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Biochemical Analysis of Polycystic Ovary Syndrome in Women with Type-2 Diabetes Mellitus

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Abstract
Introduction
Polycystic ovary syndrome (PCOS) is an endocrine-metabolic disorder characterized by multiple hormonal imbalances, reflecting on a clinical presentation dominated by manifestations of hyperandrogenism, which generate short and long-term consequences on female health. Among these, infertility is one of the most alarming associated morbidities, as it currently affects approximately 48.5 million women aged 20–44 years, with PCOS accounting for 6–15% of these cases, although up to 70% of women with PCOS may be undiagnosed.
Material And Methods
The Subjects were studied from general government hospital and private hospitals and labs from Udaipur. A total of 170 subjects belonging to polycystic ovary syndrome will be classified. All PCOD women were underwent a complete history and physical examination. Women with PCOD should be interviewed of their name, address, age, socio-economic status, menstrual history.
Result
We found that majority (44.71%) of patients are of age group 21-25 years followed by 32.94% population in 26-30 years. 14.12% study population are in less than 20 years age group and 8.24% population are of >30 years age group. We calculated various biochemical, lipid profile and hormonal parameter according to W/H Ratio of our study group. We found significant difference in FBS, VLDL, LH, Testosterone and Progesterone. There is no-significant difference between these parameters as p value is >0.05.
Conclusion
This study demonstrates that the risk of type 2 diabetes is markedly elevated in middle-aged women with PCOS and suggests including BMI, glucose, and SHBG-circulating levels in the risk stratification.
Keywords: *PCOD, Biochemical Profile, T2DM-1*

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I. Introduction

Polycystic ovary syndrome (PCOS) is an endocrine-metabolic disorder characterized by multiple hormonal imbalances, reflecting on a clinical presentation dominated by manifestations of hyperandrogenism, which generate short and long-term consequences on female health [A1]. Among these, infertility is one of the most alarming associated morbidities, as it currently affects approximately 48.5 million women aged 20–44 years [A2], with PCOS accounting for 6–15% of these cases [A3], although up to 70% of women with PCOS may be undiagnosed [A4].

Menstrual irregularity, chronic anovulation, hyperandrogenism, and multiple small sub-capsular cystic follicles in the ovary on ultrasonography characterize the syndrome. PCOS is associated with insulin resistance, increased risk of type 2 diabetes mellitus and cardiovascular disorders (B2). Obesity, mainly central obesity, is present in varying degrees (30-70%) in women with PCOS (B3, 4). Central obesity, being a prominent feature of the so-called metabolic syndrome, is directly linked to increased peripheral insulin resistance (B5). It has been shown that insulin resistance is responsible for the development of polycystic ovaries in PCOS women although obesity seems to be the major cause (B6).

Clinical features of PCOS include hirsutism; androgenic alopecia8 menstrual irregularity, usually from the time of menarche[F9]; acne[F1]0; hyperinsulinemia[F11]; insulin resistance (IR); early onset of type 2 diabetes mellitus[F12]; and dyslipidemia13. According to the 1990 NICHD definition, women with PCOS may present three phenotypes: (i) oligo-ovulation, hyperandrogenemia and hirsutism (Oligo+ HA+ Hirsutism); (ii) oligo-ovulation and hyperandrogenemia, without frank hirsutism (Oligo+ HA); and (iii) oligo-ovulation and hirsutism, without measurable hyperandrogenemia (Oligo+ Hirsutism)14. According to ESHRE guidelines[F15], women with PCOS present with four phenotypes: type I: hyperandrogenism, chronic

anovulation, and polycystic ovaries; type II: hyperandrogenism and chronic anovulation but with normal ovaries; type III: hyperandrogenism and polycystic ovaries but ovulatory cycles; and type IV: chronic anovulation and polycystic ovaries but no clinical or biochemical hyperandrogenism. The association between PCOS and hyperinsulinemia was first reported by Burghen et al. [F16], as it became clear that women with the syndrome have major metabolic as well as reproductive morbidities. Recently, more attention was focused on the degree of IR (insulin resistance) in women with PCOS. One report even considered all women with PCOS to have some degree of IR[F17]. Recent evidence suggests that obesity appears to exert an additive synergistic impact on the manifestations of PCOS, including a modifying effect on insulin sensitivity and gonadotrophin secretion and independently and negatively affecting insulin sensitivity, risk of diabetes, and cardiovascular impact[F18]. This study aims to corelate biochemical analysis of different hormones in polycystic ovarian syndrome and its impact on type 2 diabetes mellitus in women of Udaipur region.

