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Original Article

Frequency of Ovarian Artery Doppler Indices in Patients of Polycystic Ovarian Syndrome

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ABSTRACT

Polycystic ovarian syndrome (PCOS) is a common endocrine disorder. It is characterized by changes in Doppler indices of ovarian arteries. These changes are more prominent than the morphological changes of ovary and uterus. **Objective:** The aim of the analysis was to calculate the percentage of deranged ovarian artery in patients with polycystic ovarian syndrome ovarian patients. **Methods:** This observational study was conducted on total 225 women of reproductive age ranging between 18-40 years presented with the PCOS at the hospital. The gold standard for diagnosis of deranged ovarian artery in PCOS is transvaginal ultrasound. The Doppler ultrasound helps to calculate the resistive and pulsatility indices of ovarian artery. The pulsatility Index and Resistive Index was calculated and percentage frequency was estimated from the calculated results. Ovarian blood flow is deranged if its indices are above or below the normal range. The resistive index (RI) measured by Doppler imaging was between 0.80 to 0.95 and pulsatility index (PI) range was between 2.01 to 4.30. The data were arranged according to BMI of patients. The age and duration of PCOS were also considered for data stratification. **Results:** The study showed that about 191 (85%) patients out of 225 with PCOS have deranged ovarian artery Doppler. The range of pulsatility index was between 2.01 to 4.30 while the range of resistive index was between 0.80 to 0.95. The mean duration of PCOS and means age of patient was calculated. It was found that the deranged ovarian blood flow was more common in the women of age 27-5.9 years. 18.4-7.1 months was the mean duration of PCOS. The mean BMI of the patient was 27.2-4.9kg/m^2.**Conclusion:** A significant number of women suffering from PCOS have deranged ovarian artery Doppler indices. This study evaluated the putative role of Doppler indices in diagnosis of suspicious PCOS patients.

INTRODUCTION

The most common and complex endocrine disorder of reproductive age women is Polycystic ovarian syndrome PCOS [1-2]. This is characterized by the various symptoms of oligomenorrhea, acne, obesity, menstrual irregularities and infertility2. PCOS was diagnosed by Stein and Leventhal for the first time in 1935. It was named as Stein leventhal syndrome after the name of scientist. It is most common hormonal irregularity. The studies have showed that the capsule and sub capsular follicle enlarged in PCOS. The profound and rapid changes of vasculature of the cycling ovary play a significant role in early maturation of follicle. To develop better understanding of pathogenesis of disease there is need to deeply analyze the vascular changes of the ovary and uterus. With the advent of color Doppler ultrasound, the ovarian artery can be identified at the lateral border of the ovary. PCOS not only affect the quality of life but also have negative physiological implications [2-3]. One frequent hypothesis regarding main cause of PCOS is that excessive production of androgen by ovaries that disturb the endocrine system

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ultimately leads to PCOS [3-4]. Higher level of gonadrotropic hormones and insulin resistance are also has significant role in PCOS process. The prevalence of PCOS in south Asian women is as high as 52% while its prevalence in developed countries is comparatively low as 15-20% [4-5]. The PI index of uterine artery is higher in the women diagnosed with the PCOS. This higher PI index ultimately leads to lower conception rates. In PCO syndrome the body mass Index BMI is considered to be predictor of fertility. The ovarian volume and BMI has direct relationship with each other. The women with PCOS have higher ovarian volume as compared to the normal women. BMI not only affect the ovarian volume but also have strong effect on endometrium thickness and uterine size. Hence, BMI and endometrium has positive correlation with each other. There is no single criterion to correctly diagnose the PCOS. Ultrasonography, hormonal assays and clinical features are currently used in diagnosis of PCOS [5-6]. Diagnosis through hormonal assays is an expensive process. The unreliability of these methods lies in the fact that they produce large number of false positive and false negative diagnostic results [7-8]. The most accurate tool to study the female reproductive system is transvaginal color Doppler ultrasonography. To assess the blood flow in obstetric, the combination of B-mode imaging and transvaginal color doppler ultrasound can be used [9-10].

