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Prevalence of Polycystic Ovarian Syndrome in adult virgin females attendZagazig University Hospital

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Abstract

Background:*Polycystic ovary syndrome (PCOS) is one of the most prevalent endocrine and metabolic disorders in women of childbearing age. Thisstudy amid to determine the frequency of Polycystic ovarian syndrome (PCOS) among the young unmarried females to increase awareness of PCOS and to promote effective early medical interventions and healthy livesfor women.* ***Methods:****This was a prospective cross-sectional study in which 180 unmarried female between 16 to 24 yearsold attending gynecology and dermatology outpatient clinic suffering from menstrual abnormalities or symptoms of hyperandrogenism to estimate the prevalence rate of polycystic ovarian syndrome from May to November 2018.according todiagnostic criteria of the NIH, Rotterdam and the AE-PCOS. Menstrual irregularities (MI) were identified, and clinical hyperandrogenism was evaluated by self-assessment of hirsutism using modified Ferriman–Gallwey score. Blood analysis was done for measurement of prolactin, thyroid-stimulating hormone, and the androgenhormones.****Results:*** *this study revealed Prevalence rate of PCOS is 55.6% among the all presented cases, oligomenorrhea, acne and hirsutism were the most common complain in this study. Also this study showed that there is association between PCOS and sedentary life and unhealthy food habits. There was significant difference between PCOS and non PCOS in LH and prolactin level. There is disturbed LH \FSH ratio (2:1 or more).It also show that there was significant difference between PCOS and non PCOS in ovarian volume.****Conclusions:*** *Lifestyle modification as healthy food and excersise play important role in prevention of PCOS.*

Key words:*Polycystic Ovary Syndrome [PCOS], Hyperandrogenism [HA], Hirsutism, Menstrual Irregularities [MI].*

I. INTRODUCTION

Polycystic ovary syndrome (PCOS) is one of the most prevalent endocrine and metabolic disorders in women of childbearing age[1]. Despite anticipated heterogenicities , PCOS is defined by a combination of signs

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and symptoms of androgen excess and ovarian dysfunction in the absence of other differential diagnoses. The etiology behind PCOS is apparently unknown, with most reports relating PCOS development to genetic factors and/or environmental influences, including diet and lifestyle factors[2]. Considering the heterogenous nature of PCOS, many definitions were set to define the syndrome. In general, prevalence data of PCOS reported in literature are largely heterogenous for many reasons. First, the application of different diagnostic criteria among studies may affect the rates of false positive and false negative diagnosis rate with substantial influence on PCOS prevalence rates. For instance, prevalence rates have been reported as low as 1.6% using a combination of all three criteria (anovulation, hyperandrogenemia and polycystic ovary in ultrasound) and as high as 18% in similar populations using the Rotterdam criteria[3]. Second, the sensitivity of the biomarkers applied in biochemical diagnosis of PCOS are of questionable efficacy[4]. Even with sensitive markers, a suitable cut-off value distinguishing PCOS cases from healthy subjects still a major challenge[5].

This resulted in emergent application of newer markers like Prostate specific Antigen (PSA)***Maleki-Hajiagha et al.***[6]in the context of PCOS diagnosis. Third, the genetic factors implicated in different ovarian sensitivity indices among different ethnicities may also play a role as evidenced from different prevalence rates in various ethnicities[7].Nevertheless, Rotterdam definition is the most widely used PCOS classification, and it is currently supported by most scientific socities and health authorities[8]**.**The studyaimed to determine the frequency of Polycystic ovarian syndrome (PCOS) among the young unmarried females to increase awareness of PCOS and to promote effective early medical interventions and healthy lives for women.

II. METHODS:

Among 15300 cases attended Gynecology and dermatology outpatient clinics at time of the study from May to November 2018, there were 180 cases presented by symptoms suggesting polycystic ovarian syndrome (1.17%) . Only 100 cases confirmed to be PCOS (0.65%). These PCOS cases were classified according to age into two groups Group less than 20 years and other one more than 20 years.Diagnosis of (PCOS) below age of 20 years depend on laboratory and clinical symptoms and signs of hyperandrogenism. While, Diagnosis of PCOS more than 20 years diagnosed by2 of 3 Rotterdam criteria that include Clinical and laboratory symptoms and signs of hyperandrogenism, Ovulatory dysfunction, Polycystic ovaries on ultrasound.

