CORRELATION OF OVARIAN VOLUME IN WOMEN WITH POLYCYSTIC OVARY SYNDROME (PCOS) WITH CLINICAL AND HORMONAL FINDINGS

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Abstract

The aim of this study is to evaluate the ovarian morphological findings in infertile women given the diagnosis of polycystic ovarian syndrome (PCOS) based on chronic anovulation (menstrual disorders) and evidence of hyperandrogenism (hirsutism & acne), and whether clinical and selected hormonal findings correlate with ovarian volume.

Over 12 months period (from 1st of Jan 2005 till the 1st of Jan 2006), the ovarian morphology were determined by transabdominal ultrasound in107 patients included in this prospective study in infertility clinic in Basrah Maternity and Child Hospital. Clinical and endocrinological state was evaluated by history, physical examination and measurements of serum testosterone, Luteinizing hormone (LH), follicle-stimulating hormone (FSH), prolactine and progesterone levels. Their ages ranged (18-40 years), mean (27.28 ± 4.4) and their mean body mass index (BMI) was (29.77± 4.0 kg/m2). Ultrasound studies showed all women studied (100%) had altered ovarian morphology (both ovaries had multiple small cyst of (2-9mm), mean total follicular number (12.3±1.7) & thick capsule. Bilaterally enlarged ovaries were found in 84 (78.5%), mean (15.6± 2.04 cm^3) and normal ovarian size were found in 23(21.5%) mean (6.6± 1.1 cm^3). All patients who had enlarged ovaries were compared with those who had normal ovarian size regarding clinical and hormonal findings in order to determine a possible association between these findings and ovarian volume. Hirsutism was present in (78.5%), acne in (68.2%), Obesity (BMI>25 kg/m^2) in (87.8%), menstrual disorders in (100%), manifested as oligomenorrhoea in (77.6%) and secondary amenorrhea in (22.4%). Comparing these clinical findings between patient who had enlarged ovaries and those who had normal ovarian size, this study has confirmed that hirsutism, acne and obesity were significantly higher in women who had enlarged ovaries the values were: (84.5% versus 56.5%), (73.8 %versus 47.8%) and(92.9% versus 69.6%) respectively, whereas oligomenorrhoea occurred more frequently in women with normal ovarian size (82.6% vs. 76.2%), the difference was statistically non significant p.value>0.05. No significant relationship was found between ovarian volume and amenorrhea. Analysis of biochemical data showed that women with PCOS were found to have elevated Serum testosterone levels (1.3±0.74ng/ml), elevated LH (11.80 ± 4.2 miu/ml) and elevated LH/FSH ratio (1.90 ± 1.03) whereas all women were found to have normal prolactin levels (10.8 ± 4.0ng/ml). Comparing these hormonal levels between women who had enlarged ovaries and those who had normal- sized ovaries we found that serum testosterone, LH & LH/FSH ratio were significantly higher in women who had enlarged ovaries. Subtle differences existed between ovarian volume in hypretestosteonemic & hyperluteinizenemic subgroups of polycystic ovarian syndrome compared to normotestosteronemic & normoluteinizenemic ones. With significant relationship was found between the ovarian size and testosterone & LH levels p. value< 0.05. A significant differences also existed between ovarian volume in elevated LH/FSH ratio subgroup of polycystic ovarian syndrome compared to normal LH/FSH ratio ones. P. value 0.001. Whereas no statistical significant difference was found between ovarian volume and FSH levels. Hirsutism, acne and obesity correlated positively with total ovarian volume (r=0.282, p-value 0.002), (r=0.229, p- value 0.009) (r=0.372, p. value 0.0001) respectively. While Oligomenorrhoea and amenorrhea showed negative correlations with total ovarian volume. Total ovarian volume correlated positively with Serum testosterone levels, LH and LH/FSH>2, (r=0.518, p- value 0.0001), (r=0.563, p- value 0.0001), (r=0.266, p- value 0.01) respectively. It can be concluded from the present study that ultrasound scanning provide a non- invasive and accurate procedure for the assessment of ovarian morphology (specifically ovarian volume).

And when clinical diagnosis of PCOS was made, virtually all women were found to have characteristic ovarian morphology that extending from apparently normal to markedly enlarged cystic ovaries. Hirsutism acne, obesity, serum testosterone levels, LH and LH/FSH ratio correlated sssstrongly with increased ovarian size. These results allow us to suggest that ovarian size > 10 cm^3 in women with PCOS with hyperandrogenism & menstrual disorders might be predictive of endocrine profiles, and emphasized the importance of careful assessment of ovarian volume by Ultrasound.

