

## ORIGINAL RESEARCH

# Comparison of uterine and ovarian doppler findings, clinical and laboratory findings in cases of polycystic ovarian syndrome with age matched controls

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### ABSTRACT

**Introduction:** Polycystic ovarian syndrome (PCOS) is the predominant etiology of anovulatory infertility, accounting for over 70% of cases. Due to the fact that approximately 16 to 25% of individuals in the general population exhibit polycystic-appearing ovaries when examined via ultrasound, the identification of polycystic ovaries has been seen as indicative, albeit not definitive, of polycystic ovary syndrome (PCOS). The aim of present study is to compare the uterine and ovarian Doppler findings, clinical and laboratory findings in cases of polycystic ovarian syndrome with age matched controls.

**Material & methods:** The prospective study was done in department of obstetrics and gynecology among 60 women, divided into two groups (cases & controls) for a period of one year. Detailed history including: age, parity, hirsutism, menstrual and obstetrics history. General, abdominal, and pelvic examination was done. Data were collected, tabulated and analyzed by SPSS 25.0, software for Windows. The level of significance was  $< 0.05$ .

**Results:** Significant differences were observed among two groups on basis of mean BMI. Laboratory findings comparison between the two groups showed that statistically significant difference on the basis of LH (mU/ml). Ovarian volume comparison at early follicular phase showed significant differences for right and left ovary as well as mean ovarian volume. Mean PI, RI and S/D was found to be more in cases (group 1) as compared to controls (group 2).

**Conclusion:** Other than clinical and laboratory findings uterine and ovarian Doppler findings is an important tools in diagnosing condition of women suffering with polycystic ovarian syndrome.

**Keywords:** Clinical, Doppler, Infertility, Laboratory Findings, Polycystic Ovarian Syndrome

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### INTRODUCTION

The most prevalent endocrine condition in women of reproductive age is polycystic ovarian syndrome (PCOS), which affects 5–10% of women [1]. The most typical symptoms of this illness are irregular menstrual cycles, anovulation, infertility, obesity, and hirsutism, one or all of which may manifest in PCOS patients [2,3]. To diagnose PCOS, at least two of the following conditions must be met: 1) Oligomenorrhea or an absence of ovulation, 2) clinical or laboratory indications of hyperandrogenism, and 3) ultrasound evidence of polycystic ovarian morphology.

Ongrayscale ultrasonography scans, this disease is defined by the existence of 20 or more follicles with diameters less than 10 mm and an increase in ovarian volume to more than 10 cc based on transvaginal ultrasonography with a transducer frequency  $\geq 8$  MHz [4,5]. The diagnosis of PCOS should show polycystic appearing-ovarian morphology on ultrasound, with exclusion of other relevant disorders.

The actual role of transvaginal Doppler ultrasound for assessing uterine and ovarian vascularities in PCOS is a topic of interesting debate, but most researchers concur that patterns of blood flow are directly related to the

function and morphology of relevant organs [6]. Studies using color Doppler ultrasound in PCOS patients have revealed that these patients had a clearly increased number of intraovarian stromal arteries and a higher peak systolic blood flow velocity than women with normal ovarian morphology. Despite the fact that the intraovarian vascularization is not visible until days 8 to 10 of the 28-day cycle. We therefore believe that the ovarian stromal Doppler examination is helpful in explaining the pathophysiology of PCOS [7] based on these alterations in intrastromal ovarian vascularities. Uterine and ovarian artery RIs can give additional information on pathophysiology of the syndrome and can be applied as a diagnostic criterion in suspected cases of PCOS. Additional investigation of patients after medication and repeating the color Doppler ultrasound (CDS) might offer a deeper insight into PCOS treatment [8].

There are limited number of studies conducted on this topic, and the inconsistent findings they have produced, coupled with the high prevalence of polycystic ovary syndrome (PCOS) and the importance of early detection and treatment of this condition. The aim of present study is to compare the uterine and ovarian Doppler findings, clinical and laboratory findings in cases of polycystic ovarian syndrome with age matched controls.[9,10]

## MATERIAL & METHODS

The prospective study was done in department of obstetrics and gynecology among 60 women over a period of one year. The patients were classified into two groups of 30 each:

Group I- cases – women suffering with PCOS.