Inclusion criteria: Age ranging from 16 to24 years.Menstrual irregularityas oligomenorrhea,amenorrhea and irregular cycles.Features of hyperandrogenism as hirsutism,acne or androgenic alopecia.Obese girls (BMI more than 30kg/m^2)**.Exclusion criteria:**Participients with known malignancy such as virilising tumors. Endocrinal disorders as cushing syndrome,thyroid disorders and adrenal disorders.

Written informed consent was obtained from all patients, the study was approved by the research ethical committee of Faculty of Medicine, Zagazig University.

Detailed history was taken from cases included name, age,residence and occupation. Menstrual history as age of menarche, pattern and frequency were taken. We also asked aboutexcersise and eating habits as (fast food ,soft drinks and chocolate eating).

The following clinical presentations were used to identify subjects with suspected PCOS: menstrual irregularities (MI), age of menarche, menstrual frequency, regularity, last menstrual period (LMP), and presence of dysmenorrhea. Menstrual abnormalities which define chronic anovulation as amenorrhea of 3 months duration or oligomenorrhea (intermenstrual interval more than 35 days). Regular cycles were defined as 9-16 cycles of a 21-35 days duration within a year or no more than 4 days difference in duration between cycles**.**

Full clinical examinations were done (weight, height, waist circumference, BMI) also, vital signs (blood pressure, pulse ,temperature and respiratory rate).

All participants went through anthropometric examinations, including weight and height; body mass index (BMI) was calculated by dividing the weight (kg) by the square meters of height (m2), and obesity was defined if BMI was ≥30 kg/m2 according to WHO criteria.

Waist circumference by a measurement was taken around the abdomen at the level of umbilicus to measure waist circumference correctly. Body hair distribution to detect male pattern hair growth According to FerrimanGallways.

Transabdominal ultrasound was done for cases more than 20 years, recent studies found that there is no role for ultrasound below age of 20 and the diagnosis of PCOS below 20 years depend on clinical presentation (acne ,hirsutism),ovulatory dysfunction and hormonal picture of hyperandrogenism as Testosterone and DHEA-S. Ultrasound was done between cycle day 2 -7 in menstruating females or after withdrawal bleeding in case of amenorrhea.

Venous blood taken for blood sample by applying tourniquets on patient arm to make the veins more prominent.Basal hormonal detection, FSH, LH, Prolactin, DHEA-S and Testosterone were done between cycle day 2-5 of menstruating females. In case of amenorrhea withdrawal bleeding was done and blood sample taken 2-5 days of withdrawal bleeding. Withdrawal bleeding is done by oral progesterone pills (typically medroxyprogesterone ,provera,10mg oral daily for 10 days). After stopping the pills, the patient would be expected to have a withdrawal bleeding. Serum FSH, LH and prolactin were done by Enzyme Immuneoassay (EIA) kits for hormonal test. FSH :LH ratio was calculated.Serum FSH:LH 1:2 was taken as raised and below this was considered normal.

Statistical Analysis:

Data collected throughout history, basic clinical examination, imaging, laboratory investigations and outcome measures coded, entered and analyzed using Microsoft Excel software. Data were then imported into Statistical Package for the Social Sciences (SPSS version 20.0).

III. RESULTS:

The socio-economic data among the studied group table (1).