Introduction

Polycystic ovary syndrome (PCOS) is one of the commonest endocrinopathies affecting 5%-10% of women of reproductive age[1]. While 1t has been described as a disorder "without identity"[2] and its name is based on alteration in ovarian morphology, until recently, the diagnosis has been based on the findings of hyperandrogenism and chronic an ovulation[3].

At recent joint asrm/eshre consensus meeting, new guidelines for the diagnosis of PCOS have been put forth giving an important role to altered ovarian morphology[4,5]. The finding of a polycystic ovary on ultrasound in association with either hyper-androgenism or anovulation is considered sufficient to make the diagnosis of PCOS according to the new definition[4,5].

However, there is known variability in morphology as described by ultrasound (US). Increased ovarian size has been considered to be the most reliable criterion[6], yet it has been reported recently that only a minority of patients with PCOS diagnosed on the basis of hyperandrogenism and chronic anovu-lation (National Institutes of Health criteria)[3] have increased ovarian size[7]. Classic ultrasound findings such as a dense stroma[6], are no longer required[8] for the diagnosis of polycystic ovary according to the new definition[4,5].

Using laparotomy followed by histological confirmation, Stein and Leventhal were the first to describe the presence of polycystic ovarian morphology together with amenorrhea,

hirsutism, and obesity[9]. Since then, the association between the presence of typical ovarian morphology and clinical and biochemical indices of (PCOS) has been confirmed[10]. Both LH and testosterone levels are elevated; with normal serum FSH levels[11]. This peculiar hormonal imbalance correlates positively with adverse fertility and pregnancy outcome[12].

The advent of US scanning provide a non-invasive procedure for the assessment of ovarian size, morphology and internal structure namely the follicles and stroma. Swanson et al were among the first to use high - resolution real - time ultrasound (static B – scanner, 3.5 MHz, Tran abdominal) to describe the ultrasound ovarian volume enlargement associated with PCOS[13]. Adams et al refined the ultrasound diagnosis of PCO to include follicular number and stroma characteristics. The typical polycystic pattern was defined by the presence of > 10 cysts measuring 2-8 mm in diameter arranged peripherally around a dense core of stroma or scattered throw an increased amount of stroma[14].

Ultrasound finding of polycystic ovaries in the general population is in the order of (17-22%)[15] and in women with anovulation and idiopathic hirsutisim is much higher (90%)[16]. Although several US features such as ovarian volume and stromal hypertrophy[17] and increased stromal blood flow[18]. Have been shown to correlate accurately with PCOS, correlations between the degree of ultrasound morphological changes and the severity of the endocrinopathy in women with PCOS has not been extensively investigated[19]. The present

prospective study was carried out to evaluate the transabdominal ultrasound ovarian morphological features (specifically the ovarian volume) in women with PCOS in which the diagnosis was made solely on the basis of classic clinical criteria of hyperandrogenism and chronic anovulation, and to correlate it with different clinical and selected hormonal findings selected hormonal findings.

Material and methods

This prospective study was conducted over a 12 months period (from the I[st]of January2005 till 1st of January 2006) on a total of 107 women with PCOS. They were complaining of infertility more than 2 years, and were referred by gynaecologist to the infertility clinic in Basrah Maternity and Child Hospital for treatment by assisted conception.

After taking a proper history, all patients were thoroughly examined clinically (by the same Gynecologist), and their findings were recorded. The following information were obtained including name, age, gravity &parity, duration of infertility, menstrual disorders, evidence of hyperandro-genisim (hirsutism and acne), family and drug history.

All women studied had no other endocrine disorders such as galactorrhoea, thyroid dysfunction, diabetes mellitus, Cushing's syndrome, non classical adrenal hyperplasia and androgen secretary tumors. None of the patients received any form of hormonal treatment in the preceding 3 months. The diagnosis of PCOS was established on the basis of the association one of the clinical criteria (hyperandrogenisim, and chronic anovulation (which was defined by the absence of ovarian function for at least three consecutive months with the exclusion of other endocrine disorders[3]. Oligomenorrhoea can be defined arbitrarily as one in which the intermenstrual cycle lasts longer than 35 days. Secondary amenorrhoea can be defined as absence of menstruation for six months[20].

The degree of oligomenorrhoea was classified according to the normative data of Treloar and colleagues[21].