METHODS

This cross-sectional study was conducted at the Radiology Department of BKMC / MMC, Mardan for the duration of six months from June 2020 to November 2020. The ethical review board of hospital approved the study and informed consent was taken. According to the Rotterdam consensus the polycystic ovarian syndrome can be characterized by presence of anovulation, hyperandrogenism, and 12 follicles in each ovary with enhanced ovarian volume. The 225 patients presented with PCOS was included in this descriptive study. The calculated confidence level was set as 95%. There was 5% margin of error. The deranged ovarian artery Doppler indices expected percentage was 83%. The Non-probability consecutive sampling approach was used to select patients. Those patients having PCOS who fulfil the Rotterdam criteria was involved in the study. Exclusion criteria was applied to the patients having evidence of hyperprolactinaemia and receiving contraceptive pills. On the basis of results obtained from laboratory screening methods, the patients having biochemical evidences of adrenal hyperplasia was also excluded from the study. For localization of ovarian arteries, the accurate tool, transvaginal ultrasonography was used. On average three to four waveforms was obtained by setting the pulsed Doppler range gate across vessel. Ovarian Doppler indices were computed by computing Pulsatility index and Resistive index.

RESULTS

The data were divided into three equal groups on the basis of BMI. The age and duration of PCOS was also labelled as significant for data stratification. The p-value of each group was calculated. The ratio of the women with deranged ovarian artery indices was 84.8%. The percentage of women without deranged ovarian artery indices was 15.1%, Table 1.

Characteristics	Values
Total participants	225
Mean age (range)	17-45 years
Mean age	5.8-27years
Mean duration of PCOS	7-18.3 months
Mean Body index	21kg/m^2 to 33 kg/m^2
Mean pulsatility index	0.70-3.32
Mean resistive index	0.03-0.87

Table 1: The calculated mean values

Deranged Ovarian artery Doppler indices	Percentage	Frequency
Patients with deranged Ovarian artery Doppler indices	191	84.8%
Patients without deranged Ovarian artery Doppler indicesTotal	34	15.1%
Total	225	100%

Table 2: Percentage and Frequency of deranged ovarian artery Doppler indices in reproductive age women

The reproductive aged women n= 225 ranging from 17-45 years presented with PCOS at the hospital was included in the study. The resistive and pulsatility index below or above the cut-off value was marked as deranged. The calculated mean age was 5.8 -27years. The means duration of PCOS calculated as 7-18.3 months. The mean body mass index of the women was between 21kg/m2 to 33 kg/m2. The means of pulsatility index was ranged between 0.70-3.32, while mean RI was between 0.03-0.87. On the basis of the subgroups created while considering age, body mass index and duration of the PCOS, the deranged ovarian artery indices frequency fluctuates significantly. Above table showed that out of 225 patients with PCOS, 191 have the deranged ovarian artery Doppler indices. The p-value of BMI group was 0.944, the group classified on basis of duration of PCOS was 0.931 and 0.995 of the data stratified on the basis of age. The prevalence of the deranged ovarian artery doppler indices is higher in the female of BMI group 30-34(kg/m2). While its prevalence is 85.7% in the women of BMI group 20-25(kg/m2). The women of the 25-30

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(kg/m2) has 82.6% prevalence. The average duration of PCOS was observed to be 19-30 months in the 85.9% patients while it was 6-18 months in 85.5% patients. The prevalence of deranged ovarian artery doppler indices was higher in the women of age group 18-29 years, while it was 85.2% in the women of age group 30-40 years. The p-value less than 0.5 is normally considered significant. The calculated p-value of the different subgroups i.e BMI, duration of PCOS and age was not statistically significant as shownd in the table 3. The frequency of the deranges ovarian artery doppler indices in the different subgroups was not statistically significant. There was no statistically significant difference was observed in deranged ovarian artery doppler indices frequency across the different subgroups.