Table (1): socio-demographic characteristics distribution among studied group:

Variable	**N =(180)** **mean ± SD** **median(Range)**	
Age/years ***Mean+_SD*** ***Range***	**19.6±3.1** **19 (16-24)**	
Age of menarche (years) ***Mean+_SD*** ***Range***	**13.4±2.1** **13 (11-17)**	
Variable	**N (180)**	**%**
Residence **Rural** **Urban**	**122** **58**	**67.8%** **32.2%**
Socio-economic class ***Low*** ***Moderate*** ***High***	**100** **70** **10**	**55.5%** **38.9%** **5.6%**

The most common gynecological complain was oligomenorrhea and dermatological complain were acne and hirsutism.**Table** 2

Table (2): Clinical presentation among studied group:

Variable	**N =(180)**	
	N	**%**

Complaint		
Oligomenorrhea	80	44.4%
Amenorrhea	28	15.5%
Irregular period	20	11.1%
Hirsutism	18	10.0%
Acne	13	7.2%
Acne and Hirsutism	21	11.6%

This study showed that the most common gynecological presentation in PCOS group was oligomenorrhea while, the most common dermatological presentation were acne and hirsutism. **[Table 3]**

Table (3): Comparison of clinical presentation between groups:

Variable	**PCOS (100) mean ± SD**		**non- PCOS (80) mean ± SD**		**X^2**	**P**
Complaint	**N**	**%**	**N**	**%**		
Oligomenorrhea	**50**	**50.0%**	**30**	**37.5%**	**5.21**	**0.02***
Amenorrhea	**11**	**11.0%**	**17**	**21.25%**	**3.12**	**0.074**
Irregular period	**10**	**10.0%**	**10**	**12.5%**	**0.87**	**0.28**
Acne	**5**	**5.0%**	**8**	**10.0%**	**1.66**	**0.19**
Hirsutism	**11**	**11.0%**	**7**	**8.7%**	**0.7**	**0.41**
Acne and hirsutism	**13**	**13.0%**	**8**	**10.0%**	**0.39**	**0.53**

This study showed that PCOS cases were significantly associated with fast food , soft drink and chocolate eating. **[Table 4]**

Table (4): Life style habits comparison between studied groups

Variable	**PCOS (100)**		**non- PCOS (80)**		**X^2**	**P**
	N	**%**	**N**	**%**		

Daily sport						
No	**85**	**85%**	**60**	**75%**	**2.87**	**0.09**
Yes	**15**	**15%**	**20**	**25%**		
Healthy diet						
No	**72**	**72%**	**48**	**60%**	**2.88**	**0.08**
Yes	**28**	**28%**	**32**	**40%**		
Fast food						
No	**46**	**46%**	**59**	**73.7%**	**14.08**	**0.0001****
Yes	**54**	**54%**	**21**	**26.3%**		
Soft drink						
No	**22**	**22%**	**50**	**62.5%**	**30.3**	**0.00****
Yes	**78**	**78%**	**30**	**37.5%**		
Chocolate eating						
No	**55**	**55%**	**66**	**82.5%**	**15.22**	**0.00****
Yes	**45**	**45%**	**14**	**17.5%**		

X^2 chi square * *Statistically highly significant difference ($P \leq 0.001$)

There was statistically significant difference between the PCOS and non- PCOS women in LH and prolactin, But regarding testosterone ,DHEA-S and FSH, there were no statistically significant difference. **[Table 5]**

Table (5): Hormonal levels comparison between PCOS and non- PCOS females:

Variable	**PCOS (100)** **mean ± SD** **median (Range)**	**non- PCOS (80)** **mean ± SD** **median (Range)**	**test** **M.W**	**P**
FSH(mIU/L):	**6.2±2.1** **7 (2.9-9)**	**5.5±3.4** **6 (1.9-14)**	**1.6**	**0.089**
LH(mIU/L)	**13.5±6.4**	**9.1±5.6**	**4.8**	**0.001****

	13.4 (4.7-31)	**5 (2-13)**		
Testosterone (ngm/l)	**2.05±4.8** **2 (0.8-6)**	**1.3±0.1** **1.02 (0.07-1.8)**	**1.3**	**0.1**
Prolactin level(ngm/l)	**17.3±6.8** **15.3 (7-38)**	**10.1±5.6** **7 (2-15)**	**7.6**	**0.001****
DHEA-S (ngm/l)	**6.2±5.8** **7.6(5.8-12.5)**	**5.1±3.4** **7(5-14)**	**1.5**	**0.13**

M.W=Mann-Witenny U test. * *Statistically highly significant difference ($P \leq 0.001$)