General examinations including built, hair distribution, thyroid and breast examination. Body weight and height were recorded for determination of body mass index (BMI) measured by weight (kg) / height (squared meters)[22] normal BMI range (19-25kg/m^{2}), hirsutism was staged according to established criteria of (Ferriman.and Gallwey scors)[23, 24].

Hormonal measurements: In all women with oligomenorrhoea & amenorrhoea, withdrawal bled was induced with 5 mg oral medroxyprogesterone acetate (provera) twice daily for 7 consecutive days[25]. Basal serum testosterone levels, LH, FSH, & prolactin were assessed on day 3 of the cycle in the same hospital laboratory and read by the same person. Testosterone concentrations were measured by radioimmunoassy. The intra-assay variation was <4% and the inter-assay variation were <11%, results are expressed as ng /mL. Serum LH and FSH concentrations were measured by means of conventional immunodiometric assay. The intra-assay variation was < 5 % and the inter–assay was < 8%, results are expressed as miu/mL.

A raised serum testosterone level, LH level, FSH level and PRL were defined as > 0.9ng /mL, > 8miu / mL, > 12miu/ mL and > 20ng/mL respectively. As these values were the upper limits of the normal reference range of our local laboratory. LH / FSH ratio was estimated and raised ratio was defined a > 2[23].

Ovulation was confirmed by serum progesterone levels measurement on day twenty first of the cycle. Ovulation was considered satisfactory when serum progesterone measurements were > 30 nmol / L in two successive cycles[26].

Ultrasound assessment: In all patients ovarian volume and morphology were

determined by single experienced sonographer, using 3.5 MHz –curved array Linear scanner(trans abdominal ultrasound)on the same day as hormonal measurement were taken. After visualization of the ovaries with the use of a full bladder technique, the following sonographic findings were recorded: 1- Ovarian volume was calculated by the formula for a prolate ellipsoid: (1/2 x length x width x thickness)[27]. 2- Total number, diameter and distribution of the cystic structures per ovary were counted and recorded in mm. 3- Ovarian capsule, whether thick or thin.

Polycystic ovarian morphology was diagnosed when there were >10 follicles with diameter 2-9 mm arranged peripherally or scattered throughout an echo dense stroma and thick capsule[15,28]. Average normal sized ovaries are (2-10mm).Ovarian volume > (10 cm^3) was considered increased[29].

According to US findings, all patients who had enlarged ovaries were compared with those who had normal-sized ovaries regarding clinical and hormonal findings in order to determine a possible association between clinical, and hormonal findings and ovarian volume.

Statistical analysis was performed in SPSS for windows statistical package. Data are expressed as mean + (SD), & in percentage. The data used for statistical analysis was the means of the observed values for the right and left ovarian volumes. Student's–t test & Chi-square test($X2$) were used as a test of significance between means & percentages respectively. P < 0.05 was considered significant. Analysis of variance (ANOVA) was used to demonstrate whether if there are any differences in endocrine parameters and ovarian volume. P<0.05 was considered significant. Correlation analyses were performed using Spearman's & Pearson's correlation coefficient tests.

Results

One hundred seven women were included in this study. Their ages range from18-40 years, mean (27.28 ± 4.4 years) & mean BMI was (29.77 ± 4.00 kg /m2).(Table.I) All women with menstrual dysfunction had a withdrawal bleed within 2-7days after completing the progestational agent course.

The ultrasound appearance of the ovaries is illustrated in (Table II). The ovaries showed characteristic polycystic morphology. Mean total ovarian volume was (13.6 ± 4.1cm3) and the mean total follicular number (12.3 ±1.7mm). Both ovaries were enlarged in 84 (78.5%) with a mean ovarian volume of (15.6 ± 2.04 cm3). The ovaries were of normal size in 23 (21.5%). with a mean ovarian size of (6.6 ± 1.1cm3). All polycystic ovaries were found to have thick capsule. The mean total follicular numbers were (13.6 ± 1.2mm) in women with enlarged ovarian size and (11.2±0.7mm) in women with normal ovarian size. There was no statistical significant difference were obtained between the mean ovarian volume of right and left ovaries in women with PCOS.(Table III)

The clinical features are presented in (Table IV). Ninety one women (85%) were found to have primary infertility and 16 (15%) of woman were found to have secondary infertility. Hirsutism was present in 84 (78.5%), acne in 73 (68.2%), oligomenorrhoea in 83 (77.6%),all women with oligoamenorrhoea were found to have vaginal bleeding at interval of 45 days -3 months, secondary amenorrhoea in 24 (22.4%) and obesity(BMI >25 kg/m2) was recorded in 94 (87.8%) of women with PCOS.

