HDL-C) less than 50mg/dl and blood pressure  $\geq 130/85$ mmHg in PCOS women were 30% (60), 3.5%(7), 34%(68), 70%(140) and 11%(22), respectively. PCOS has evolved as a risk factor for endocrinal and metabolic derangements. **Conclusions:** Special strategies are required to prevent MS and its associated complications in PCOS women.

**Key words:** Polycystic ovarian syndrome, Metabolic syndrome, and Prevalence.

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### INTRODUCTION

Polycystic ovarian disease is a major health and economic burden and is the most common endocrinopathy among the women of reproductive age group.<sup>[1]</sup> It is associated with chronic anovulation, insulin resistance and androgen excess. Clinical manifestations of PCOS being oligomenorrhoea or amenorrhoea, hirsutism, infertility, hyperandrogenism, obesity and enlarged bilateral ovaries with cysts.<sup>[2]</sup> Although genetic metabolic and neuroendocrine interactions as well as environmental factors have been implicated in its pathogenesis but nothing is fully understood.<sup>[3-6]</sup> Insulin signaling pathway abnormalities have been strongly postulated in its pathogenesis.

The National Cholesterol Education Program Adult

Treatment Panel III (NCEP ATP III) guidelines defines MBS as having three or more of the following abnormalities<sup>[7-9]</sup> :

- Waist circumference in the female greater than 88 cms.
- Fasting glucose level at least 110 mg/dl.
- Fasting serum triglycerides at least 150 mg/dl
- Serum high density lipoprotein cholesterol (HDL-C) less than 50 mg/dl.
- Blood pressure at least 130/85 mm.<sup>[10]</sup>

These two syndromes MS and PCOS are interrelated through a condition named Insulin resistance. Hyper insulinaemia, insulin resistance is an almost universal failure of PCOS and

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occurs both in obese and lean women. With the syndrome, Insulin resistance is thought to be uniting pathogenic factor in the association between hypertension, glucose intolerance, obesity, lipid abnormalities and coronary artery disease which together constitutes metabolic syndrome.<sup>[11]</sup> A few studies conducted worldwide looking for the prevalence of MS among PCOS patients were within the range of 14.5%<sup>[12]</sup> to 46.0%.<sup>[13]</sup>

This background knowledge demands the necessity to know the prevalence of MS in women with PCOS in our society and to define the predictors (risk factors) associated with it among PCOS patients of Uttarakhand.

## METHODS

This prospective observational study involved 200 patients, aged 15-40 years who attended the Gynecology clinic at Swami Rama Himalayan University, Dehradun, Uttarakhand from May 2016 till May 2017. The Ethics Institutional Review Board of Swami Rama Himalayan University approved the study and informed consent was obtained from all participants. PCOS patients were diagnosed with using the Rotterdam criteria (two out of three following criteria were sufficient of diagnosis of PCOS)

- (i) Irregular menstruation (oligo-ovulation and/or anovulation
- (ii) Clinical and /or biochemical sign of hyperandrogenism
- (iii) Polycystic ovaries (Presence of 12 or more follicles in each ovary, 2-9 mm in diameter and/ or increased ovarian volume >10 ml<sup>[14]</sup>

Metabolic syndrome was diagnosed using the Adult Treatment Panel III (ATP III) guidelines when any three of the following were present-

- (i) Central obesity: waist circumference > 80 cms or BMI > 30 kg/m<sup>2</sup>
- (ii) Raised TG level > 150 mg/dl
- (iii) Reduced HDL cholesterol: <50 mg/dl
- (iv) Raised blood pressure: Systolic BP > 130 or diastolic BP > 85mm hg
- (v) Raised fasting plasma glucose: > 100 mg/dl

Exclusion criteria were PCOS girls younger than 15 years old, women older than 40 years (to avoid potential overlap with perimenopause, hyperprolactinemia, hypothyroidism, diabetes mellitus (DM) type 1, hepatic or renal diseases, pregnant or lactating women and illiterate patients, medication use which affected sex hormones for six months prior to study e.g oral contraceptives, metformin and other antiobesity drugs, statins, etc were excluded from the study. Body weight was measured with the participants barefoot and wearing light clothing. Standing height was measured using a mounted tape. The participants were barefoot with arms hanging freely of their sides. Body mass index (BMI) was calculated as weight in kilograms divided by the square of height in meters (kg/m<sup>2</sup>). According to the WHO categories, persons who have a BMI between 25.0 and 29.9 are classified as overweight and those who have a BMI of

30.0 or higher are classified as obese.<sup>[15]</sup> Waist circumference was measured at the level of umbilicus using an unstretched tape measures without any pressures to body surface. Hip circumference was determined as the maximum value over the buttocks. Systolic and diastolic blood pressures were measured twice in right arm after a 10 minutes rest period and the average was used for analysis. Blood samples for various tests were taken after 12 hours fasting and were analyzed in the ISO accredited lab of Himalayan Institute of Medical Sciences.