There were statistically significant differences between the PCOS and non- PCOS women below 20 years in LH and prolactin .But regarding testosterone, DHEA-S and FSH, there were no statistically significant difference. **[Table 6]**

Table (6): Hormonal level comparison between PCOS and non- PCOS women less than 20 years

Variable	**PCOS (60)** **mean ± SD** **median (Range)**	**non- PCOS (50)** **mean ± SD** **median (Range)**	**test** **M.W**	**P**
FSH(mIU/L):	**6.1±1.8** **7 (2.9-7)**	**5.7±2.8** **5 (1.9-12)**	**1.5**	**0.082**
LH(mIU/L)	**13.7±5.2** **13.0 (4.7-31)**	**8.8±5.6** **7 (2-12)**	**5.1**	**0.001****
Testosterone (ngm/l)	**2.03±3.12** **2 (1.5-6)**	**1.5±0.8** **1.3 (0.1-1.8)**	**1.6**	**0.099**
Prolactin level(ngm/l)	**17.1±6.4** **16.2 (9-38)**	**9.8±5.6** **8 (3-15)**	**8.2**	**0.0003****
DHEA-S (ngm/l)	**5.1±2.3** **5.6(5.8-9.8)**	**4.7±2.1** **7(5-8)**	**1.1**	**0.24**

There were statistically significant differences between the PCOS and non- PCOS females more than 20 years in LH and prolactin. But regarding testosterone, DHEA-S and FSH, there were no statistically significant differences. **[Table 7]**

Table (7): Hormonal level comparison between PCOS and non- PCOS females more than 20 years:

Variable	PCOS (40) mean ± SD median (Range)	non- PCOS (30) mean ± SD median (Range)	test M.W	p
FSH(mIU/L):	6.4±2.5 7 (2.9-9)	5.8±3.1 6 (1.9-14)	1.51	0.096
LH(mIU/L)	13.7±5.7 13.5 (5.1-31)	9.3±5.8 5 (4-13)	4.3	0.002*
Testosterone (ngm/l)	2.14±3.2 2 (0.8-4)	1.5±0.12 1.02 (0.07-1.8)	1.6	0.089
Prolactin level(ngm/l)	17.8±5.2 15.3 (7-31)	11.2±4.2 7 (2-13)	6.2	0.001**
DHEA-S (ngm/l)	6.3±3.9 7(5.8-12.5)	5.3±2.7 6(5-14)	1.6	0.12

* *Statistically highly significant difference ($P \leq 0.001$)

In this table, there was statistically significant difference regarding follicle number 12 or more, peripheral distribution of follicles and ovarian volume with no difference in highly echogenic bright ovarian stroma between PCOS and non PCOS women. **[Table 8]**

Table (8): Hormonal level comparison between PCOS and non- PCOS females more than 20 years:

Variable	PCOS NO(40)	%	Non PCOS NO(30)	%	X2	P
Follicle number>12 (2-9mm)	34	85.0%	10	33.3%	22.1	0.00**

Peripheral distribution of follicles	**30**	**75.0%**	**8**	**26.7%**	**23.7**	**0.00****
Ovarian volume of more than 9cm3	**30**	**75.0%**	**7**	**23.3%**	**27.5**	**0.00****
Highly echogenic bright ovarian stroma	**25**	**62.5%**	**12**	**40.0%**	**4.8**	**0.02***

* *Statistically highly significant difference ($P \leq 0.001$)

IV. DISCUSSION

In our study among 15300 cases attended Gynecology and dermatology outpatient clinics at time of the study, there were 180 cases presented by symptoms suggesting PCOS (1.17%), only 100 cases were confirmed to be PCOS (0.65%) as they fulfilled the postulated criteria for PCOS diagnosis. Prevalence of PCOS defined on basis of Rotterdam criteria was therefore estimated at (55%) among the presented cases(180). This is much higher than prevalence rates reported by a recent meta-analysis which concluded that the overall prevalence of PCOS (with corresponding 95% CI) according to diagnostic criteria of the NIH, Rotterdam and the AE-PCOS Society is 6% (5-8%, n = 18 trials), 10% (8-13%, n = 15 trials) and 10% (7-13%, n = 10 trials), respectively[9]. Indeed, prevalence rates was reported in literature up to 20% in adults, and up to 30% in adolescent females[10].