Comparison between PCO women who had enlarged ovaries versus those who had normal ovarian size showed that hirsutism, acne and obesity were found to be higher in group with enlarged ovaries. The values were (84.5% vs. 56.5%), (73.8% vs. 47.8%) and (92.9% vs.

69.6%) respectively. The differences were statistically significant p. <0.05.

In spite of higher percentage of secondary amenorrhoea was detected among women who had enlarged ovaries in comparison to women with normal ovarian size (23.8% vs. 17.4%), the difference was statistically non significant On the other hand, higher percentage of oligoamenorrhoea was found among women who had normal ovarian size in comparison to women who had enlarged ovaries (82.6% vs. 76.2%); the difference was statistically non significant (Table IV).

Biochemical indices are illustrated in (Table V). Women with PCOS were found to have elevated mean serum testosterone, Serum LH and LH/FSH ratio. The values were (1.3±0.74), (11.80±4.2) and (1.90±1.03) respecttively, whereas the mean FSH (5.6± 3.6) and PRL (10.8±4.0) levels were found to be within a normal ranges. Comparing these biochemical findings between patients who had enlarged ovaries and those who had normal ovarian size, this study has confirmed that mean serum testosterone level, mean LH level and LH/FSH were found to be significantly higher among women with enlarged ovaries. (1.4±0.69 vs. 0.69±0.65), (12.12±4.23 vs. 6.6±3.08) & (2.05±1.06 vs. 1.37±0.90) respecttively. P values-0.001, 0.001 & 0.001.

While mean FSH level among women who had enlarged ovaries was (5.9±3.98) in comparison to (4.84±2.00) among women who had normal- sized ovaries. The difference was statistically non significant.

The mean serum prolactin levels showed normal levels in all women with PCOS. The values were (10.5±4.02) in women who had enlarged ovaries and (11.4±4.00) in those who had normal ovarian size.

(Table VI) shows the relationship between ovarian volume and biochemical findings. Elevated testosterone levels was found among 71/107 (66.4%) with a mean level (1.6±0.5), the remaining 36/107 (33.6%) women showed normal testosterone level with a mean level (0.47±0.3).

Among women who had enlarged ovarian size elevated testosterone levels was found in 63/84 (75%), mean (1.6±0.6) and 21/84 (25%) were found to have normal testosterone levels mean (0.57±0.3). While among women who had normal ovarian size elevated testosterone level was detected among 8/23 (34.8%), mean (1.37±0.6) and normal testosterone levels was found among 15/23 (65.2%), mean (0.32±0.2). Subtle differences existed between ovarian volume in hypretestosteonemic, subgroups of polycystic ovarian syn- drome compared to normotestostero- nemic ones. With significant relationship was found between the ovarian size and testosterone levels p. value< 0.0001.

Elevated LH levels was found among 73/107 (68.2%) with a mean (13.3±3.3), and normal LH levels was found among 34/107(31.8%) with a mean level (5.5±1.8). Among women who had enlarged ovaries 62/84 (73.8%) showed elevated LH levels with a mean level (13.7±3.4) and 22/84 (26.2%) were found to have normal levels with a mean level (5.9±1.03).On the other hand women who had normal sized ovaries, elevated LH level was detected among 11/23 (47.8%) with a mean LH level (9.2±1.8), and normal LH level was found among 12/23 (52.2%) with a mean of (4.8±1.8). Significant differences existed between ovarian volume & LH levels in hypreluteinizenemic, subgroups of poly- cystic ovarian syndrome compared to normoluteinizenemic ones. P.value< 0.0003. Another findings in this study, normal FSH levels was found among 96/107 (89.7%) with a mean 6.6±3.6 and decreased FSH was found among 11/107 (10.3%) with a mean (2.4±1.3).

Within enlarged ovarian volume group, normal FSH level was found among

78/84(92.8%) and decreased FSH level in 6/84 (7.1%) with a mean (2.4±1.8). On the other hand within a normal ovarian volume group, normal FSH level was found among 18/23(78.3%) with a mean (5.5±1.7), and decreased FSH level was found among 5/23 (21.7%) with a mean of (2.4±0.23). There was no significant relationship between US ovarian volume and serum FSH level.

