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Original Research Article

Comparison between unilateral and bilateral polycystic ovaries in adolescent PCOS

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Abstract: Classic polycystic ovarian syndrome is described as bilateral ovarian involvement. Rotterdam consensus has defined unilateral polycystic ovary also. Very few studies are in literature regarding unilaterality of PCO and still less in adolescent single PCO. Clinical and ultrasound characteristics of 144 adolescent girls with PCOS were collected as part of a prospective cohort study and this data was used to compare unilateral and bilateral PCO. The objectives are to compare the clinical and Ultrasound characters of girls having PCOS and unilateral PCO with those having bilateral involvement and to study the clinical and ultrasound features of girls having PCOS and no polycystic ovaries Data collected from 144 adolescents diagnosed to have PCOS as part of a community study was used. Appropriate statistical methods were used to find out significant association between the variables. No significant differences were noted regarding the variables between unilateral and bilateral PCO. Adolescents with PCOS did not exhibit any difference in their clinical behaviour depending on number of ovaries involved.
Keywords: Polycystic ovarian syndrome (PCOS), adolescent.

INTRODUCTION

Polycystic ovarian syndrome (PCOS), initially identified in adult women, has now been increasingly reported among adolescents. It is essentially an endocrine disorder which can lead onto systemic complications like diabetes, metabolic syndrome, cardiovascular risk, infertility and endometrial hyperplasia. The aetiology of PCOS is unknown; a genetic predisposition has been proposed, which is evidenced by inheritance in families and identical twins. The genetic factors are influenced by diet and physiological variations during pubertal growth spurt (insulin resistance and hyperinsulinism) resulting in hyperandrogenism, which is the biochemical hallmark of PCOS. Ovulatory dysfunction follows, manifested by irregular menstruation or oligomenorrhoea and polycystic ovaries (PCO) on ultrasound.

The widely accepted criteria for diagnosis of PCOS in adults is Rotterdam criteria.[1] According to this criteria, patients are required to have at least two of the following three factors for the diagnosis of PCOS: (a) Ovulatory dysfunction (b) Clinical or biochemical evidence of hyperandrogenism, and (c) Polycystic ovaries. Ovulatory dysfunction manifests as oligoovulation or anovulation in adolescents. Menstrual cycle lasting more than 40 days is considered as oligomenorrhoea. Clinical hyperandrogenism is evidenced by presence of acne, acanthosis nigricans and hirsuitism. Biochemical hyperandrogenemia is the most common laboratory abnormality in PCOS. Ultrasound criteria for polycystic ovaries include presence of either 12 or more follicles measuring 2–9 mm in diameter or increased ovarian volume (>10 cm^3), or both [2]. The presence of a single polycystic ovary is sufficient to make diagnosis of polycystic ovarian syndrome [3].

Since the initial description of polycystic ovarian syndrome by Stein and Leventhal in 1935, considerable amount of research work took place about various aspects of the syndrome. The first report of a unilateral polycystic ovarian syndrome appeared in the British Journal of Obstetrics and Gynaecology in 1964 [4]. Though there is abundant literature of PCOS in adults; available data on PCOS in adolescents and unilateral PCO is scarce. The present study involves 144 adolescent girls with PCOS diagnosed by Rotterdam criteria, as part of a community survey [5]. The objective of the study was to assess the significance of clinical and ultrasound parameters with reference to unilateral and bilateral polycystic ovaries in adolescents. A third group of girls with normal ovaries (normal volume and number of follicles) satisfying the Rotterdam criteria were also included for analysis.

METHODOLOGY

The study was conducted in the adolescent clinic of Child Development Centre, an autonomous institution under Government of Kerala. The study group included adolescent girls aged 15–19 years of age and all patients were least 2 years postmenarchal. The data was collected using a structured questionnaire, physical examination and trans-abdominal ultrasound examination of pelvis. The variables included menstrual irregularity, obesity (calculated from BMI), body fat percentage, waist-hip ratio, hirsuitism (modified Ferriman–Gallwey score) [6, 7] and ultrasonography findings (ovarian volume and number of follicles). The hormonal analysis was not performed in this study. The study was approved by the Institute Ethical and Research Committee.

