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Diagnostic Accuracy of Revised Follicular Number and Ovarian Volume on Ultrasound in Successful Detection of Polycystic Ovaries

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ABSTRACT

Objectives: The objective of this study was to find out diagnostic accuracy of revised follicular number and ovarian volume on ultrasound in successful detection of polycystic ovaries in terms of sensitivity and specificity using Revised and Rotterdam's diagnostic criteria.

Design: Cross-sectional observational study Place and Duration: Radiology Department of Dow University of Health Sciences, Karachi, 6 months from March 2018-August 2018.

Methodology: This cross sectional study was conducted in Radiology Department of Dow University of Health Sciences, Karachi, for 6 months from March 2018-August 2018 After ethical approval using non probability convenient sampling technique, 250 females of polycystic ovarian syndrome between 16-39years, having symptoms of were enrolled for the study and patients with endometric cysts and infertility due to secondary causes like tubal ligation were excluded. Clinical history, hormonal assay and Ultrasound were performed in the early follicular phase, between 2nd and 5th day of the menstrual cycle. After period of 4 weeks every patient was followed for lab investigations. SPSS version 20 was used for data analysis.

Results: Among 250 patients, the mean age was25.61 ± 5.05years. 232 (92.8%) of the patients had menstrual irregularities, 79 (31.6%) had hirsutism, 51 (20.4%) had acne while 157 (62.8%) had infertility. Revised follicular volume and ovular volume criteria had 47.3% sensitivity and 91.9% specificity when compared with Rotterdam Criteria. Moreover, calculation of kappa statistic revealed a value of 0.365 (p<0.001).

Conclusion: It was predicted in our study that revised follicular volume and ovular volume criteria had low sensitivity but high specificity as compared with Rotterdam Criteria. Furthermore, common clinical feature found in females diagnosed with polycystic ovarian disease was menstrual irregularities.

Key words: Polycystic, Revised follicular number, Ovarian volume, Rotterdam criteria

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INTRODUCTION

The most common endocrine disorder is poly-cystic ovary syndrome (PCOS) among adult women affecting around 6-8 % of women [1]. Although young females often experience PCOS symptoms, in community-based adolescents the incidence of PCOS characteristics has not been recorded. This is clinically important, as the diagnosis of PCOS is difficult in adolescence, and early diagnosis can help increase long-term health interventions [2]. Data accuracy is clinically, socially and financially significant, as the diagnostic label for the PCOS includes an increased risk of infertility, uterine dysfunction, endometrial cancer, obesity, diabetes type II, dyslipidemia, hypertension and heart illness, as well as an negative impact due to restricted access to healthcare services [3]. The most suitable diagnostic criteria for PCOS are continuously controversial in adolescents. Two of the three criteria (oligo anovulation criteria, Clinical and biochemical ovary, or Polycystic Ovarian ultrasound aspect) have been suggested by National Institutes of

Health (NIH) criteria [oligo anovulation and organic or clinical hyperandrogenism (HA)] and the consensus criteria for Rotterdam [4]. Researchers agree to exclude any other associated endocrine diseases. None of these diagnostic criteria can be used in adolescence confidently [5]. In the early years following menarche and oligo-anovulation, menstrual irregularities are prevalent [6]. In addition, tests used to evaluate testosterone levels in laboratories differ extensively. The lack of standards for testosterone levels of populated adolescents compounds these restrictions [7]. In the early post menarche years, ovaries appearance can be different than in adult females. The difference is multi follicular appearance of ovaries which is different from polycystic ovary (PCO) morphology and is not well defined [8]. In addition, ovarian morphology evaluation is restricted to the trans-abdominal approach where women are not sexually active. Therefore, in young women clinicians increasingly retain the possibilities of PCOS, with little guidance as to how these characteristics are to be discriminated against in the ordinary phase of development [9].

The evaluation of ovarian follicle numbers has become the key element in polycystic ovarian morphology (PCOm) with the emergence of trans-vaginal ultrasonography. In the event that the measures are conducted of the ovaries and increase in ovarian volume (OV) and an increased ovarian surface area is considered also as reliable PCOm markers. Today the selection of follicular surplus and ovarian expansion as key criteria for defining ultrasound PCOm is generally accepted [10]. The normal values for follicles per ovary (FNPO) as well as for OV are still a subject of great debate, especially setting exact thresholds to distinguish between normal ovaries and PCOm. As a result of high-resolution ultrasound, more than 50 percent of regular ovulatory females in certain communities presently meet an agreement limit for treatment of PCOm (i.e. 2–9 mm diameter follicles with a median of both ovaries) [11]. The most probable result is that the spatial resolution rate of new ultrasound scanners have significantly improved. The issue has been revised in studies comparing PCOS and control through the analysis and use of properly selected control groups through operations [12]. OV appears to be a useful replacement indicator for PCOm, though in all study comparisons of both parameters, comparable with FNPO, there is a less sensitive distinction between patients with PCOm and the controls. Therefore, in the event that the image quality does not provide a credible FNPO evaluation, particularly when the transvaginal path is not viable, such as in teenagers, the use of OV to diagnose PCOm is suggested [13]. In general, the ovarian stromal volume and total ovarian size are well correlated and thus, stromal measurements in clinical practice cannot be included with any extra significance. At current cardiac indicators by Doppler are impractical for discrimination between PCOm and the ordinary ovarian anatomy due to the lack of standardized information and the absence of cut-off scores [14].

