

**Systematic Review****The Role of Colour Doppler Imaging in the Diagnosis of Poly Cystic Ovarian Syndrome**Areeba Aslam¹, Syeda Khada Tul Sughra¹, Aneeqa Aslam², Sadia Shaukat³, Ayesha Irshad¹, Swera¹¹University Institute of Radiological sciences and Medical Imaging Technology, The University of Lahore, Pakistan²Services Institute of Medical Sciences, Lahore, Pakistan³Rawalpindi Medical University, Lahore, Pakistan

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ABSTRACT

Poly Cystic Ovarian Syndrome (PCOS) is a hormonal disorder that affects women during their reproductive years (18-30years). It is a condition that affects ovulation and the ovaries. Many fluid-filled sacs develop inside the ovaries in PCOS. These are follicles, each of which contains an immature egg. The egg is never mature enough to cause ovulation to occur. Important alterations in ovarian vascularization at the level of intraovarian arteries occur in PCOS patients.

Objective: To determine the role of color doppler ultrasonography in evaluation of PCOS.

Methods: An electronic database search with data ranging from 1999-2021 was performed (Science Direct, Google Scholar, PubMed, Springer). A total 28 articles were found. All studies are fully available evaluating PCOS on doppler ultrasound. **Results:** Performance of Doppler ultrasound diagnosis was evaluated. PCOS patients had decreased ovarian artery pulsatility index (PI), resistance index (RI), and SD ratios and increased uterine artery pulsatility index (PI), resistance index (RI), and SD ratios. **Conclusion:** It is concluded that the lowest ovarian stromal resistance levels were found in the patients than the controls.

INTRODUCTION

Polycystic Ovarian Syndrome (PCOS) is a multifaceted condition characterized by absence of ovulation for prolonged period and an excessive amount of androgen, with a prevalence rate of four to seven percent in females [1]. PCOS is the most frequent endocrinopathy [4]. PCOS commonly occurs in a woman's reproductive life within the first several years [5]. PCOS symptoms include sterility, disturbed menstrual cycle, excessive hair growth, oily skin and weight gain. According to traditional descriptions, the typical polycystic ovary is big and lilly white, with a viscous capsule having many follicles underneath. PCOS patients have significant changes in intraovarian arteries[2]. Doppler ultrasonography has improved ovarian illness differential diagnosis and contributed to a better understanding of the causes of the numerous underlying disorders, allowing for a better understanding the nature of

diseases and management [9]. Using duplex and color Doppler transvaginal sonography (TVS) probes, high-quality images of the female reproductive organs and assessment of blood velocimetry in the arteries is now achievable [3]. In the early 1990s, colour Doppler sonography became increasingly sensitive. Blood flow changes in the urogenital system are now commonly assessed using TVS Doppler ultrasonography in combination with Brightness-mode imaging. The signal arising from Doppler ultrasound shows quantification in the ovarian supporting tissue seems to be increased in PCOS patients. PCOS is a condition that affects women who have a large ovarian volume. In women with PCOS, the vascularization flow index (VFI), flow index (FI), and vascularization index(VI)are all greater[6].

METHODS

In this review article, articles were searched through Science Direct, Google Scholar, PubMed, Springer for studies published between 1999 and 2021 using specific MeSH terms. In this systematic study, we analyzed 28 cross-sectional type analytical investigations to find which parameters of Doppler ultrasonography are helpful in evaluating PCOS. Obese and non-obese patients with ages ranging from 18-30 years were included.