Elevated LH/ FSH ratio (>2) was found among 60/107(56.1%) with a mean (3.00±1.02), while 47/107 (43.9%) showed normal LH /FSH ratio with a mean level (1.29±0.4).

Within enlarged ovarian volume group 50/84 (59.5%) had elevated LH/FSH ratio with a mean (3.12±1.09) and 34/84 (40.5%) had normal LH / FSH ratio with a mean (1.48±0.41). On the other hand within normal ovarian volume group, 10/23 (43.5 %) were found to have elevated LH /FSH ratio with a mean (2.6±0.45) and 13/23 (56.5%) were found to have normal LH / FSH ratio with a mean (0.96±0.56). A significant differences also existed between ovarian volume in elevated LH/FSH ratio subgroup of polycystic ovarian syndrome compared to normal LH/FSH ratio ones. P value 0.001. Whereas no statistical significant difference was found between ovarian volume and FSH levels value 0.001.

Table VII shows the correlations between total ovarian volume and clinical features. Positive correlations were found between total ovarian volume and hirsutism(r=0.282, p=0.002), & acne (r= 0.229, p=0.009) and obesity (r=0.372, p=0.0001), while oligomennorrhoea and amennorrhoea showed negative correlations with total ovarian volume (r=0.063, p=0.259) and (r=0.033 p=0.226) respective.

Table VIII shows the correlations between the total ovarian volume and hormonal parameters. Positive correlations was found between total ovarian volume and serum testosterone, serum LH and LH / FSH ratio (r=0.518, p=0.0001), (r=0.563, p=0.0001) and (r= 0.266, p=0.01) respectively. Negative correlations was found between total ovarian volume and serum FSH (r=0.204, p=0.480).

Discussion

This study is one of few reports on the accuracy of US diagnosis of polycystic ovaries that were confirmed by clinical and hormonal findings. It has determined the prevalence of abnormal ovarian findings in 107 women when the diagnosis of PCOS is made clinically. In addition to that, identification a possible association between clinical findings and selected hormonal concentrations and ovarian volume were determined.

In this study, we found that altered ovarian morphology occur in all women with clinical diagnosis of PCOS. Our findings are close to study done by Eneico et al[30]. After calculation the ovarian volume, we found 78.5% of women had increased ovarian size while 21.5% were found to have normal ovarian volume, but with classical ovarian findings on US (Table II). Our results are close to that reported by[28,31].

It is interesting that in creating the new criteria for the diagnosis of PCO, the consensus panel did not find the classical appearance of follicle distribution and increased stromal mass to be necessary for the diagnosis[8]. Although other investigators have stressed the importance of increased ovarian stroma, or the ratio of stroma / total area[32], the consensus panel stated that this is reflected in total volume determinations volume determinations[8]. Because the peripherial orientation of cystic structures is not a criterion for the diagnosis for the current diagnosis[4,5,8], but was necessary for our diagnosis of the classical PCO[16] so it is quite possible that our findings, none of women studied having "normal ovarian morphology".

In the present study the clinical features in women with PCOS were evaluated and we found all women with PCOS presented with anovulatary infertility. Our finding is higher than that of kosta et al[25].

In this study, hirsutism and acne were present in (78.5%) and (68.2%) of patients respectively. Our results were higher than that reported by[33,34].

When comparing these clinical findings in women who had enlarged ovaries with those who had normal- sized ovaries, we found hirsutism and acne were higher in women who had enlarged ovaries (Table IV). The differences were statistically significant and in agreement to that reported by[27,31,35].

Another finding in our study, obesity has been proven to be important and common clinical findings. It was present in (87.8%) of patients. This result is in agreement to that of[35,36]. A higher significant relationship of obesity was found in women who had enlarged ovaries in comparison to women with normal ovarian size. Our result is in agreement to that of[27].

Menstrual disorder is another main clinical presentation, was also evaluated in our study. Approximately (77.6%) of patients presented with Oligomenorrhoea. Our result is similar to that of[37].

