Original Article

Evaluation Of Ovarian Artery Doppler Indices In Patients With Polycystic Ovarian Syndrome

[1]Adeeba Iqbal, [2]Muhammad Ali Memon, [3]Azhar Rashid, [4]Mariam Bashir Pavgi, [4]Gulraiz Karim Rind Baloch, [5*]Ali Akbar Pirzado

[1]Department of Radiology, Indus Medical College, Tando Muhammad Khan
[2]Department of Oncology, Indus Medical College, Tando Muhammad Khan
[3]Department of Stereotactic Radiosurgery/ Radiation Oncology, Neurospinal & Cancer Care Institute (NCCI), Karachi
[4]Department of Anatomy, Ziauddin University, Karachi
[5*]Department of Community Medicine & Public Health, SMBB Medical University, Larkana

Corresponding Author: [5*]Ali Akbar Pirzado (apirzado@smbbmu.edu.pk)
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Abstract

Objective: The main objective of this study is to assess the prevalence of unstable ovarian artery doppler indices in patients with polycystic ovarian syndrome.

Methodology: This is cross-sectional descriptive study, conducted at a tertiary care hospital from February 2021 to January 2022. A total of 130 patients with polycystic ovarian syndrome. The patients included were those having duration of illness was more than 3 months, age between 20-40 years. Patients with influencing factors e.g., high prolactin and hypothyroidism were excluded from the study. The selected patients were undergone transabdominal ultrasound for the localization of anatomical position of ovarian arteries. Pulsed doppler range gate was established across the vessel and mean of three waveforms was observed. The doppler artery indices included were pulsatility index (PI) and resistive index (RI). The values were obtained and recorded.

Results: The mean age of patients was 29.33 ± 4.11 years. Majority of patients (54.33%) were between the 19-29 years. Mean time of duration of polycystic ovarian syndrome (PCOS) was 3.11 ± 1.43 years. Mean body mass index (BMI) was 28.38 ± 2.01 kg/m^2. The frequency of deranged arterial involvement in patients was 71%.

Conclusion: The findings suggested that the prevalent of deranged ovarian artery indices (RI and PI) in polycystic ovarian syndrome (PCOS) is significantly high.

Keywords: Polycystic ovarian syndrome, ovarian artery, Doppler ultrasound, pulsatility index, resistive index

INTRODUCTION

Patients with infertility are usually associated with clinical features in combination of deranged levels of hormones that can be reflected in terms of polycystic ovarian syndrome (PCOS). (1) Although, complete understanding of the polycystic ovarian syndrome is not well established yet, it is considered that various disturbances in hormones, such as high androgen levels, resistance of insulin, including patients with diabetes and raised levels of insulin. (2) Insulin disrupts the hypothalamus-hypophysial-ovary axis. Resistance of insulin by ovarian parenchyma causes defective signaling in normal metabolism along with sustained steroidogenic and mitogenic function, resulting in high androgen levels which is the key hormone for production of symptoms in PCOS patients such as increased hair growth on face etc. (3) PCOS is very common endocrinological dilemma in females of reproductive age and usually affect 1 in 10 females. Radiological findings of polycystic ovaries on scans are observed in 20-30% females in their reproductive

age. [4] Main reasons for referral of such patients to radiological evaluation is failure to conceive, problems in menstruation, and high levels of androgens causing facial growth of hairs. [5] It has been postulated that inability to conceive was one of the major complaints related to PCOS patients. The literature shows the evidence that PCOS of one the leading reason for ovarian dysfunction, causing high rate of failure to conceive. [6] Primarily, polycystic ovaries are diagnosed by hormonal testing. The important screening tests consist of gonadal hormones assessment such as follicular stimulation hormone (FSH), luteinizing hormone (LH), prolactin, and thyroid-stimulating hormone (TSH). The most important and helpful parameter in evaluation is the FSH to LH ratio. Prolactin and TSH are usually recommended in determination of other pathological problems i.e., hyperthyroidism etc. Additionally, some other tests may also be performed such as male hormones i.e., dehydroepiandrosterone sulfate (DHEAS), and testosterone, or progesterone challenge. [7]

Mainly, radiological evaluation is performed for polycystic ovaries with normal levels of hormones. The choice of assessment is trans-abdominal and trans-vaginal ultrasonography. These modalities are available easily, economical, and convenient. Additional details can be obtained by magnetic resonance imaging (MRI). [8] Assessment of anti-Mullerian hormone may give valuable information in PCOS patients. [7] Polycystic ovarian syndrome (PCOS) is mixture of clinical and laboratory evaluation. Although the diagnosis of polycystic ovaries is measured by radiological assessment, further evaluation of hormonal status should be performed to see underlying cause. The ovarian pathological assessment by ultrasound is considered as gold standard for diagnosis of polycystic ovaries. [9] Ultrasonography gives much information about the pathophysiological and morphological details associated with the dynamics of blood flow. [10-11] Recent research shows that many crucial changes arise within blood flow ovarian vascularization in ovarian arteries. [11-12] Khan et al. performed a study in 2019 and showed that indices were abnormal in 85.4% females with polycystic ovarian syndrome. [13]

The main objective of this study was to assess the non-invasive, economical, and approachable Doppler ultrasound in diagnosis of polycystic ovarian syndrome patients using ovarian artery indices.