II. Material And Methods

The study will be carried out jointly in the Department of Biochemistry and Department of Obstetric & Gynaecology, R.N.T Medical College & Hospital, Udaipur. A total of 170 subjects belonging to polycystic ovary syndrome will be classified. All PCOD women were underwent a complete history and physical examination. Women with PCOD should be interviewed of their name, address, age, socio-economic status, menstrual history. **Inclusion criteria:** 1. Women with PCOD are attending outdoor OPD of the hospital, first time diagnosed PCOD & Consent form to be illed by subjects of this study. 2. Diagnosed polycystic ovarian syndrome, age ranging from 18-40 years. 3. Women with PCOD Willing to have physical examinations like Weight, Height, BMI, W/H ratio, Blood Pressure. **Exclusion criteria: 1.** Women with diagnosed adrenal hyperplasia, androgen secreting neoplasm, other pituitary (acromegaly) and adrenal disorders like Cushing syndrome, Virilizing adrenal or ovarian neoplasm. 2. Women with hyperprolactinemia and other infertility cause.

III. Result

The study will be carried out jointly in the Department of Biochemistry and Department of Obstetric & Gynaecology, R.N.T Medical College & Hospital, Udaipur. A total of 170 subjects belonging to polycystic ovary syndrome will be classified. We found that majority (44.71%) of patients are of age group 21-25 years followed by 32.94% population in 26-30 years. 14.12% study population are in less than 20 years age group and 8.24% population are of >30 years age group. The mean age of our study population is 24.75years. In our study 63.53% study population is urban and 36.47% population is rural.

Table 1: Distribution of study population according to Age

Age Distribution (Years)	No. of Patients	Percentage
15-20	24	14.12
21-25	76	44.71
26-30	56	32.94
>30	14	8.24
Total	170	100.00
Mean ± SD	24.75±4.24	

We found that 54.71% study population is married and 45.29% study population is unmarried. The mean weight of our study population is 45.04kg and mean waist to height ratio is 0.79cm. In table 2, we found that mean FBS is 95.83. Mean Insulin of our study population is 7.24 and mean HOMA IR is 31.25.

Table 2: Distribution of study population according BMI

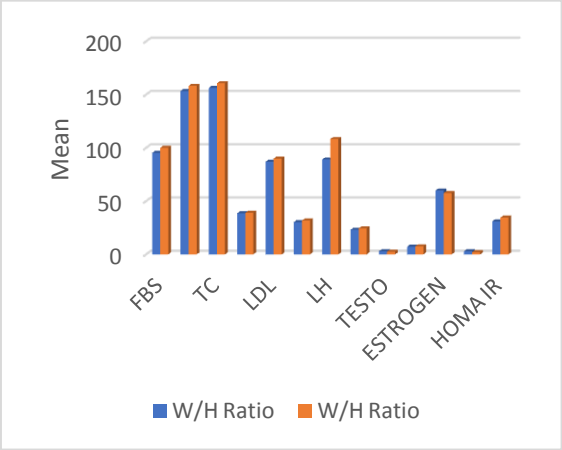
BMI	Mean	SD
<18.5 (Underweight)	16.32	0.88
18.5-22.99 (Normal BMI)	20.64	1.17
23-24.99 (Overweight)	23.8	0.57
Mean ± SD	24.75±4.24	

In our study mean BMI for overweight category is 23.8 followed by 20.64 in Normal category and 16.32 in underweight category.

Table 3: Distribution of study population according Parameter.

Parameter	Mean	SD
FBS	95.83	19.33
INSULIN	7.24	2.06
HOMA IR	31.25	9.66

In graph 1, we calculated various biochemical, lipid profile and hormonal parameter according to W/H Ratio of our study group. We found significant difference in FBS, VLDL, LH, Testosterone and Progesterone. There is no-significant difference between these parameters as p value is >0.05.