The prevalence of oligomenorrhoea was higher among women who had normal-sized ovaries compared with women who had enlarged ovaries (Table IV).The difference was statistically non significant and in agreement with other studies[27,33].Amenorrhoea was present in(22.4%) of women with PCOS, our finding is higher than that of[35]. In this study a higher non significant percentage of secondary amenorrhoea was found among women who had enlarged ovaries (23.8%) in comparison to those women with normal sized ovaries (17.4%).Our results are in agreement to that of[27]Biochemical data

was also analyzed in our study. Serum testosterone levels & LH were elevated in women with PCOS. Our finding is in agreement to that of[30,31,33,36]. In this study, we documented that women who had enlarged ovaries had higher mean serum testosterone levels compared with women who had normal ovarian size (Table V). The difference was statistically significant and in agreement with other studies[31,29]. In this study we document that a significant differences existed between ovarian volume & serum testosterone levels. Elevated serum testosterone was found in (75%) & normal testosterone in (25%) of women who had enlarged ovaries. Whereas elevated serum testosterone levels was found in (34.8%) & normal testosterone in (65%) of women who had normal ovarian size. (Table VI) These findings are in contrast to that of[27]. Who found no significant relationship between the US ovarian volume and serum testosterone levels. Our results allow us to suggest ovarian enlargement as a marker of excessive androgen production and disturbance of menstrual cycle in PCOS.

Also we reported that women who had enlarged ovaries had a higher mean serum LH levels compared with those who had normal-sized ovaries (Table V). The findings are in contrast to that of[27]. In this study we also document that a significant differences existed between ovarian volume & serum LH levels. Elevated serum LH was found in (73.8%) & normal LH in (26.2%) of women who had enlarged ovaries. Whereas elevated serum LH levels was found in (47.8%) & normal LH in (52.2%) of women who had normal ovarian size. (Table VI) These findings are in contrast to that of[27]. Serum FSH level was also analyzed in patients with PCOS , we found normal FSH level in 89.7%and decreased FSH level in 10.3%.This result is similar to that reported by[30]. In this study we also document that no significant differences existed between ovarian volume & serum

FSH levels. Normal serum FSH was found in(92.8%) & decreased FSH in (7.1.%)of women who had enlarged ovaries. Whereas normal serum FSH levels was found in (78.3%) & decreased FSH in (21.7%) of women who had normal ovarian size. (Table VI) These findings are in contrast to that of[27]. Another finding in our study that, elevated LH/FSH ratio was found among 56.1% women with PCOS. Our finding is in agreement with other studies[27,30]. Also we document that a significant differences existed between ovarian volume & LH/FSH ratio. (Table VI).Our results are in agreement to that of[29]. Correlations of total ovarian volume with clinical features and hormonal parameters were evaluated in the present study. We demonstrate that hisutism, acne and obesity correlated positively with ovarian volume (Table VII). These results are in agreement to that of[12,34]. Menstrual disorders are a characteristic feature of women with PCO. However, it is interesting that we found a negative significant correlation between total ovarian volume and oligomenorrhoea and amenorrhoea. These results are in agreement to that of[27]. The present study demonstrates that total ovarian volume had appositive correlations with serum testosterone levels, LH and LH /FSH ratio(Table VIII).These findings are in agreement to that of[12,30 & 34].

Hyperandrogenism is a characteristic feature of women with PCOS; however, it is expecting to find a positive significant relationship between total ovarian volume and testosterone levels, hirsutism and acne.

In conclusion**,** we have shown that in patients with classic PCOS, enlarged ovaries are present in 78.5% & 21.5%of patients had normal ovarian volume and all of these patients, have altered ovarian morphology. Hirsutism, acne, Obesity, serum testosterone levels, serum LH and LH/FSH ratio>2 were significantly higher in women who had enlarged ovaries in comparison to those who had normal ovarian size and strongly correlated with total ovarian volume. Ovarian size >10cm^3 might be predictive of endocrine profiles in women with PCOS and the value of US studies in the assessment of ovarian volume is emphasized. I would like to thank Dr. Assal B. Shindi, Department of surgery; College of Medicine, University of Basrah and Dr. Jehhan Mageed AL–Mukh, Department of Microbiology, Basrah Maternity and Children Hospital.