Number of researches is performed for PCOS detection internationally but in developing countries like Pakistan very few data is presented while the prevalence of the above condition is higher than expected. Therefore this study will help to determine the diagnostic accuracy of revised follicular number and ovarian volume on ultrasound in successful detection of polycystic ovaries in terms of sensitivity and specificity with Rotterdam criteria as gold standard.

METHODOLOGY

This is a cross sectional observational study through non probability convenient sampling technique carried out for a period of 6 months from March 2018-August 2018 was conducted at the Radiology Department of Dow University of Health Sciences, Karachi. The study was conducted after Ethical permission was taken from the Institutional review board of the hospital. Sample size was calculated using the previous reported sensitivity and specificity (13) with the margin of error of 9% and confidence interval of 95%. The minimum sample size was calculated to be 246. A total of 250 patients of PCOS between the ages of 16 to 39years, with symptoms of hyperandrogenism like acne and / or hirsutism, having menstrual disorders such as oligo menorrhea and being infertile were selected for this study. Patients having endometric cysts, being infertile due to secondary causes such as tubal abnormality or ligation and hyper-prolactinemia (serum prolactin 20 ng/ml) were excluded from this study.

After explaining the procedure a signed informed consent was taken from each patient. Clinical history, hormonal assay and Ultrasound were performed in the early follicular phase, between 2nd and 5th day of the menstrual cycle. After period of 4 weeks every patient was followed for lab investigations. All data was recorded on a pre-designed Proforma which comprised of demographic features, ovarian morphology and volume, ovarian follicular number and lab investigations. Confounding variables were controlled by strictly following the inclusion and exclusion criteria.

DATA ANALYSIS

For data analysis, SPSS version 20 was used. Mean ± SD was calculated for quantitative variables i.e. age, ovarian volume, follicular number and investigation like LH, FSH, LH/FSH ratio, Serum Testosterone levels. Frequency and percentages were calculated for qualitative variables like, menstruation irregularities, hirsutism, acne and risk factors (age, infertility and family history). Diagnostic accuracy was calculated for revised follicular number and ovarian volume on ultrasound taking Rotterdam Criteria as gold standard testing it's sensitivity and specificity. A p-value of <0.05 was taken as significant.

RESULTS

The data analyzed were of total 250 patients and their mean age was found to be 25.61 ± 5.05years.The study

results showed that 232 (92.8%) of the patients had menstrual irregularities, 79 (31.6%) had hirsutism, 51 (20.4%) had acne while 157 (62.8%) had infertility. Also, their mean right ovarian volume was found to be 10.89 ± 6.36, mean left ovarian volume was 10.74 ± 7.26, mean level of luteinizing hormone was 9.71 ± 3.82, mean level of follicular stimulating hormone was 4.22 ± 1.44, mean level of total serum testosterone was 1.30 ± 0.79, mean level of sex hormone binding globulin was 42.09 ± 9.88, mean follicular number of right ovary was 15.23 ± 3.50 while that of left ovary was 15.29 ± 3.86 (Table 1).

The study results further revealed that revised follicular volume and ovular volume criteria had 47.3% sensitivity and 91.9% specificity when compared with Rotterdam Criteria (Table 2). Moreover, calculation of kappa statistic revealed a value of 0.365(p<0.001) showing apooragreement beyond chance between revised follicular volume and ovular volume criteria and Rotterdam criteria (Table 3).

DISCUSSION

In our study of 250 patients having a mean age of 25.61 ± 5.05years, it was observed that with revised follicular volume and ovular volume criteria the results showed 47.3% sensitivity and 91.9% specificity when compared with Rotterdam Criteria. Among the 250 patients, 232 (92.8%) had menstrual irregularities, 79 (31.6%) had hirsutism, 51 (20.4%) had acne while 157 (62.8%) had infertility.

In a study by Hickey M et al on 232 females recruited in their study reported a mean age of 15.2 ± 0.48 years with 53 % having menstrual irregularities, 32 % had hirsutism and 21 % had acne. Only 48 (21%) of the females according to Rotterdam's diagnostic criteria showed sensitivity while 184 (79%) showed specificity to the criteria [15]. In contrast our study demonstrated 47 % sensitivity and 92 % specificity with 93% having menstrual irregularities. Similar frequency of acne and hirsutism was noted in our study as well. However, higher mean age of 25.60 ± 5.04 years was recorded in our study as compared to 15.2 ± 0.48 years reported in the above study.