The hallmarks of the clinical presentations of PCOS include menstrual irregularity, hyperandrogenism, and cystic ovaries. Nevertheless, the pattern of clinical presentation varies greatly among the affected women[11]. The current study indicated that menstrual irregularities including oligomenorrhea and amenorrhea were also the most prevalent clinical presentation in the study population (44.4%, 15.5%; respectively). Analyzing PCOS group only, menstrual disorders were the most prevalent clinical presentation (71%), while hyperandrogenism was identified in 29% of the cases. Similar to our findings, **Milczarek et al.**[12] evaluated 26 girls with menstrual disorders and/or symptoms of hyperandrogenism two years after menarche and applied Rotterdam criteria for possible diagnosis of PCOS. The study group was divided into three subgroups: with isolated cutaneous manifestation (CM) of hyperandrogenism (n = 6), with isolated menstrual disorders (n = 10), and with cutaneous manifestation and menstrual disorders (n = 10). PCOS cases presented with the highest proportion in the menstrual disorders group (70%). By more restricted criteria with a testosterone cut-off point of > 55 ng/dl, only seven patients (27%) met all Rotterdam criteria.

Similarly, another study was done by **Velija-Ašimi, Zelija.**[13]to evaluate the endocrine changes in PCOS women during metformin treatment which done on 100 women with PCOS aged 20-40 years ,this study reported oligomenorrhea or amenorrhea in 69% of their study population.

In contrary, **Thathapudi et al.** [14]reported higher rates of menstrual disorders (89%) in PCOS study group. This discrepancy could be interpreted on basis of the strict inclusion criteria of their study population, and selection of the PCOS patients attending only the infertility clinics. Furthermore, higher prevalence of menstrual irregularities was also reported also by **Yetim et al.**[10]who identified 83% of the subjects with PCOS were oligomenorrheic/amenorrheic. Comparing PCOS to non-PCOS group, the current results indicated a statistically

significant difference in percentages of oligomenorrhea (p= 0.02). Nevertheless, other clinical presentations including amenorrhea, irregular periods, acne and hirsutism were similar to control (p>0.05). Difference in reported rates of PCOS clinical presentations may differ among the studies for many reasons, principally due to differences in the anthropometrics and hormonal profiles of the included females [15].

Interestingly, lifestyle pattern demonstrated a significant relationship with PCOS. The current analysis indicated significant higher consumption of fast food (P<0.0001) in PCOS compared to non-PCOS (54% vs 26.3%; respectively).

Nevertheless, comparing unhealthy diet patterns in both groups did not show a statistical significance (p=0.08). This finding should be interpreted with caution; as it was reported that women with PCOS may have a greater appetite and are more overweight, despite a healthier diet [16].

A recent meta-analysis investigated the effect of lifestyle on reproductive, anthropometric (weight and body composition), metabolic and quality of life factors in PCOS included 15 randomized controlled trials (RCTs) comparing lifestyle treatment (diet, exercise, behavioral or combined treatments) to minimal or no treatment in women with PCOS in total of 498 participants. The main finding was that lifestyle intervention may significantly improve the free androgen index (FAI), weight and BMI in women with PCOS [17]. Association between major dietary patterns and polycystic ovary syndrome was investigated by **Shahdadian et al.**[18], who reported thatWestern and plant-based dietary patterns were associated with an increased risk of PCOS. Also, moderate adherence to the mixed dietary pattern was associated with a reduced risk of PCOS. Similarly, a cross-sectional cohort study of 711 women with PCOS from a heterogeneous population spanning a wide spectrum of socioeconomic strata. There was a notable association between increased calories and fat content in diet with the presence of hirsutism, raised body mass index, insulin resistance [19].