The study population was classified into three groups, based on the ovarian appearance on ultrasound - normal ovaries, unilateral polycystic ovary and bilateral polycystic ovaries. The relationship between these three groups and various other variables like age, body fat percentage, BMI, waist-hip Ratio, clinical hyperandrogenism, hirsuitism, ovarian volume and follicle number, by using Chi square test and ANOVA method (F test). Statistical analyses were performed using IBM SPSS version 20 for Windows. The graphical representation is shown by using Box – whisker plot and by multiple bar diagrams respectively.

Definition of Variables:

Menstrual irregularity: Menstrual cycle lasting more than 40 days is considered as oligomenorrhoea. One of the criteria for the diagnosis of PCOS in adolescents is oligomenorrhoea persisting 2 years after menarche [8].

Clinical hyperandrogenism: Assessed by the degree of hirsuitism using modified Ferriman–Gallwey score

Polycystic ovaries: Ovary having either 12 or more follicles measuring 2–9 mm in diameter or increased ovarian volume (>10 cm^3) [9].

BMI: Measured as weight in kilogram divided by height in meter, ^{2} and classified based on modified ELIZ chart for adolescents [5].

STATISTICAL ANALYSIS AND RESULTS

144 adolescent girls diagnosed to have polycystic ovarian syndrome by Rotterdam criteria were included in the study. The mean age of the study population was 17.1 years. A positive family history of PCOS, especially in the mother, was present in 12.5% of the girls. Among them, 141 (97.91%) patients presented with menstrual irregularity, and 118 (81.94%) patients presented with clinical features of hyperandrogenism. The ultrasonography examination identified 119 (82.63%) girls with polycystic ovaries according to the Rotterdam criteria. The findings were unilateral polycystic ovary in 59 girls (48.73%) and bilateral in 62 girls (51.27%) and normal ovaries in 23 girls (17.36%). The baseline characteristics of the study population in relation to the ovarian group are shown in table 1.

Among 144 adolescents, maximum number (95) 65.97% were in the overweight category (category 3, BMI > 22kg/ m^2) and 30 were obese (category 4, BMI >25kg/ m^2). Seventeen of the 23 girls (73.91 %) with normal ovaries were overweight (Figure 1). The comparison done by Pearson chi-square test did not yield statistically significant association (p – 0.796). With regard to follicle number per ovary and ovarian volume, the association was statistically significant ($p < 0.001$). The mean ovarian volume on the right side was 7.34 ml and on the left side was 6.26ml for normal ovaries subset. In unilateral PCO, the ovarian volume increased to 11.45ml and 7.98ml respectively and in bilateral PCO (Figure 2). The mean right ovarian volume was 14.25ml and left ovarian volume was 13.85ml. Menstrual irregularity, body fat percentage,

waist / hip ratio and clinical hyperandrogenism did not show such differences between these 3 groups (Table 2 & 3).

Overall, clinical hyperandrogenism and hirsuitism were more prevalent in the normal ovaries group and bilateral PCO group. ANOVA method using F test showed significant association between the variables ($p < 0.001$). However, in this study, maximum prevalence of hirsuitism was noted in the group of girls having normal ovaries, which cannot be explained (Table 4). The conclusion that can be drawn by these observations is that, there is no relation of elevated FG scores with laterality or size of ovaries.

Table 1: Baseline characteristics of the study population in relation to the ovarian group

	Normal ovaries			Unilateral polycystic ovary			Bilateral polycystic ovary		
	Number	Mean	SD	Number	Mean	SD	Number	Mean	SD
Age (years)	23	17.2	1.28	59	17.05	1.41	62	17.33	1.29
Body fat %	23	27.08	6.22	59	26.22	9.36	62	25.42	8.88
BMI (kg/m^2)	23	23.59	2.87	59	23.15	3.91	62	22.97	4.28
W/H ratio	23	0.868	0.039	59	0.880	0.039	62	0.869	0.040
Right OV (ml)	23	7.30	1.64	59	11.45	6.16	62	14.25	5.37
Left OV (ml)	23	6.26	2.57	59	7.98	3.06	62	13.85	4.34
FNPO (right)	23	2.39	0.65	59	2.98	1.05	62	3.48	0.78
FNPO (left)	23	2.22	0.90	59	2.58	0.93	62	3.34	0.94
FG score	23	8.96	3.6	59	6.15	5.54	62	4.60	4.25

