The relationship between male testosterone hormone and some female hormones in women with polycystic ovary syndrome (PCOS)

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Objectives This study was designed to determine the levels of hormones insulin, testosterone and some female hormones in some male and female hormones in patients with polycystic ovary syndrome (PCOS) and to know the reasons for these changes in view of the prevalence of PCOS and its importance as a major problem affecting the health of women and her fertility.

Methods The hormones included LH, FSH, PRL, estradiol (E2), progesterone (P4) and LH/FSH ratio in patients with PCOS compared with control group, and to find the relationship between male testosterone hormone and female hormones under the study in patients with PCOS. Fifty-five female patients with PCOS in reproductive age with body mass index (BMI) (25.01 ± 1.70 kg/m²), aged 15–46 years old and who recalculated fertility centre of teaching Al-Sadr hospital in Al-Najaf Al-Asraf Governorate from 1/9/2013 to 1/10/2014, compared with 20 non-patients women with PCOS with BMI (23.87 ± 2.66 kg/m²) and age 17–47 years old as control group.

Results The results showed that there was a significant increasing (p < 0.05) in insulin, testosterone, LH, PRL and LH/FSH ratio in patients with PCOS compared with control group, while there was a significant decreasing (p < 0.05) in FSH, E2 and P4 in patients with PCOS compared with non-patients women.

Conclusion As the results have shown that there was a positive significant relationship between testosterone and LH, PRL and LH/FSH ratio while the relationship was negative significant between testosterone and FSH, E2 and P4 in patients with PCOS.

Keywords polycystic ovary syndrome (PCOS), testosterone, LH, FSH, progesterone (P4)

Introduction

Polycystic ovary syndrome (PCOS) was first described in 1935 by Stein and Leventhal therefore is known Stein-Leventhal syndrome.1 PCOS is one of gynaecological very common in reproductive age and it occurs in about 5–10% of women reproductive age in the world.2–8 PCOS is a disease that infected the ovaries which may be associated with a number of clinical symptoms and hormonal disorders; therefore, PCOS is not one disease, but a group of related diseases together, which may lead, in the end to infertility resulting from chronic anovulation.2–4 In some cases of PCOS did not have any pathogenic symptoms except there are several small cysts in size in the ovaries, which can be observed when vaginal examination by ultrasound,6–8 but in most cases, this syndrome is accompanied by several clinical symptoms, which can be diagnosed in the PCOS such as menstrual cycle disorders (amenorrhea or oligomenorrhea), anovulation, infertility, hirsutism, acne and obesity9–11 and these symptoms often are produced by hyperandrogenism that caused by insulin resistance and hyperinsulinemia,12–15 also PCOS can be diagnosed through some laboratory tests such as measuring hormones levels especially insulin, LH, FSH and male hormones (androgens) especially testosterone hormone14–16 and these symptoms may be shown individually or jointly, but did not require their presence together to diagnose PCOS.17,18

The studies also showed that insulin resistance and hyperinsulinaemia in PCOS may also cause hyperlipidemia and diabetes mellitus type 2 (NIDDM),19–21 early arteriosclerosis22 and thyroid dysfunction,23 in addition to a number of complications on the long extent such as chronic cardiovascular diseases,24 hypertension,25,26 cervical cancer, nerve system diseases and stroke.27,28 Researches indicated that infection in the pregnant women with PCOS may cause abortion, early birth, hypertension and diabetes associated with pregnancy.29–31 The real reasons of PCOS are unknown yet, several theories were put to explain mechanisms of PCOS, but the recent studies suggested that there are new evidences pointed to transmit this syndrome genetically by gene of prevailing type has not been detected to present time,31–33 the treatment of PCOS focuses on treating the different symptoms and disorders accompanying of PCOS.34,35

The aim of present study is to examine changes in some male and female hormones in patients with PCOS and find the relationship between the male testosterone hormone and female hormones in patients with PCOS and to know the reasons for these changes in view of the prevalence of PCOS and its importance as a major problem affecting the health of women and her fertility.

Materials and Methods

Subjects

This study was conducted on 75 women of reproductive age. Among them 55 women with pcos with body mass index (BMI; 25.01 ± 1.70), aged 15–46 years who recalculated Fertility Center of teaching Al-Sadr hospital in Al-Najaf Al-Asraf Governorate from 1/9/2013 to 1/10/2014 and diagnosed in brief by the doctor of the fertility center through clinical and biochemical signs of hyperandrogenism as hirsutism, acne and obesity or oligo and/or anovulation that is menstrual disturbance or appearance of the polycystic ovarian on ultrasound, while 20 healthy women with BMI (23.87 ± 2.66) and...
age 17–47 years as control group, their fertility have been confirmed and they have no other diseases like artery diseases, thyroid gland diseases, diabetes mellitus and blood pressure.

**Count BMI**

Weight and height of the body were measured, BMI was calculated by dividing by the weight square of the height (kg/m²).

**Hormone Assays**

Venous blood samples of PCOS patients and non-patients were collected in third and fourth day of menstrual cycle (follicular phase) after 12 h overnight fasting for the estimation of the hormones, serum levels of LH, FSH, testosterone, PRL and estradiol (E2) were measured by specific electro chemiluminescence immunoassay (Elecsys 2010 Cobas, Roche Diagnostics, Mannheim, Germany), insulin hormone was measured using chemiluminescence (Siemens Medical Solutions Diagnostics, CA, USA), and progesterone (P4) levels were determined using chemiluminescence (Advia Centaur, Siemens healthcare Diagnostics, UK).