Graph 1: Correlation of various hormonal and biochemical factors with W/H Ratio.

IV. Discussion

A number of endocrine abnormalities such as dyspidemia, hyperglycemia and hyperinsulinemia and other such metabolic syndrome occur in PCOS patients [D15, 16]. Since insulin resistance and mitochondrial dysfunction has a correlation between each other, it plays a major role in the pathogenesis of PCOS. In glucose metabolism, the mitochondrial function plays a critical role due to which T2DM has the potential pathogenic roles in PCOS. In a number of diseases, the researchers identifed point mutations in the functional genes that encode mt-tRNAs [D17, 18]. Such tRNA mutations may lead to transcriptional and eventually translational defects which might lead to mitochondrial respiratory dysfunction.

We found that majority (44.71%) of patients are of age group 21-25 years followed by 32.94% population in 26-30 years. 14.12% study population are in less than 20 years age group and 8.24% population are of >30 years age group. The mean age of our study population is 24.75years. A recent study by Kumar A N et al [B] found that age range of PCOS patients are 19-35 years. The mean age of controls was 26.7 ± 3.4 years and for PCOS patients, it was 25.6 ± 3.9 years (P=0.06). Out of 80 PCOS women recruited for the study, 42 women were in the age range of 20 to 25 years, 29 women were 25 to 30 years of age, and 9 women were 30 to 35 years of age. These finding are agreed with Naidu et al. (B2), Zhang et al. (B16).

In our study 63.53% study population is urban and 36.47% population is rural. We found that 54.71% study population is married and 45.29% study population is unmarried. Mean weight of our study population is 45.04kg and mean waist to height ratio is 0.79cm. A similar study by Sachdeva G et al [I] found that waist circumference mean values were for all women 79.5 cm (SD=9.46), women with PCOS 80.49 cm (SD=9.47), controls 76.6 cm (SD=8.9), with a p-value of 0.017. However, there were significant differences in the waist-circumference categories (normal, overweight, obese); mainly, the obese status n=40 (25.2%) compared to the obese of the control group n=4 (7.4%), p-value=0.018. Codner E et al [E] found that waist-to-hip ratio were higher in PCOS women than in DM1PCOS and controls. Women with DM1 PCOS had higher waist-to-hip ratio than the control group, despite similar BMI. In our study mean BMI for overweight category is 23.8 followed by 20.64 in Normal category and 16.32 in underweight category. We found that in age group >30 years mean BMI is 22.4 followed by 18.65 in 26-30 years age group. In 21-25 years age group 16.31 is mean BMI our study group. Here, we calculated various biochemical, lipid profile and hormonal parameter according to BMI of our study group. There is no-significant difference between these parameters.

Rubin K H et al [ZB] found that the prevalence of women in PCOS OUH with BMI ,25 kg/m2 was 40% (430/1082), BMI between 25 and 29.9 kg/m2 was 25% (273/1082), and BMI $ 30 kg/m2 was 35% (379/1082). The risk for T2D is closely associated with BMI, and T2D was very uncommon in normal weight women at the time of diagnosis of PCOS (ZB25, 26). A recent population-based Finnish study reported a synergistic effect of overweight/ obesity and PCOS for the risk of development of T2D, whereas the risk of T2D was not increased in normal weight women with PCOS (ZB7). Two previous observational studies from the United States and one from Australia reported T2D prevalence of 10% (mean age = 26.5 years, BMI = 37.1 kg/m2) (ZB27), 7.5% (mean age = 28 years, BMI = 32.9 kg/m2) (ZB27), and 5.8% (mean age = 20.5 years, BMI = 28.0 kg/m2) (ZB28), respectively. These findings support a relatively low baseline risk of T2D in Danish women with PCOS compared with other nationalities. Jalilian et al [L] found that Overweight and obesity are symptoms associated with PCOS. For there study, BMI ≤ 25 was considered as overweight. BMI ≥

30 was defined as obesity and central obesity, or android was defined as waist-hip ratio greater than 0.85 and waist circumference more than 88 cm). In 12 of the involved studies, the prevalence of overweight was investigated and the meta-analysis estimate was 21% (95% confidence interval: 16-25).

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