Table I: Age and body mass index of women with PCOS

Characteristic	Total No : (107)
Age (in years)	27.28 ± 4.4
BMI(kg/m^2)	29.77 ± 4.00

Data presented as (mean ± SD)

**Table II. Ovarian ultrasound features in women with PCOS**

Variables	Total No : (107)	Women with enlarged ovaries No: (84) % (78.5%)	Women with normal ovarian size No: (23) % (21.5%)
Ovarian volume	13.6 ± 4.1	15.6 ± 2.04	6.6 ± 1.1
Total follicular number(mm)	12.3 ± 1.7	13.6 ± 1.2	11.2 ± 0.7

Data presented as (mean ± SD) or in (%)

Table III. Right and left ovarian volume in women with PCOS

Variables	Total ovarian volume in women with PCOS No: (107)	Ovarian volume in women with enlarged ovaries No: (84)	Ovarian volume in women with normal ovarian size No:(23)
Right ovary	13.6 ± 4.2	15.6 ± 2.3	6.6 ± 1.2
Left ovary	13.5 ± 4.0	15.4 ± 2.00	6.6 ± 1.1
P value	N S	N S	N S

Data presented as (mean ± SD), P- Value was determined by T test, NS: not   significant
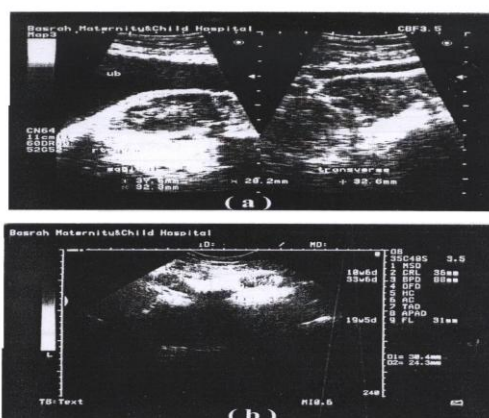
Transabdominal US – (a) RT polycystic ovary, (b) LT polycystic ovary.
The ovarian length and width are increased. The follicle number, with
a diameter mainly between 2-5 mm, is more than 10. The distribution
within the ovaries is mainly peripheral. The increased and hyperechoic
stroma occupies the center of the ovaries

Table IV .Clinical features of women with PCOS

Clinical feature	Total No :(107)	Women with enlarged ovarian volume. No: (84)	Women with normal ovarian size. No :(23)	P- value
Infertility				
Primary infertility	91 (85%)	75 (89.3%)	16 (69.6%)	0.01 S
Secondary infertility	16 (15%)	9 (10.7%)	7 (30.4%)	0.01 S
Hirsutism	84 (78.5%)	71 (84.5%)	13 (56.5%)	0.01 S
Acne	73 (68.2%)	62 (73.8%)	11 (47.8%)	0.001 S
Oligomenorrhea	83 (77. 6%)	64 (76.2%)	19 (82.6%)	N S
Secondary amenorrhoea	24 (22.4%)	20 (23.8%)	4 (17.4%)	N S
Obesity	94 (87.8%)	78 (92.9%)	16 (69.6%)	0.001 S

Data presented as the number & (%) of women reporting the clinical presentation of PCOS.
S: significant, N S: not significant

Table V: Biochemical indices in women with PCOS

Variables	Testosterone ng/ml	LH miu/ml	FSH miu/ml	LH/FSH ratio	Prolactin miu/ml
Women with PCOS Total No:(107)	1.3 ± 0.74	11.80 ± 4.2	5.6 ± 3.6	1.90 ± 1.03	10.8 ± 4.0
women with enlarged ovarian volume No : (84)	1.4 ± 0.69	12.12 ± 4.23	5.9 ± 3.98	2.05 ± 1.06	11.4 ± 4.0
Women with normal ovarian size No : (23)	0.69 ± 0.65	6.6 ± 3.08	4.84 ± 2.0	1.37 ± 0.90	10.5 ± 4.02
P- value	0.0001 S	0.001 S	0.210 N.S	0.001 S	0.275 N.S

Table VI: Relationship between biochemical indices and ovarian volume in women with PCOS