BMI – Body Mass Index, W/H ratio – waist / hip ratio, OV - ovarian volume, FNPO - Follicle Number per ovary, FG - Ferriman Galway score for hirsuitism

Table 2: Relationship between characteristics and ovarian group

	F	Significance
Age	0.713	0.492
Body fat	0.331	0.719
W /H ratio	1.578	0.210
Right OV	14.708	<0.001
Left OV	56.390	<0.001
FG score	07.184	0.001

W/H ratio – waist / hip ratio, OV - ovarian volume, FG - Ferriman Galway score for hirsuitism

Table 3 - Relationship between characteristics and ovarian group

Characteristics	Pearson Chi- Square	df	Significance
BMI	3.103	6	0.796
FNPO Right	63.823	2	<0.001
FNPO Left	14.926	2	<0.001
Menstrual irregularity	1.050	2	0.591
Clinical Hyperandrogenism	4.549	2	0.103

BMI – Body Mass Index, FNPO - Follicle Number per ovary

Table 4: Distribution of hirsuitism in the relation to ovarian group

Ovarian appearance	Hirsuitism		Ferriman Galway score	
	Present	Absent	Maximum score	Mean score
Normal ovaries	20	3	13	8.96
Unilateral polycystic	24	35	18	6.15
Bilateral polycystic ovary	43	19	14	4.60