### Statistical Analysis:-

Statistical analysis was performed with SPSS software (version 13). Data were presented as mean  $\pm$  standard deviation and percentages(numbers), when appropriate. The comparison between continuous variables was performed with "t-test". A p value of less than 0.05 was considered significant.

## RESULTS

Metabolic syndrome occurred in 44 out of 200 subjects. The prevalence hence became 22% in our tertiary care center in Uttarakhand. The rate at which the metabolic syndrome component, occurred in total PCOS population and in woman with metabolic syndrome is shown in table-1. Waist circumference exceeded 88cms in 61%, FBS level was > 110 mg/dl in 11%, TG levels were >150mg/dl in 81%, HDL-C level were <50mg/dl in 97% patients and blood pressure were recorded more than 130/85mmHg in 32% patients of metabolic syndrome.

These were some of the laboratory findings including FSH, LH, S. Prolactin and TSH which did not have a significant change in both the groups. On the other hand, Triglycerides, fasting blood sugars were significantly higher in PCOS woman with MS than in without MS. HDL and LH were seen much tower in women without MS. It is clearly evident from table no.-3 that the risk of MS increased in the obese category. 36.66% of the total MS women developed PCOS in obese section. Table no. 4, highlights the association of increasing age with woman with MS (P<.0001), and also women with higher BMI developed PCOS significantly more(P<.0001).

**Table 1: The rate of metabolic syndrome component in total PCOS population and in metabolic syndrome women.**

	PCOS (n-200)	MS-(44)
Central obesity	33%(66)	61%(27)
FBS>110mg/dl	3%(6)	11%(5)
HDL-< 50mg/dl	60%(120)	97%(43)
Triglycerides>150mg/dl	31%(62)	81%(36)
Blood pressure $\geq$ 130/85mmHg	11%(22)	32%(14)

Data are presented as numbers in parenthesis as percentage wise

## DISCUSSION

Asian Indians constitute a very high-risk population as far as diabetes and cardiovascular diseases are concerned and the number is constantly rising.

The prevalence of MS in any area varies according to the region, the urbanization extent, changes in the lifestyles, cultural beliefs and socioeconomic status. Recent studies shows that about 1/3 of the urban population in Indian's major cities have MS.

**Table 2: Comparison of laboratory findings between polycystic ovarian syndrome woman with and without metabolic syndrome.**

Variables	With MS (n=44)	Without MS n=156	p value
FSH(mg/dl)	6.22±2.09	6.41±1.85	0.494
LH(mg/dl)	8.30±4.52	6.78±2.05	0.002
TSH	4.85±12.89	2.90±2.02	0.228
Prolactin(ng/ml)	20.07±13.80	18.95±8.94	0.349
Free Testosterone(nmol/l)	1.79±2.32	1.54±1.21	0.467
Fasting BS(mg/dl)	99.23±30.17	90.18±9.06	0.012
Triglycerides(mg/dl)	203.67±89.65	131.0±45.92	0.0001
HDL(mg/dl)	37.20±5.51	44.01 ±8.59	0.0001

Data are presented as mean± SD.

**Table 3: Comparison of laboratory findings between Polycystic ovarian syndrome woman with and without metabolic syndrome.**

	<18.5	18.5-24.9	25-29.9	>30
PCOS	4(2%)	51(26%)	85(43%)	60(30%)
MS	0/4	4/51(7.8)	18/85	22/60(36.66)

**Table 4: Comparison of PCOS woman with and without MS.**

	Without MS	With MS (n=156)	P value (n=44)
Age-	25.89±4.35	30.29±4.08	<0.0001
BMI-	26.93±4.52	31.53±4.30	<0.0001

The development of obesity or an increase in the abdominal fat, is considered as the primary event in the manifestations of MS. There is a significant rise in free fatty acids in blood which causes insulin resistance, high blood pressure, increased triglycerides, decreased HDL and lastly diabetes. Hence central obesity becomes the antecedent factor in development of MS. In our study also 701 women, were overweight and obese in MS group. In the present study, prevalence of metabolic syndrome was found to be 22% and no MS was seen in non-obese group which is very much comparable with the study done by coviello et al. They had reported 63% PCOS had MS and 11% over weight had MS.

In their independent studies by Legro RS et al and Gaziano J Metal came out with the conclusion that high triglyceride level, low HDL-C level and high fasting blood sugars are independent predictors of myocardial infarction and cardiovascular disease.<sup>[5,6]</sup> In our study also all the women

with MS had increased level of FBS >110mg/dl, (11% Vs 3%), increased level of triglycerides >150 mg/dl (81% Vs 31%) and decreased HDL-C <50mg/dl (97% vs 70%).

## CONCLUSION

In this study MS was seen in 22% patients only as compared to the studies done in United States.<sup>[7,8]</sup> The difference may be because of the thinner and smaller frame people from hilly area. And also because of their life style and socioeconomic status. Thus, based on the results of our study, we propose that all PCOS diagnosed women must be subjected to a lipid profile as to estimate the presence of MS and to visualize the risk of future development of DM and cardiovascular complications.

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