RESULTS

In this study, the average age group is between 18 to 30 years. Those women who are more obese are more likely to have a poor clinical reproductive presentation, reducing the chances of early detection [26]. Ovarian PI has a substantial negative relationship with serum Luteinizing hormone (mIU/L) ($r=-0.6$), luteinizing hormone/Follicle-stimulating hormone ratio ($r=-0.7$), BMI ($r=-0.3$), prolactin ($r=-0.4$), and ovarian volume ($r=-0.5$). Ovarian RI has a substantial negative relationship with serum Luteinizing hormone (mIU/L) ($r=-0.6$), luteinizing hormone/Follicle-stimulating hormone ratio ($r=-0.7$), Body mass index ($r=-0.3$), prolactin ($r=-0.3$), and ovarian volume ($r=-0.5$). [19] Two-dimensional (2D) Doppler imaging was used to determine the pulsatility index (PI) and resistance index (RI) of the uterine artery and ovary, while three-dimensional (3D) power Doppler imaging was used to determine the vascularization index (VI), flow index (FI), and vascularization flow index (VFI) [7]. The ovarian artery pulsatility index (PI), resistance index (RI), and SD ratios were all lower in PCOS individuals. The uterine artery pulsatility index (PI), resistance index (RI), and SD ratios were all significantly higher in PCOS individuals [8].

DISCUSSION

PCOS is the most common gynecological problem in our area. Changed complaints are common among these women, they have an influence on their physiological and psychological health, decreasing their quality of life [10]. PCOS may now be recognized in females with the help of biochemical tests and ultrasound exams [11]. With the emergence of pelvic ultrasonography in the 1980s, an un-intrusive assessment of ovarian morphology became available. According to ultrasonography studies, around twenty percent of young women have polycystic ovaries (PCO), with twenty-five to seventy percent experiencing symptoms of PCOS [12]. You can view two-dimensional (2D) slices of three-dimensional (3D) structures using traditional transvaginal sonography. 3D sonography, on the other hand, allows for the simultaneous evaluation of three orthogonal planes while measuring a volume that

comprises the biological structure. 3D sonography has been shown to provide a definite technique for calculating the volume from inner part of the ovary by deducting overall follicles volume from overall ovarian volume [13]. An ultrasonographic test is being used to identify polycystic ovaries. The existence of many rounded fluid-filled structures (> 10 , 2-8 mm in diameter) grouped around a hyperechoic inner part of the ovary was defined as the ultrasonography criteria for diagnosing PCOS [14]. These factors were discovered to be closely related to histopathology outcomes [15]. Matsunaga and colleagues identified two types of PCOS based on sonographic appearance: rounded anechoic structures arranged around margins of inner part of the ovary and a generalized cystic pattern. Smaller cysts in the former kind can be discovered in the subcapsular area, whereas tiny cysts in the latter type can be seen in both the subcapsular and inner parts of the ovary [16]. With the help of transabdominal and transvaginal ultrasonography color flow images of branches of arteries of uterus lateral to cervix in sagittal plane is achievable. The arteries of ovaries can be examined at their entry/exit point [17]. Color Doppler is sensitive to slow flow, allowing for the identification of blood flow velocimetry by computing the Resistance index (RI) and pulsatility index (PI) electronically using formula: $PI = (\text{peak systolic velocity} - \text{end diastolic velocity}) / \text{time-averaged maximum velocity}$, $RI = (\text{peak systolic velocity} - \text{end diastolic velocity}) / \text{peak systolic velocity}$ [18]. Females with PCOD have a greater velocity of blood in ovaries during the early follicular phase of the typical menstrual cycle [20]. The majority of PCOs patients in this study were between the ages of 20 and 25, with 37.1 percent being between the ages of 26 and 30 (22.9 percent). This is consistent with the findings of Jamal AF et al 2019 in Iraq, who reported that the age group 18-27 had the highest frequency (32.7 percent and 43 percent, respectively) [21]. The low PI values indicate that the ovarian stromal arteries in PCOS women's ovaries are dilated, engorged, and numerous [22]. Females with PCOS had ovarian volumes ranging from 6.7 to 12.6 milliliter, with an average of 9.65 milliliter [23]. Our research indicated that ovarian artery PI and RI values are lower in females with PCOS, which is consistent with multiple previous studies [24].

CONCLUSION

On colour doppler ultrasonography, patients with PCOS showed a substantially higher pulsatility index and resistivity index for the arterial supply of the uterus and a significantly lower pulsatility index and resistivity index for the ovarian artery. By evaluating these indices, PCOS can be diagnosed with Doppler ultrasonography.

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