Correlation Study of Aromatase, Some Sex Hormones, and Body Mass Index among Iraqi Patients with Polycystic Ovary Syndrome

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Abstract: Polycystic ovary syndrome (PCOS) is heterogeneous affecting factors including endocrine disorders, complex genetic and environmental etiology also can contribute to PCOS. This study investigated the aromatase relation with POCS Iraqi female (without got treatment and got) compared with estradiol (E2), testosterone hormones and body mass index.

Methods: Ninety six female divided into three groups: 37 with PCOS without getting any treatment, 32 with PCOS with getting treatment and 27 as a healthy female. Aromatase level, serum sex hormones estradiol (E2) and testosterone were measured on the third day of menstrual cycle by ELISA. Also body mass index was calculated and all variable were compared for the three groups.

Results show a significant decreasing in aromatase levels in G1 (0.035±0.05) compared with G2 and G3 (P<0.05). Aromatase had non-significant increase in G2 than G3. The aromatase was high level in G2 (2.30±0.28) when compared with G3 who's got treatment

Key words: Polycystic ovary syndrome, aromatase, estradiol (E2), testosterone and body mass index

How to cite this article: Dhahaad HA, Al-Saadi WT (2020): Correlation study of aromatase, some sex hormones, and body mass index among Iraqi patients with polycystic ovary syndrome, Ann Trop Med & Public Health; 23(S18): SP231830. DOI: http://doi.org/10.36295/ASRO.2020.231830

Introduction:

Polycystic ovary syndrome (PCOS) is characterized as heterogeneous disorder in women of productive age [1,2]. PCOS is associated with elevated levels of androgen and correlated with steroidogenic, metabolic and genetic syndromes (menstrual irregularities, hyperandrogenism, chronic anovulation, infertility, diabetes mellitus type 2, gestational diabetes, hypertension, dislipidemia) [2,3]. PCOS etiology still unclear and associated with high level of androgens and the steroidogenesis and abnormal fuliculogenesis are the basic causes of PCOS [6].

Estrogen (oestrogen) and Testosterone are steroids female and male sex hormone respectively. Estrogen develops and regulates productive system and secondary sex characteristic in the
female.

Estradiol (E2) is secreted especially by the follicles of the ovary and other tissues (adrenal glands, liver, fat, breast, brain and testicles). E2 is the most abundance of estrogen during reproductive age. In the body, E2 synthesized from cholesterol by successive steps through formation of androstenedione which converted to estrone by aromatase enzyme then converted to E2.

Testosterone plays role in the development of male reproductive tissues (testes and prostate) and promoting secondary sexual characteristic which include increased muscle, bone mass and growth of body hair. Testosterone secreted by testicles (from the Leydig cells) and lesser amount from ovary in the female. Testosterone is synthesized from cholesterol as E2 through several enzymatic steps.

Aromatase is the enzyme belonging to the chytochrome P450 family (CYP) and a product by CYP19 gene located at the chromosome 15Q21. Aromatase is expressed within the gonads (ovary and testicles), placenta, brain, liver, muscle and adiposecytes. The aromatase primary function is to produce estrogen aromatizing androgens via catalyzes the last steps of estrogen biosynthesis through the process called sterogenesis from androgens (transforms androstenedione to estrone and testosterone converted to estradiol).

The goal of this study was to evaluate aromatase levels in Iraqi women with PCOS who got treatment and without treatment compared with controls one and found its correlation with estrogen, testosterone hormones and body mass index (BMI).

**Methods**

The blood sample were collected from (69) Iraqi female with PCOS and (27) healthy female. All female age ranged (20- 45) years. The blood samples of PCOS were enrolled from Medical City hospital in Baghdad and Bint-Al-Huda hospital for maternity and childhood in Nassiriya city in period time March 2019 to September 2019. The samples were divided into three groups as below:

1. Females who diagnosis with PCOS (37) without getting any treatment as (G2).
2. Females who diagnosis with PCOS (32), they have getting treatment for two months as (G3).
3. Healthy females (27) as control group (G1).

The blood samples for all groups were withdrawn in the third day of menstrual cycle.
Aromatase was estimated in EILSA Kit from Elabscience. Hormones including Estradiol (E2) and testosterone were estimated by electrochemiluminescence immunoassay (ECLIA) from Elabscience. Body mass index (BMI) for all groups was calculated as weight in kilograms divided by the square of height in metres (kg/m²).

**Statistical analysis:**

Statistical analysis for the measuring data was performed and expressed by mean ± standard deviation (SD). The variable of each group was tested for normality and was used P test.

**Results and Discussion:**

The results were obtained is summarized in table (1), which showed the data as mean ±SD for aromatase, E2 and testosterone for Iraqi females with PCOS (without and with treatment) and healthy control.