In particular, chocolate consumption in the study carried by ***Graff et al.***[20]**,** was significantly higher in PCOS group (45% vs 17.5%, p<0.001). The possible association between chocolate intake and PCOS may be emphasized on basis of the high glycemic index contained within chocolate, resulting in increased BMI and worsening of insulin resistance. Indeed, effects of chocolate intake was little investigated in PCOS context. However, reports demonstrated conflicting evidence concerning its impact on PCOS patients. Dark chocolate is rich in cocoa which is a rich source of dietary polyphenols. Polyphenols are known for their antioxidant properties and was associated with improved insulin resistance [21]. In addition, it was shown that acute dark chocolate consumption prior to prolonged exercise enhanced insulin sensitivity compared with chocolate consumption alone [22]**.** The precise impact of chocolate consumption on PCOS is therefore still questionable.

Physical activity may also play a role in PCOS pathology. The current findings indicate that lower application of daily exercise in PCOS group vs non PCOS group (15% vs 25%; p=0.08). Despite statistical non-significance, these results shouldn't be overlooked. In line with the current results, a recent study carried by***Bialka-Kosiec et al.*** [23] in which they examined 37 participants with a diagnosis of PCOS, and 48 healthy control females with no prior diagnosis of PCOS concluded that the young female participants with PCOS were shown to have similar body composition to age-matched healthy controls. However, the clinical group with PCOS reported less frequent use of exercise. Statistical non-significance depicted in our work doesn't preclude the role of physical activity, instead, they may be related to the lower percentages identified throughout our

cohort with regular exercise attributed to the different definitions of "exercise" component in relevant studies. For example, **Bialka-Kosiecet al** [23]assigned subject to having exercise or not based on subjective questionnaire, on contrary, our work addressed only females with regular daily aerobic exercise. The strict criteria for exercise pattern in the current study was associated with lower sample size and possible increase in type II statistical errors with subsequent statistical non-significance. **Samadi et al.**[24], recruited 30 patients with PCOS having age between 20 and 35 and body mass index (BMI) ≥30 kg/m2 selected based on Rotterdam Diagnostic Criteria, and randomly divided into experimental (high intensity exercise + metformin, N = 15) and control groups (metformin, N = 15). The exercises were done for 12 weeks. After 12 weeks, no significant difference was observed in waist-to-hip ratio (WHR), but in exercise group, the BMI and fat mass significantly decreased and levels of follicle-stimulating hormone (FSH), free testosterone (FT) increased compared to control group (P <0.05). While levels of improvement of total testosterone (TT), dehydroepiandrosteronesulphate (DHEAS) and luteinizing hormone (LH) were not significant between the two groups (P > 0.05). Furthermore, there was a significant decrease in homeostatic model assessment of insulin resistance (HOMA-IR) and hirsutism severity in experimental group (P < 0.05). In both groups, the order of menstrual cycles improved significantly (P < 0.05). These findings suggest that even when significant differences exist, the effects of exercise may not be homogenous across the whole components of PCOS, raising concerns about the real value of exercise in improving the syndrome.

In this study, analysis of difference in hormonal profiles comparing PCOS subjects to non-PCOS ones demonstrated significant differences in mean LH levels (13.5 vs 9.1 IU; respectively) and prolactin levels (17.3vs 10.1 ng/ml; respectively). FSH, Testosterone levels and DHEA-S failed to demonstrated significance upon comparison (p= 0.089, 0.1, 0.13; respectively). This pattern was maintained on subgroup analysis for females more than or less 20 years confirming independence of hormonal changes on age. Similarly,**Yue et al.**[25], reported non-significant difference in FSH levels comparing PCOS to healthy controls in line with the current findings. In similar context, **Dambalaetal.**[26] analyzed the results of 42 women with PCOS and 42 controls, matched for age and weight. Comparing PCOS to control, they found non-significant difference in FSH, DHEA-S and total testosterone levels.

Different results were reported by **Yetim et al.**[10]**,** analyzed the results of hormonal profiles of 53 adolescent girls aged between 14.5 and 20 years who were admitted to their outpatient clinic with symptoms of hirsutism and/or irregular menses and diagnosed as having PCOS in accordance with the Rotterdam criteria. The LH levels andLH/FSH ratio were significantly higher (p=0.005, p=0.042; respectively) and SHBG was significantly lower (p=0.004) in PCOS patients as compared to the controls.