| Variables		Enlarged ovaries No: 84 (15.6± 2.3cm³)		Normal ovaries No:23(6.6±1.1±cm³)		Total N0		P- value
		N0	**%**	**N0**	**%**	**N0**	**%**	
Testosterone ng/ml	**Elevated levels**	63	(75%)	8	(34.8%)	71	(66.4%)	0.0001 HS
		mean (1.6 ± 0.6)		mean (1.37 ± 0.6)		mean (1.6 ± 0.5)		
	Normal Levels	21	(25%)	15	(65.2%)	36	(33.6%)	
		mean (0.57 ± 0.3)		mean (0.32 ± 0.2)		mean (0.47 ± 0.3)		
LH miu/ml	**Elevated levels**	62	(73.8%)	11	(47.8%)	73	(68.2%)	0.003 HS
		mean (13.7 ± 3.4)		mean (9.2 ± 1.8)		mean (13.3 ± 3.3)		
	Normal levels	22	(26.2%)	12	(52.2%)	34	(31.8%)	
		mean (5.9 ± 1.03)		mean (4.8 ± 1.8)		mean (5.5 ± 1.8)		
FSH miu/ml	**Decreased levels**	6	(7.14 %)	5	(21.7%)	11	(10.3%)	0.751 NS
		mean (2.4 ± 1.8)		mean (2.4 ± 0.23)		mean (2.4 ± 1.3)		
	Normal levels	78	(92.8%)	18	(78.3 %)	96	(89.7%)	
		mean (6.1 ± 3.9)		mean (5.5 ± 1.7)		mean (6.6 ± 3.6)		
LH / FSH ratio	**Elevated levels > 2**	50	(59.5%)	10	(43.5%)	60	(56.1%)	0.001 S
		mean (3.12 ± 1.09)		mean (2.6 ± 0.45)		mean (3.00 ±1.02)		
	Normal levels	34	(40.5%)	13	(56.5%)	47	(43.9%)	
		mean (1.48 ± 0.41)		mean (0.96 ± 0.56)		mean (1.29 ± 0.4)		

Table VII: Correlations between total ovarian volume with clinical findings.

|	Hirsutism	Acne	Oligoamenorrhoea	Amenorrhoea	Obesity (BMI>25kg/m^2)
Ovarian volume	r = -0.282	r = -0.229	r =0.063	r = 0.033	r = 0.372
	P=0.002**	P=0.009**	P=0.259 N S	P=0.226 N S	P=0.0001**

Table VIII: Correlations between total ovarian volume with biochemical indices in women with PCOS.

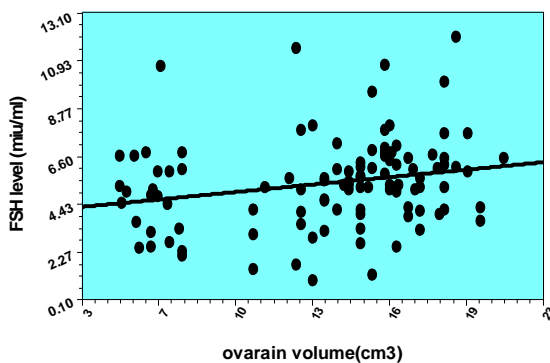|	Testosterone levels	LH levels	FSH levels	LH / FSH Ratio
Ovarian volume	r = 0.518	r =0.563	r =0.204	r =0.266
	**0.0001	**0.0001	N S	**0.01

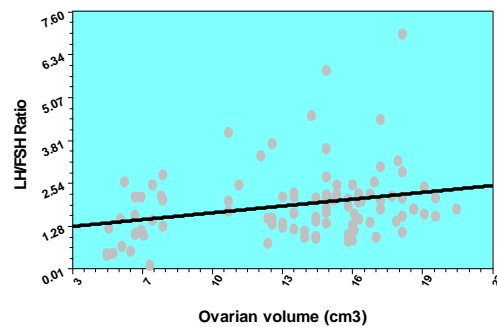P-value was determined by Pearson s correlation coefficient test
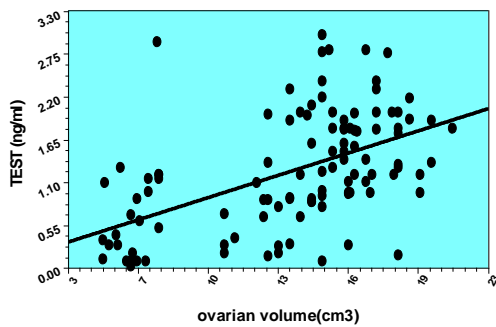
Correlation of total ovarian volume with testosterone level
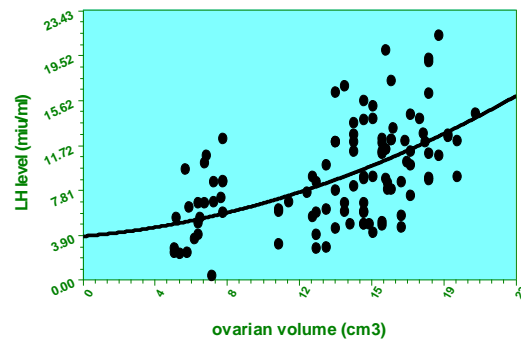
Correlation of total ovarian volume with LH level

Correlation of total ovarian volume with FSH level

Correlation of total ovarian volume with LH/ FSH ratio

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