Table 1: Aromatase and some biochemical parameters with PCOS (with and without treatment) and healthy in Iraqi females.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>G1 No.=27</th>
<th>G2 No.= 37</th>
<th>G3 No. =32</th>
<th>P value</th>
<th>G1 Vs. G2</th>
<th>G1 Vs. G3</th>
<th>G2 Vs. G3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aromatase (ng/ml) Mean ± SD</td>
<td>0.35 ± 0.05</td>
<td>2.30 ± 0.28</td>
<td>1.69 ± 0.22</td>
<td>0.0038</td>
<td>0.0027</td>
<td>0.85</td>
<td></td>
</tr>
<tr>
<td>E2 (ng/ml) Mean ± SD</td>
<td>30.44±1.72</td>
<td>76.44±7.48</td>
<td>37.76±2.50</td>
<td>0.0016</td>
<td>0.191</td>
<td>0.008</td>
<td></td>
</tr>
<tr>
<td>Testosterone (ng/ml) Mean ± SD</td>
<td>0.26 ±0.01</td>
<td>1.13 ± 0.38</td>
<td>0.64 ± 0.04</td>
<td>3.2×10⁻¹⁷</td>
<td>7.57×10⁻⁵</td>
<td>1.18×10⁻⁵</td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>24.2 ± 1.87</td>
<td>30.31±2.91</td>
<td>27.14±3.26</td>
<td>0.014</td>
<td>0.03</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

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(S) significant differences which p-value < 0.05 , (HS) high significant differences which p-value < 0.001 , (NS) No significant differences which p-value > 0.05

The results show a significant decreasing in aromatase levels in G1(0.035±0.05) compared with G2 and G3 (P<0.05). Aromatase had non significant increase in G2 than G3. The aromatase was high level in G2 (2.30±0.28) when compared with G3 who's got treatment.

E2 showed highly significant increase in G2 (P<0.01) as compared with G1 and G3. Also testosterone showed high significant (P<0.01) in G2 compared with G1 and G3. The high level of testosterone was observed with PCOS[18]. In polycystic ovary, theca cells synthesize more androgens than in normal ovary cells. Moreover, polycystic ovary (granulose cells) has a lower aromatase activity which results in disturb the production of androgen and estrogen[4]. Testosterone level decrease (0.64±0.04) in G3 due to submit the group female to the treatment. Most female in G3 treated with metformin. The convenient effect of the use metformin on the hyperandrogenism of PCOS has been mentioned in several studies[10,20, 21]. Metformin may increase ovulation, improve menstrual regularity and decrease androgen levels[22,23].

BMI appeared highly significant in G2 compared with G1 and G3. There is evidence that gain weight especially abdominal obesity lead to onsetPCOS compared to normal weight female[24,25]. PCOS can manifest in female of any weight but more than 75% of them are overweight or obese. Metformin associated with decreased BMI in over weight and obese patients with PCOS[26].

Also the result reveled that there is highly significant(p<0.001) withnegativecorrelation (–ve) between aromatase enzyme and E2 in both groups (G2 and G3) as in table (2) and figures (1,2). While there was non significant (p> 0.05)negative correlation (–ve) between aromatase and testosterone in G2 as in figure (3), and significant (p< 0.05) positive correlation (+ve) between aromatase and testosterone in G3, figure (4).
Table 2: Coloration of aromatase and some biochemical parameters in Iraqi female with PCOS without and with treatment.

<table>
<thead>
<tr>
<th>Aromatase</th>
<th>E2</th>
<th>Testosterone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without treatment (G2)</td>
<td>$r = -0.359$</td>
<td>$r = -0.377$</td>
</tr>
<tr>
<td></td>
<td>$P = 0.000$</td>
<td>$P = 0.151$</td>
</tr>
<tr>
<td></td>
<td>H.S</td>
<td>Non s</td>
</tr>
<tr>
<td>With treatment (G3)</td>
<td>$r = -0.115$</td>
<td>$r = 0.206$</td>
</tr>
<tr>
<td></td>
<td>$P = 0.000$</td>
<td>$P = 0.013$</td>
</tr>
<tr>
<td></td>
<td>H.S</td>
<td>S</td>
</tr>
</tbody>
</table>

Figure (1): Correlation between Aromatase with E2 in Iraqi patients with PCOS without treatment

Figure (3): Correlation between Aromatase with testosterone in Iraqi patients with PCOS without treatment

Conclusion:

The study revealed that there was a negative correlation between aromatase enzyme with both E2 and testosterone hormones in Iraqi female with PCOS without any treatment. Also there was a positive correlation between aromatase and testosterone while negative correlation with E2 in female with PCOS whose got treatment.

References