Group II- controls – women of same age group with normal ovulatory cycle.

Patients were classified on the basis of following inclusion and exclusion criteria:

### Inclusion criteria-

1. Women with age 19 to 35 years.
2. For cases women fulfilling latest 2 out of 3 Rotterdam criteria-(1) clinical or biochemical

hyperandrogenism, (2) evidence of oligo-anovulation, (3) polycystic appearing-ovarian morphology on ultrasound, with exclusion of other relevant disorders.

3. For controls fertile women with normal menstrual cycle.

### Exclusion criteria:

1. Any patient has hypertension, diabetes mellitus, autoimmune disease, cardiovascular disease, anemia, Cushing syndrome, thyroid disease, hyperprolactinemia or any condition that may affect circulatory system.
2. Women on drugs for induction of ovulation.
3. Androgen secreting tumor ovarian or adrenal.
4. Adult onset congenital adrenal hyperplasia.
5. Patient with follicular cyst > 20mm in early follicular phase.
6. History of tubal or ovarian surgery or pathology.
7. All pregnant women.
8. Women on Contraceptive pills.

An informed written consent was taken from all patients. Detailed history including: age, parity, hirsutism, menstrual and obstetrics history. General, abdominal, and pelvic examination were done. Transvaginal Doppler flow measurements were taken of the uterine and intraovarian blood arteries. The apparatus used was Mindray machine with a 2.8-7.7 MHZ transvaginal transducer. All women received identical fixed preinstalled power Doppler ultrasound settings. It was possible to acquire the various Doppler indices (PI- RI- S/D ratio). The mean value of three consecutive waveforms was calculated for each inspection on both sides. Data were collected, tabulated and analyzed by SPSS 25.0, software for Windows. The level of significance was < 0.05.

## RESULTS

Mean age and BMI were recorded between the two groups and it was noted that significant difference was obtained on the basis of BMI as shown in table 1.

**Table 1: Demographic data of the two groups**

Variable	Group 1	Group 2	P value
Age (in years)	33.1±6.1	31±5.7	0.9
BMI	26.5±4.2	23±4.6	0.02

Laboratory findings comparison between the two groups showed that statistically significant difference was seen when compared on the basis of LH (mU/ml) and Free Serum Testosterone (pg/ml) whereas non significant differences were obtained on comparison with FSH (mU/ml) as shown in table 2.

**Table 2: Comparison between the two groups regarding Laboratory findings**

Variable	Group 1	Group 2	P value
LH (mU/ml)	13.6±1.5	5.3±2.3	0.001
FSH (mU/ml)	7.2±0.52	6.3±1.5	0.2
Free Serum Testosterone (pg/ml)	3.51±0.44	1.57±0.28	<0.01

Ovarian volume comparison at early follicular phase between the two groups was done and it was found that significant differences there among the two groups for right and left ovary as well as mean ovarian volume as shown in table 3.

**Table 3: Comparing ovarian volume (ml) at early follicular phase between the two groups**

Variable	Group 1	Group 2	P value
Right	11.5±2.7	6.5±3.2	0.001
Left	10.6±4.2	4.8±3.1	0.001
Mean ovarian volume	10.7±2.8	5.6±2.6	0.001

At early follicular phase uterine artery Doppler finding was compared between the two groups. Mean PI, RI and S/D was found to be more in cases (group 1) as compared to controls (group 2). It was found that significant differences were observed for the values of uterine artery PI, RI& S/D as shown in table 4.

**Table 4: Comparing uterine artery (mean value) Doppler findings at early follicular phase between the two groups**

Variable	Group 1	Group 2	P value
Uterine artery PI	2.60±0.75	2.45±1.1	0.02
Uterine artery RI	1.07±1.03	0.87±0.16	0.02
Uterine artery S/D	7.5±2.9	2.9±2.1	0.03

At late follicular phase comparison of uterine artery Doppler findings was compared between the two groups and it was found that significant differences was observed for the values of uterine artery PI, RI& S/D as shown in table 5.