In another study by Lauritsen et al. in which 447 females with symptoms of PCOS were enrolled, however only 74 (16.5%) of females showed sensitivity while 373 (83.5%) showed specificity according to Rotterdam's diagnostic criteria. Among them, the mean age was 31.5 ± 3 years. 20 (27%) of females reported hirsutism, 36(48.6%) reported acne. Anovulation was reported in 20(4.5%) of females [16]. On the contrary in our study 47 % sensitivity and 92 % specificity was reported.

Studies show that in the first year of menarche an ovulatory cycles in PCOS account for 85%, in the third year 59% and in the sixth years 25% anovulatory cycles. Higher serum androgen and LH concentrations are associated with ovulatory cycles [17]. About two-third of PCOS adolescents have menstrual symptoms and one third of patients will have the symptom from primary amenorrhea to frequent dysfunctional bleeding. It should therefore be evaluated as an early clinician sign of PCOS for persistent oligomenorrhea or amenorrhea, particularly if it persists 2 years beyond menarche [18].

Hirsutism is 5 to 15 per cent prevalent in the general population with relevant ethnic and geographical variations [19]. Therefore, PCOS represents the major cause of hirsutism, but the presence of hirsutism does not fully predict ovulatory dysfunction. Hirsutism may predict the metabolic sequellae or failure to conceive of infertility treatment in some patients with PCOS in estimated 65-75% (although lower in Asian communities). In abdominally obese patients, hirsutism often tends to be more severe. A modified Ferriman-Gallwey score is still the most common approach to visually evaluate hirsutism [20].

Acne is prevalent in females with PCOS, especially in adolescent years, and the prevalence varies (14-25%) to some extend ethnicity and patient age differences. While there is still poor definition of the combined incidence of acne and hirsutism in PCOS, clinically it has proved that the incidence is higher to those of both characteristics

Table 1: Participant characteristics.

Variables (n=250)	n(%)/Mean ± S.D.
Menstrual Irregularities	
Yes	232(92.8)
No	18(7.2)
Hirsutism	
Yes	79(31.6)
No	171(68.4)
Acne	
Yes	51(20.4)
No	199(79.6)
Infertility	
Yes	157(62.8)
No	93(37.2)
Right Ovarian Volume	10.89 ± 6.36
Left Ovarian Volume	10.74 ± 7.26
Luteinizing Hormone	9.71 ± 3.82
Follicular Stimulating Hormone	4.22 ± 1.44
Total Serum Testosterone	1.30 ± 0.79
Sex Hormone Binding Globulin	42.09 ± 9.88
Follicular Number Right Ovary	15.23 ± 3.50
Follicular Number Left Ovary	15.29 ± 3.86

Table 2: Sensitivity and specificity of revised follicular volume and ovular volume criteria.

Revised Criteria Diagnosis	Rotterdam Criteria Diagnosis	
	Yes	No
	n(%)	n(%)
Yes	62(47.3)	8(8.1)
No	69(52.7)	91(91.9)

Table 3: Calculation of agreement between revised follicular volume and ovular volume criteria and rotterdam criteria.

Measure of Agreement	Value	P
Kappa	0.365	<0.001

[21]. It is possible to evaluate androgenic alopecia with well-known subjective methods like Ludwig's score. Androgenic alopecia is less frequent and occurs later, but it still has serious psychopathologic comorbidities [22]. Hirsutism and acne can be associated, although biochemical hyperandrogenism is poorly related. One of the research has shown that acne and androgenic alopecia are not good markers of hyperandrogen for PCOS in comparison with hirsutism [23]. However in our study the frequency of hirsutism was observed to be 31%.

Population-based infertility studies have shown that a common type of anovulatory infertility (including PCOS) represents 25-40% of cases [24]. In addition, 70-90 % of the ovulatory disorder is predicted to be due to PCOS the most prevalent cause of ovulatory dysfunction. Prolong anovulation periods are probably related to increased infertility [25]. Whereas in our study infertility was observed in 62 % of the cases of females which is divergent as compared to other studies.

The qualitative approach of our study has assured that we have sampled the extensive range of females with PCOs. However the study might not be immune from observer and recall bais. Considering the observations of our study and to what extend the diagnosis of PCOs will be consistent with other criteria will be revealing to discover more facts about the identification of the disease.

CONCLUSION

It was predicted in our study that revised follicular volume and ovular volume criteria had low sensitivity but high specificity as compared with Rotterdam Criteria. Furthermore, the most common clinical feature found in females diagnosed with polycystic ovarian disease was menstrual irregularities.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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