

Correlation between serum bisphenol A and testosterone levels in women with polycystic ovary syndrome

By

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Abstract

The aim was to estimate the levels serum bisphenol A and testosterone levels in women with polycystic ovary syndrome. This prospective case-control study was done from January to June 2021 and included 40 women PCOS (17-38 years), fulfilling the Rotterdam PCOS diagnostic criteria. Among women, 31 patients belonged to the PCOS group. Women with diabetes mellitus, Cushing's syndrome, infectious diseases, hypertension, thyroid dysfunction, hyperprolactinemia, oral contraceptives, antiandrogens, and infertility treatment during the period in the last 6 months. Presence of hirsutism and/or acne was taken as basis of patients Hirsutism scores were determined using the Modified Ferriman Gallwey scoring system. The diagnosis of PCOS is in accordance with the Rotterdam 2003 Criteria, such as oligomenorrhea. Serum bisphenol A and testosterone levels were measured in all patients. The relationship between the variables was examined using the Pearson correlation method. The conformity of the variables to the normal distribution was investigated. Belonging to continuous variables; median, minimum and maximum values are presented. If the P value was less than 0.05, the difference between the groups was considered statistically significant. The study showed that bisphenol A level was elevated significantly ($P < 0.01$) in PCOS women (45.3 ± 9.24 ng/dl) as compared with control group, The study showed that testosterone level was elevated significantly ($P < 0.01$) in PCOS women (0.18 ± 0.03 ng/dl) as compared with control group (1.53 ± 0.29 ng/ml). The study showed that the highest mean of prolactin was in PCOS women (25.86 ± 7.31 ng/dl) as compared with control group (18.11 ± 3.14 ng/dl), with highly significant difference ($P < 0.01$).

Keywords: bisphenol A; Testosterone; polycystic ovary syndrome

Introduction

Reproductive capacity worldwide has decreased for various reasons in the last 50 years (1). In the United States, this reduction rate from 1960 to the present is 44% (2). On the other hand, pubertal developmental disorders, polycystic ovary syndrome. There is an increase in the incidence of hormonal diseases such as (PCOS) and endometriosis (3). Taken together, this indicates that changing environmental conditions have an impact on the female reproductive system, suggesting negative effects. Male reproduction of environmental conditions in the last 10 years. When studies on the female reproductive system are examined for a similar effect, It is noteworthy that there is a gap in this area. PCOS is an important condition that is seen with a frequency of 5-8% in the community and can cause infertility. It is an endocrine problem. Although the findings classically begin in adolescence, the foundations, It is known to occur at earlier ages (4,5). PCOS, hyperandrogenemia, anovulatory condition characterized by cycles (amenorrhea/oligomenorrhea) and polycystic ovary structure. Metabolic and reproductive disorders are intertwined. Genetics in the etiopathogenesis of PCOS. There is evidence that these factors are effective. They are natural or synthetic chemical compounds that act by disrupting the endocrine physiology revealed. Most disruptors act by disrupting estrogen signals gene expression by directly affecting the endogenous hormone synthesis and disrupt their metabolism and can also cause inheritable disorders with epigenetic effects (6,7). Endocrine disruptors, nuclear

receptors, nonnuclear steroid hormone receptors (membrane estrogen receptors), nonsteroidal receptors (such as serotonin, dopamine, norepinephrine receptors) neurotransmitter receptors), orphan receptors (aryl hydrocarbon receptor), steroid by enzymatic pathways and thought that they affect the endocrine and reproductive systems (8). Bisphenol A (BPA), food containers, plastic bottles, baby bottles, interior of cans. It is easily exposed due to the fact that it is in the structure of many plastic products. In addition, serum BPA levels were found to be significantly higher in women with PCOS (9,10). The aim was estimate the levels serum bisphenol A and testosterone levels in women with polycystic ovary syndrome

Material and Method

This prospective case-control study was done from January to June 2021 and including 40 women PCOS (17-38 years), fulfilling the Rotterdam PCOS diagnostic criteria. Among women, 31 patients belonged to the PCOS group. Women with diabetes mellitus, Cushing's syndrome, infectious diseases, hypertension, thyroid dysfunction, hyperprolactinemia, oral contraceptives, antiandrogens, and infertility treatment during the period in the last 6 months. Presence of hirsutism and/or acne was taken as basis of patients Hirsutism scores were determined using the Modified Ferriman Gallwey scoring system. The diagnosis of PCOS is in accordance with the Rotterdam 2003 Criteria, such as oligomenorrhea (more than 45 days between menses or less than eight menses per year), hyperandrogenism, presence of clinical hirsutism (acne, hirsutism, androgenic alopecia, acanthosis nigricans) or high androgens as a laboratory finding (increase in serum total and free testosterone levels), ultrasonographic polycystic ovary image [presence of 12 or more follicles with a diameter of 2-9 mm, and/or increased ovarian volume (>10 mL)]. Serum bisphenol A and testosterone levels were measured in all patients. The relationship between the variables was examined using the Pearson correlation method. The conformity of the variables to the normal distribution was investigated. Belonging to

continuous variables; median, minimum and maximum values are presented. If the P value was less than 0.05, the difference between the groups was considered statistically significant.