**Table 5: Comparing uterine artery (mean value) Doppler findings at late follicular phase between the two groups**

Variable	Group 1	Group 2	P value
Uterine artery PI	2.54±1.05	2.46±0.3	0.002
Uterine artery RI	1.07±1.0	0.86±0.05	0.02
Uterine artery S/D	7.2±2.6	5.4±1.7	0.04

Ovarian volume was inversely correlated with PI and RI in both the groups and results were not significant for any of the index ( $p>0.05$ ) as shown in table 6.

**Table 6: Correlation of Doppler ultrasound indices with ovarian volume**

Variable	Pulsatility Index	Resistance Index
Ovarian volume	Group 1	-0.010
	Group 2	-0.187
P value	0.308	0.201

## DISCUSSION

The physiological, physical, and psychological aspects of women's lives undergo changes over the many reproductive stages. The majority of women are unable to communicate and get appropriate counsel regarding normal or abnormal developmental changes because of familial, cultural, and societal constraints. One such condition that might begin to manifest throughout adolescence and cause uncertainty regarding the changes being experienced is PCOS. [11] The present study was conducted among two groups of 30 women patients in each group for comparing uterine and ovarian Doppler findings, clinical and laboratory

findings in patients of polycystic ovarian syndrome. In this study, the mean concentration of FSH was not statistically significant between two groups. Contrary to this, a few authors have reported higher levels of LH [2,13]. Gülekli et al evaluated prospectively the performance of serum LH, FSH, testosterone, free testosterone, SHBG, and insulin concentration in a group of 32 patients with PCOS and 25 healthy controls. These investigators had observed that the LH/FSH, total testosterone, and insulin levels best predicted the PCOS status.[14] In our study the average uterine artery RI of PCOS group was higher in both phases as compared to normal women group which was

similar to a study by Mala et al [15] on 25 PCOS patients and 25 healthy women, and the results revealed that the PCOS group's uterine artery RI was much greater than the control group's, but the ovarian artery RI was significantly lower. Additionally, ovarian stromal artery vascularization was noticeably higher in PCOS patients compared to healthy women. The results of a color Doppler examination of the uterus and ovaries on 20 PCOS patients and 20 healthy women revealed significant variations in the uterine artery and ovarian stromal artery RIs between the PCOS patients and healthy women, according to the Bostancia et al [16] study. They discovered that ovarian stromal artery RI was lower and uterine artery RI was higher in PCOS patients compared to the control group. In early and late follicular phase, there were statistically significant differences between the two groups for uterine arteries and results were dissimilar to study conducted by Fetouh and Mohamed.[17] According to a study by Farshchian et al [18] who concluded that PCOS patients' uterine artery RI was significantly lower than that of healthy women, discovered statistically significant difference between cases of PCOS and controls in uterine artery RI. In contrast to our study Fetouhand Mohamed, found there was no statistically significant difference in the uterine artery S/D ratio of the uterine arteries in the early and late follicular phases between the cases and the controls.[17] Contrary to a study by Ozkan, [19] which showed that greater uterine arteries S/D ratio in cases than controls, discovered that there was statistically negligible difference between cases of PCOS and controls in uterine arteries S/D ratio. The small sample size of patients included in this study may be the cause of the disparate results we found for uterine indices. Our findings are in line with those of Allen et al [20], who examined the ovary in the early follicular phase rather than the late follicular phase when developing follicles were >10 mm in diameter. Their findings suggest that in general, polycystic ovaries had higher early follicular phase blood flow than normal ovaries.

## CONCLUSION

From the study it was concluded that the uterine artery and ovarian arteries are important anatomical structures of the female reproductive system. The Doppler indices have the potential to exhibit the diagnosis with polycystic ovary syndrome (PCOS). The utilization of Doppler examination may provide valuable insights in the assessment of patients with polycystic ovary syndrome (PCOS), complementing the standard evaluation of clinical & laboratory findings.

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