METHODOLOGY

This was a cross-sectional study, conducted at a tertiary care hospital. The duration of the study was from February 2021 to January 2022. Patients fulfilling the inclusion criteria were included by consecutive and non-probability sampling method. Details of study were given to patients and informed consent was taken. The patient included were females with polycystic ovarian syndrome, age between 20-40 years, both married and unmarried. Patients with hypothyroidism, hyperprolactinemia, and those who were taking oral contraceptive pills were excluded from the study.

Assessment of all included patients was done by ultrasound for localization of ovarian arteries in hilum of ovaries. The range gate of pulsed doppler was set along the lumen of vessel to get a mean of three waveforms. The indices of ovarian doppler artery i.e., pulsatility index (PI), and resistive index (RI) were assessed. These indices were labelled as abnormal if they were below or above the normal range e.g., PI = 2.01 – 4.30, and RI (0.80 to 0.95). Derangements in indices were noted and were noted in proforma along with other data of patients. The analysis of data was performed by SPSS 24.0. For BMI, age, disease duration, PI and RI, mean and standard deviation were calculated. Frequency and percentages were calculated for marital status, deranged indices etc. Post-stratification chi-square test was applied to observe the effect on deranged indices on doppler. P-value of <0.05 was considered as statistically significant.

RESULTS

The range of age was between 20 to 40 years with mean age of 29.33 ± 4.11 years. Majority of patients (54.33%) were between the 19-29 years. Mean time of duration of polycystic ovarian syndrome (PCOS) was 3.11 ± 1.43 years. Mean body mass index (BMI) was 28.38 ± 2.01 kg/m^2 (Table 1). Figure 1 shows distribution of patients according to marital status. The frequency of deranged arterial involvement in patients was 71%. Frequency of deranged ovarian artery

indices in polycystic ovarian syndrome (PCOS) is shown in figure 2. Stratification of deranged indices is described in terms of BMI with significant correlation (p=0.021) (Table 2).

Table 1: Distribution of Patients according to BMI (n=130)

BMI (kg/m^2)	Number of patients	Percentage
≤30	87	66.92
>30	43	33.07

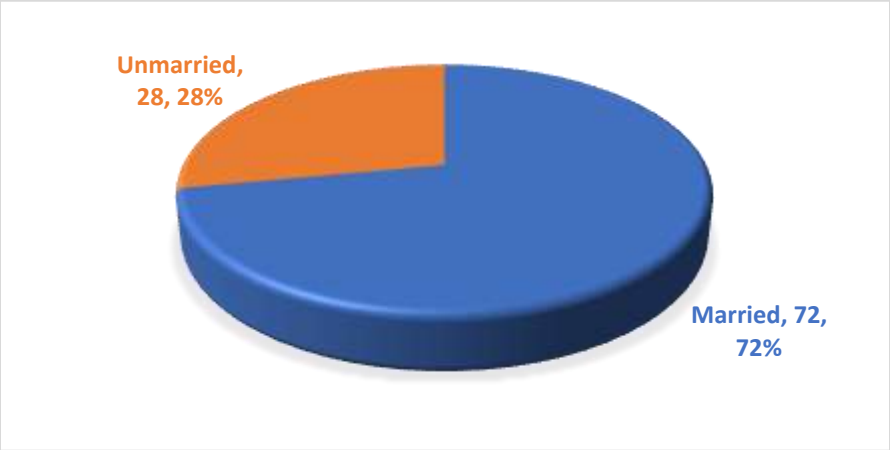

Figure 1: Distribution of patients according to marital status (n=130)