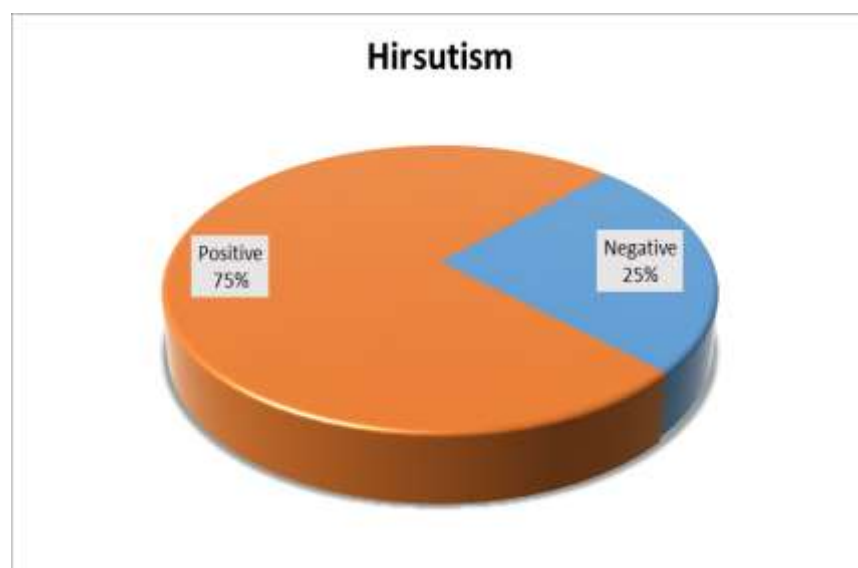
Results

The study showed that the highest mean of BMI (32.01 ± 1.49 Kg/m²) was recorded in PCOS ($P < 0.01$) as compared with control group, Table 1

Table 1: Level of BMI in PCOS women and the control group

Studied groups	BMI (Kg/m ²) (Mean \pm SD.)	T. test	P. value
PCOS women (n:40)	32.01 ± 1.49	20.18	0.001
Control group (n:40)	25.42 ± 1.153		

In the current study, the high rate of acne recorded among PCOS women was 75% and 25% of PCOS women without acne, Figure 1



The study showed that bisphenol A level was elevated significantly ($P < 0.01$) in PCOS women after treatment (45.3 ± 9.24 ng/dl) as compared with control group (17.38 ± 10.3 ng/ml), as shown in Table 2

Table 2: Level of bisphenol A in PCOS women before and after treatment

Studied groups	bisphenol (pg/ml) (Mean \pm SD.)	P. value
PCOS women (n:40)	45.3 ± 9.24	0.001
Control group (n:40)	17.38 ± 10.3	

The study showed that testosterone level was elevated significantly ($P < 0.01$) in PCOS women after treatment (0.18 ± 0.03 ng/dl) as compared with control group (1.53 ± 0.29 ng/ml), as shown in Table 3.

Table 3: Level of testosterone in PCOS women before and after treatment

PCOS women (n:38)	Testosterone (ng/ml) (Mean \pm SD.)	T. test	P. value
Before treatment	1.53 ± 0.29	25.41	0.001
After treatment	0.18 ± 0.03		HS

The study showed that the highest mean of prolactin was in PCOS women (25.86 ± 7.31 ng/dl) as compared with control group (18.11 ± 3.14 ng/dl), with highly significant difference ($P < 0.01$) as shown in Table 4.

Table 4: Level of prolactin in PCOS women before and after treatment

Studied groups	Prolactin(ng/ml) (Mean \pm SD.)	P. value
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PCOS women (n:40)	25.86 ± 7.31	0.001 HS
Control group (n:40)	18.11 ± 3.14	

The study showed that the highest mean of cholesterol was in PCOS women (207.8 ± 17.28 mg/dl) as compared with control group (139.0 ± 14.48 mg/dl), with highly significant difference ($P < 0.01$) as shown in Table 5.