Strikingly, the significant higher levels of prolactin presented in PCOS cohort in the current results may be only attributed to false diagnosis PCOS due to symptomatic similarities between PCOS and hyperprolactinemia. Recent studies that have conducted a rigorous etiological investigation show that hyperprolactinemia found in PCOS correspond either to non-permanent increase of prolactin levels, to prolactin secreting pituitary adenoma or to other etiologies**[27]**. For instance, **Hayashida et al.** [28]**,** studied a population of 227 PCOS women. 6% of PCOS women had elevated prolactin (n = 16), which was consistently explained by the presence of pituitary adenoma.

Assessment of biochemical markers of hyperandrogenemia through the current work apparently resulted in non- significant differences comparing PCOS hormonal profiles with non-PCOS ones as regarding testosterone levels and DHEA-S (p=0.1, 0.24; respectively) *Similarresults were reported by**Milczarek, et al.*** [12] in which they carried subgroup analysis in different ages has replicated the same pattern of non-significance in subjects more or less than 20 years. Strikingly, other reports indicated that PCOS has significantly higher testosterone and DHEA-S [14,25].

The ultrasonographic features of adult PCOS were well established through the current work. Assessment of ovarian morphology in 40 adult PCOS cases based on US findings in the current study resulted in significant differences between PCOS and non-PCOS groups. Ovarian volumes (OV) were statistically higher in PCOS (p= 0.0003) with majority of cases (85%) presented with 12 or more follicles measuring 2-9 mm3, and ovarian volume of more than 9 cm3 with peripheral distribution was presented in 30 (75%) patients. In accordance with our findings, **Sujata et al.**[29], evaluated 26 PCOS women (Rotterdam criteria) and 45 matched ovulatory and normo-androgenic women. A detailed 2D and 3D scan was carried out in early follicular phase (Day 2-Day 5) in all patients. Ovarian volume, follicle number per ovary (FNPO) and stromal volume were measured in PCOS and controls. Mean ovarian volume was 13.7±5.89 and 5.06±2.44 (p<0.0001), FNPO was 19.18±6.89 and 7.13±3.51 (p<0.0001) in PCOS and controls, respectively. The cut-offs for the diagnosis of PCOS were 2D OV=6.15 cm3, 2D FNPO=12. By 3D scan, OV=7 cm3, FNPO=10, stromal volume=6 cm3. Importantly, they reported that 2D FNPO showed the highest specificity and sensitivity (AUC), 0.95238 and 0.93548, for the diagnostic accuracy of PCOS. Furthermore, **Şentürk etal.**[30], conducteda prospective randomized control study of 40 PCOS patients and 40 healthy women who were matched with respect to BMI (<25 kg/m² and ≥25 kg/m²). When compared to the healthy women, PCOS patients had significantly higher ovarian volumes (P= 0.01). Interestingly, pelvic MRI exams of obese adolescent girls whose examination is difficult using pelvic US techniques showed also increased ovarian volumes and stroma for PCOS cases [31]. In similar context, a study carried by **Aydogmus et al.**[32] in which they reported that average follicle number per ovary presented statistical significance difference comparing PCOS to healthy controls (P<0.001), and was found to be significantly correlated with AMH, as a sensitive marker of PCOS diagnosis. It should be noted that studies similar to our work yielded different mean follicle counts per ovary in PCOS cases. This can be interpreted considering that the latest generation of ultrasound devices is more sensitive and yields a larger follicle count in the general population; therefore, the current use of the old cutoff can overestimate the prevalence of PCOM. And so, group of experts proposed the use of higher thresholds (that is, 19 to 25 follicles per ovary) to define PCOM with the new ultrasound machines [33].

V. CONCLUSIONS

Polycystic ovarian syndrome is a commen problem of women of reproductive age affecting their life physically mentally and socially.Lifestyle modification as healthy food and excersise play important role in prevention of PCOS.

Future studies should be designed to include patients from different centers using more sensitive assays or more recent markers to externally validate the study results.

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