**Statistical Analysis**

Results were entered to SPSS version 17, mean and standard deviation (mean ± SD) were also calculated, statistical analysis was done using the Student’s t test of confirmation of the normal distributed. The correlation among the hormones was performed by Pearson correlation test and p value < 0.05 was considered statistically significant.

**Results**

**Comparison of the Hormone Concentrations between Patients with PCOS and Control Group**

The results (Table 1) show a significant increase (P < 0.05) in concentrations of hormones insulin (14.84 ± 7.80), LH (9.87 ± 1.94) testosterone (0.88 ± 1.56) and PRL (26.59 ± 7.75) and LH/FSH ratio (2.8 ± 1.57) in patients women with PCOS compared with control group (12.50 ± 5.33), (6.88 ± 1.94), (0.47 ± 0.31), (15.60 ± 3.17) and (0.88 ± 0.34) respectively, while there was a significant decreasing (P < 0.05) in hormones levels FSH, estradiol (E2) and progesterone (P4) in women patients with PCOS (3.86 ± 1.39, 58.14 ± 8.56, 1.85 ± 0.34) when compared with non-patients women with PCOS (8.34 ± 1.51, 75.35 ± 5.9, 0.87 ± 0.6) respectively (Table 1).

**Correlation between Male Testosterone Hormone and Female Hormones in Patients Women with PCOS**

A significant positive correlation was found between the testosterone and LH (P < 0.05, R = 0.93) and LH/FSH ratio (P < 0.05, R = 0.87) and PRL (P < 0.05, R = 0.79) in patients with PCOS (Figs. 2–4), while there was a significant negative correlation between testosterone and FSH, E2 and P4 (P < 0.05, R = −0.98, R = −0.89, R = −0.96) respectively in patients with PCOS (Figs. 1, 5, 6).

**Discussion**

PCOS is a group of disorders in the reproductive and metabolism function of the body, and the mechanism of PCOS is unknown so far, but may cause in it one or more of the
patients with PCOS compared with healthy controls, which was its relationship significantly negative with the testosterone hormone in patients with PCOS, the studies have pointed that hyperinsulinemia may affect the system hypothalamic-pituitary system, causing an increase in LH through either the increased frequency pulsating of GnRH or by increasing sensitivity of the pituitary gland to GnRH hormone, or increase stimulation of the gland because of disorder feed back mechanism between the pituitary gland and ovary steroid and hyperandrogenism caused abnormal secretion of the gonadotrophins with relatively high on levels of LH to FSH, which lead to stop growth development of the follicles and production the androgen and the excess of it turns into excess of terminal tissue to estrogen causing abnormal production of the steroids of the ovaries which leads to the continuation of abnormal secretion of gonadotrophins. Also studies have demonstrated that any disorder in the level of LH leads to disorder in the level of FSH because of the pituitary gland disorder or not to respond to GnRH hormone, as each increased the LH may decrease FSH and this leads to height rate of LH/FSH and this rate increases with secretion increased the androgens in women with PCOS and this is indicated by many studies. And the results of our study also showed a significant increase in the level of PRL in patients with PCOS compared with non-patients, and the relationship was significant positive between PRL and the testosterone hormone, and the reason may be due to hyperinsulinemia, which causes hyperandrogens in the body that affects prolactin-releasing hormone (RPH) which is generated by the hypothalamus causing increased hormone, or may be due to the disorders in the body of patients with PCOS, especially high level of androgens which may lead to a number of neuroendocrine changes such as decreasing level of the dopamine hormone, which is the prolactin inhibiting factor (PIF) causing a high level of prolactin hormone and this result was consistent with the results of many studies.

The study showed that there was a significant decrease in levels of E2 and P4 hormones in patients with PCOS compared with control group, and there was a significant negative relationship between E2 and P4 and testosterone hormone in women with PCOS, and result of this study agreed with results of many researches, which demonstrated the inability of the ovary to form ovarian hormones (estradiol and progesterone) by granulosa cells and this would lead to a reduction in levels of these hormones in blood serum against an increase in the levels of androgenic hormones that produce from the ovary which increase secretion of LH which inhibited aromatase enzyme and this reduces transformation the androgen to estradiol. A few of the FSH leads to low level of estradiol because FSH, the main hormone in the stage of follicular phase of the menstrual cycle, operates on the composition and maturity of ova and this high level LH causes damage to the premature follicles and anovulation and thus, non formation of yellow body in the second half of menstrual cycle, leading to lack of progesterone that works with the estradiol on metamorphosis of the endometrium last stages of the menstrual cycle in recent menstrual cycle of the cession endometriosis in the normal case. But in patients with PCOS, the secretion of estradiol
from the ovary stimulates growth of the endometrium to become thick and with no enough progesterone leads to severe bleeding or intermittently for a long time and this may cause carcinoma of uterus. Therefore, high secretion of LH increases the secretion of androgens whenever there is a decreased secretion of progesterone and estradiol, this result agreed with the findings of many studies.

References


Conclusion

As the results have shown that there was a positive significant relationship between testosterone and LH, PRL and LH/FSH ratio while the relationship was negative significant between testosterone and FSH, estradiol (E2) and progesterone (P4) in patients with PCOS.

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Research
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