Table 5: Level of cholesterol in PCOS women before and after treatment

PCOS women (n:38)	Cholesterol(mg/ml) (Mean \pm SD.)	T. test	P. value
Before treatment	207.8 ± 17.28	23.83	0.001
After treatment	139.0 ± 14.48		HS

The study showed that TG level was reduced significantly ($P < 0.01$) in PCOS women (196.66 ± 16.37 mg/dl) as compared with control group (94.96 ± 8.76 mg/ml), as shown in Table 6

Table 6: Level of TG in PCOS women before and after treatment

PCOS women (n:38)	Triglyceride(mg/ml) (Mean \pm SD.)	T. test	P. value
Before treatment	196.66 ± 16.37	38.89	0.001
After treatment	94.96 ± 8.76		HS

The study showed that HDL level was elevated significantly ($P < 0.01$) in PCOS women (48.64 ± 4.68 mg/dl) as compared with control group (31.57 ± 4.36 mg/ml), as shown in Table 7.

Table 7: Level of HDL in PCOS women before and after treatment

PCOS women (n:38)	HDL(mg/ml) (Mean \pm SD.)	T. test	P. value
Before treatment	31.57 ± 4.36	19.39	0.001
After treatment	48.64 ± 4.68		HS

Discussion

Banu Ucar *et al* found that the mean BMI was 25.20 ± 5.37 Kg/m² which was also within the overweight range. The finding of this study was also in agreement with the finding of Pivonello *et al* ⁽¹⁰⁾. Milanović *et al* ⁽⁹²⁾ demonstrate that BMI of the women with PCOS were within the normal limit, this discrepancy with the present study could be attributed to sample collection. To concern too much in terms of appearance above politics, it is simply not possible to consider the system in a way that is fit for criticism. For this reason, they may lose time in a long time and by visiting the doctor hospital. The multidisciplinary system for the treatment of diseases over polycystic is the most ideal system. In Yeditepe University Hospitals Polycystic Ovary Syndrome and Hirsutism Clinic, which will be established with this vision, examination, diagnosis, and follow-up are carried out with the common features and cooperation of endocrinology, obstetrics and dermatology specialists..Polycystic Ovary Syndrome and an arrangement for all physicians come together in the PCOS center, the desired evaluation is made in the water presentation of the current clinical literature on polycystic. Patients' warehouses and shipments will be clothed with up-to-date science. Clinical studies are carried out by

the team in the field of Polycystic Ovary Syndrome and Hirsutism^(8,11,12). It is evident from this study that the serum level of testosterone was decreased after treatment compared to that before treatment, this finding reveals an improvement in testosterone secretion in women with PCOS which could be related to an improvement in ovarian function (13).

The effects of BPA on oocytes have been studied in various animals. After BPA exposure, an increase in LH and FSH beta subunits was observed, but it was concluded that gonadotropins were not affected, so there was no hypothalamic influence (14). It has been observed that it affects ovarian differentiation, in addition, it suppresses ovarian development by decreasing FSH beta expression, resulting in ovarian hypotrophy. It was observed that ovarian growth and folliculogenesis were interrupted by exposure to BPA in the early period. BPA exposure in adulthood resulted in epigenetic changes and follicle atresia, down-regulation of some genes as a role in oocyte maturation (15,16). Primordial follicle formation was inhibited after oral BPA exposure of pregnant mice, susceptibility to chromosomal defects and aneuploidy was formed, and changes in meiotic prophase and follicle formation inhibition were observed(17). The current study illustrate that there was a statistically significant decrease in serum prolactin level as evident, this improvement in prolactin level may be related to an improvement in ovarian function in PCOS women after treatment. This finding was in agreement with Wang et al,⁽¹⁸⁾ who uses atorvastatin, which was another statin drug for the treatment of PCOS women in their study. While Jayashree *et al*⁽¹⁹⁾ who studied serum prolactin cut-off value as an indication of a PRL-producing adenoma in women with polycystic ovarian syndrome and hyperprolactinaemia, and they conclude that women with PCOS(20). The triglyceride-rich lipoproteins in the aorta presence of atherosclerotic lesions and macrophages Presence of triglycerides in foam cells formed findings such as direct atherosclerosis of triglycerides shows that it may

have effects on PCOS(21). In different studies, triglyceride levels are significantly higher in PCOS patients. was found high. However, in this study, the PCOS group were significantly more obese compared to the control group (22-24). If familial history of hyperlipidemia in women with PCOS 1.8 times more likely to have dyslipidemia. As a result of comparing the parameters, the authors, the prevalence of dyslipidemia in PCOS patients stated that it was due to body weight (25). This lead to: increased conversion of intermediate-density to LDL and of HDL to the smaller fractions (which was catabolized faster), decrease elimination of circulating LDL and reduced formation of HDL ⁽²⁶⁾.

Conclusions.

- 1- There was a highly significant relation of Bisfenol A with PCOS.
- 2- Hirsutism, more frequently occur in PCOS women in relation to Bisfenol A level

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