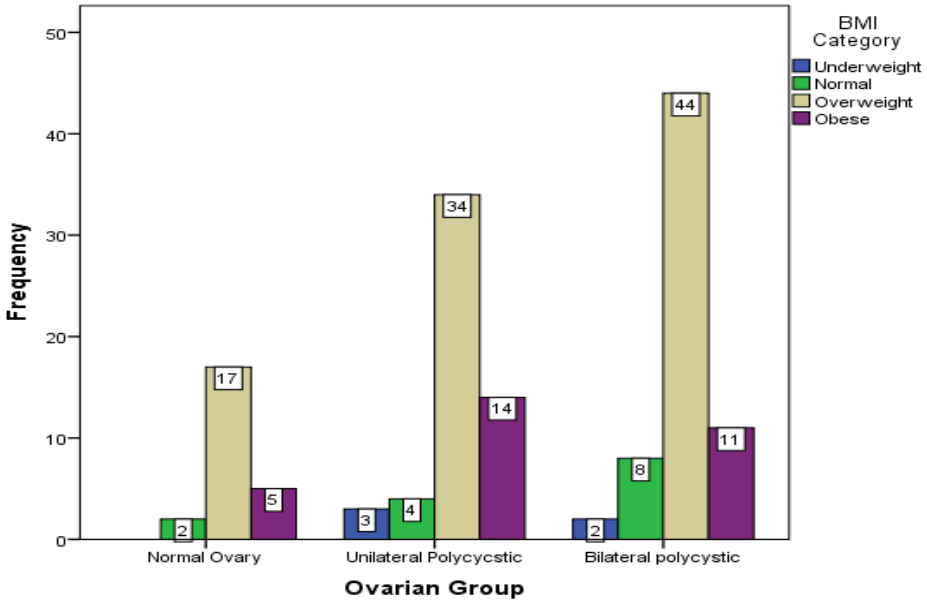

Fig 1: Relationship between ovarian group and BMI

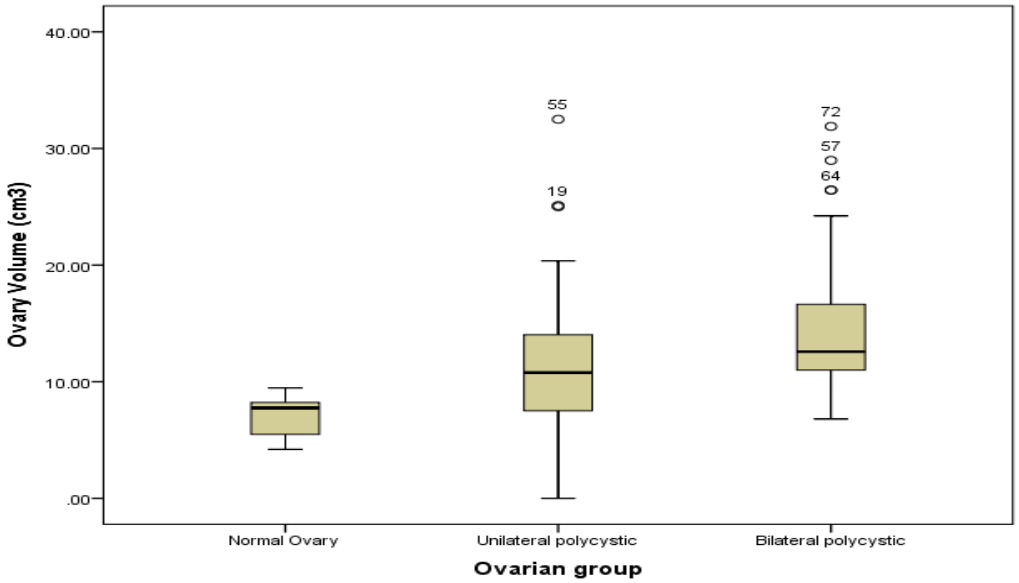

Fig 2: Boxplot showing relation between ovarian group and ovarian volume

DISCUSSION

PCOS has been classically described as "bilateral ovarian enlargement" with obesity, hirsuitism and infertility. The occurrence of a single PCO with contralateral ovary being normal was first reported in 1964 [4]. Later, the ultrasound criteria were added to the definition of PCOS in International consensus definition and this definition incorporated the unilateral polycystic ovary also [2]. According to the Rotterdam criteria, one ovary fitting the international consensus definitions, or the occurrence of one of the criteria, is sufficient to qualify as PCOS.[10] The available literature on studies incorporating data on unilateral PCO is scarce. Yao *et al.;* in their study explored the characterization and relationship of unilateral PCO with PCOS [11]. Twelve women with unilateral PCO were selected after laparoscopy and studied for clinical,

biochemical and ultrasonography evidence of PCO. Eight cases with typical PCOS were included (bilateral PCO) as control and both groups were compared. They observed unilateral PCO in classic PCOS and in non PCOS patients.

Unilateral PCO could be taken as a special entity with some differences from the Classic PCO. Unilateral PCO having some of clinical and biochemical features, but in a milder form. Only small subsets of patients in previous studies of unilateral PCO met the standard diagnostic criteria of PCOS. The sample size of these studies was less and these studies also stressed the importance of larger volume studies in future. Our study included 144 patients and our study population also had one subset of patients with normal ovaries meeting the Rotterdam criteria of PCOS. Our study did not demonstrate any significant relationship of unilateral or bilateral PCO to the other variables, a finding almost consistent with that of Yao *et al.;* [11].

A retrospective study published from the US analysed 23 adolescents aged 10 to 18 years [12]. The subjects were divided into two groups: PCOS with unilateral PCO and bilateral PCO. Patients with normal ultrasound and PCOS were excluded from study. Clinical, biochemical and radiological features were evaluated between the two groups. Comparison of Insulin resistance and metabolic syndrome was undertaken between the groups. No statistically significant difference noted between the two groups; thus suggesting that unilateral polycystic ovary may represent an early stage along the progression to bilateral PCOS. Over time the unaffected ovary in patients with unilateral PCO will continue to increase in volume, leading to bilateral disease. Metabolic abnormalities of unilateral PCO highlight that though being a precursor of bilateral PCO, it still imparts considerable comorbidity risks [12].

In the present study, insulin resistance was not analysed. The major drawback of our study was the lack of assessment of hormonal profile with PCO. The remaining results are consistent with those reported in literature. Hence, close follow up by strict clinical and biochemical criteria can reduce bias and give a clear profile of adolescent PCOS with single ovarian PCO.

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