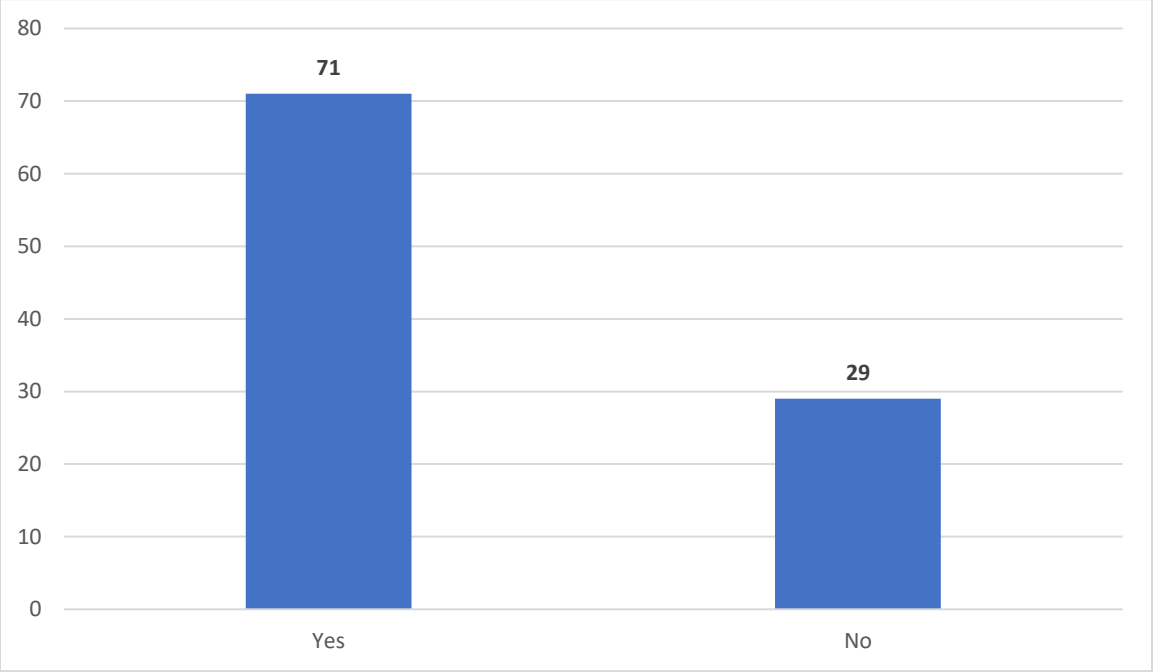

Figure 2: Deranged Ovary Artery Indices in PCOS (n=130)

Table 2: Stratification of deranged ovary artery indices in terms of BMI (n=130)

BMI (kg/m^2)	Deranged ovary artery indices		P-value
	Yes	No	
≤30	68	21	0.021
>30	23	18	

DISCUSSION

Evaluation of ovarian pathologies by ultrasonography is considered as important diagnostic tool and is also labelled as gold standard in terms of polycystic ovaries. [14] The polycystic ovaries are structural phenotypical variation in females having abnormal ratio of FSH to LH and clinical symptoms of PCOS. Although, the clinical features and biochemical changes are not present in all females suffering from polycystic ovarian syndrome (PCOS). The use of trans-vaginal doppler sonography has provided wonderful input in accurate ultrasonographic diagnosis. Additionally, it provided adequate understanding about much recent aspects about pathophysiological and anatomical details on mechanism of blood flow within pelvic system. In patients with PCOS, it also revealed important alterations in vascularization within ovaries, especially in the region of ovarian hilum. 2- or 3- dimensional ultrasonographic evaluation have postulated such hypotheses with analysis by color doppler. [14-15]

In this study, the prevalence of abnormal indices in ovaries was observed in 71% patients. Khan et al. showed higher prevalence (85.4%) of deranged indices in PCOS patients. [13] Another study alleged that uterine artery indices (e.g., both PI and RI) are over 95th percentile in PCOS patients. [16] Mala et al. demonstrated in her study that both PI and RI were decreased below 50th percentile in PCOS patients. [17]

Many studies have been conducted on assessment of uterine and ovarian blood flow and showed high resistance index i.e., more than 95th percentile, and have significant association with deranged hormonal system. On study revealed strong relationship between artery PI and FSH:LH ratio. [18] Another study conducted by Zaidi et al. postulated the increased color flow intensity of doppler index in ovarian parenchyma among PCOS patients. The blood flow impedance of ovarian artery was decreased in PCOS patients. [20] These findings are in similarity with other studies. [21-23] While comparing within two groups e.g., PCO and PCOS, it was observed that PI in uterine artery was higher than 95th percentile in PCOS patients. There was a strong correlation observed in PCOS patients with increased PI in uterine artery and deranged AS and DHEAS levels. [24-25]

Patients with PCOS has higher tendency for the development of atherosclerosis, causing thickening and stiffness of vessel walls, and ultimately resulting in higher systemic vascular resistance. In patients with PCOS, important risk factor for coronary artery disease and myocardial infarction is to be defined.

CONCLUSION

Our findings showed that frequency of abnormal ovarian artery indices in higher in patients with polycystic ovarian syndrome. Therefore, it is recommended that these deranged indices should be utilized for timely and early diagnosis of PCOS so that adequate changes in lifestyle or medical treatment can be provided in order to reduce the morbidity.

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