Subgroups	Number	Ovarian artery deranged Doppler indices	P-value
BMI (kg/m2)			
20-25(kg/m2)	63	54 (85.7%)	0.944
25-30(kg/m2)	75	62 (82.6%)	
30-34(kg/m2)	86	76 (88.3%)	
Duration of PCOS			
6-18 months	111	95 (85.5%)	0.931
19-30 months	114	98 (85.9%)	
Age (years)			
18-29 years	191	163 (85.3%)	0.995
30-40 years	34	24 (85.2%)	

Table 3: Prevalence of ovarian artery deranged Doppler indices

DISCUSSION

PCOS is complex endocrine disorder of the reproductive age women. It is characterized by ovarian dysfunctions [11-12]. The gold standard diagnostic tool for PCOS is transvaginal Doppler ultrasound. It not only helps to assess uterine and ovarian blood flow changes in normal state but also in menstrual state. In United States the PCOS has affected 4-5 million women of the reproductive age. Its prevalence is 6.6%. In the present study the frequency of the women having PCOS with deranged ovarian artery Doppler indices is 85%. The other 15% women diagnosed with PCOS don't have the deranged ovarian artery doppler indices. Artani et al reported the study similar to ours. The mean calculated age was 27-5 years. Wahab et al also conducted the quasi-experimental study on 35 patients having history of PCOS and showed that the mean age was 27.2-4.8 years [13-14]. The study conducted by Akram et al is comparable to our study with mean age of 27 – 4.9 years. The 85% of women having BMI between 20-25 kg/m2 have deranged ovarian artery indices. The 82% of women having BMI ranging between 25-30 kg/m2 have deranged ovarian artery Doppler indices. While 76% women has deranged ovarian artery indices with the BMI ranging between 30-34 kg/m2. The duration of PCOS was between 6-18 months in 95% of women. While 98% having the PCOS ranging between 19-30 months. The mean age calculated by Usmani et al was 28-4.2 years. Chaudhari et al and Kumar et al also observed the mean duration of PCOS to be 28 – 7.6 years and 29 – 6.4 years respectively [15-16]. The mean of body mass index of 225 women with PCOS was 27 – 4 Kg/m2. The means BMI of our patients is comparable to the mean BMI calculated by Akram et al and Qazi et al that is (27.6 – 5.7 Kg/m2) and (26.5 – 5.1 Kg/m2) respectively. The mean pulsatility index of present study is 3.32 – 0.70. The mean RI is 0.90 – 0.05. Out of the 225 patients followed for the study, the of deranged ovarian artery indices was observed in 84.8%. Bano et al conducted the similar study and the results of PI and RI are comparable to present study PI and RI, that is 3.89 – 0.76 and 0.93 – 0.10 respectively [17-18]. Noumana et al. designes the clinical study in which they included 140 patients out of which 70 was diagnosed with PCOS history, the mean RI value was 0.733 and mean PI value was 1. 6303.there were 43.5% patient of PCOS in the age group ranging from 15-25 while 61.8% patients of PCOS in the agr group 26-35. The age group 36-45 has lowest number of PCOS patients with the 42.9%. In a study conducted by battaglia et al. it was indicated that the women diagnosed with PCOS has decreased RI and increased PI. The result of present study is also in line with the results of the study conducted by Maciolek-Blewniewska et al. The mean PI (3.21 – 0.54) and mean resistive index (0.90 – 0.06) they reported are comparable to our study [19]. Our results are in line with the study conducted by Aleem et al. who conducted study on 40 patients with confirmed PCOS and 50 control patients reported similar PI and RI (3.34 – 0.18), (0.86 – 0.02) respectively in the 88% of women with PCOS [20-21]. The deranged ovarian artery Doppler indices play a putative role in diagnosis of PCOS in suspected patients. Our study not only establish the strong connection between deranged ovarian artery Doppler indices and PCOS, but also provide with the percentage frequency of ovarian artery deranged in PCOS women different subgroups created while considering the BMI, age and duration of PCOS.

CONCLUSION

This cross-sectional study provided the frequency of the deranged ovarian artery Doppler indices in women with PCOS. The frequency of patients with PCOs and deranged ovarian blood flow is 84%. Ovarian Doppler study has a putative role in diagnosis of PCOS suspected patients. RI and PI values provided an insight into pathophysiological state of affected ovary. For further elaboration of diagnostic role of deranged ovarian artery indices in

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suspected PCOS patients, a cross-sectional study with the control group is highly suggested. Ovarian artery Doppler can help differentiate patients with PCOS from those who don't have PCOS and therefore the association between the Doppler induces and PCOS can be established by such analysis

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