Journal of Pharmaceutical and Applied Chemistry

ISSN: 2357-0210 VOLUME 2, ISSUES 3, 2016 www.egyptfuture.org/ojs/

The Relation between Hypothyroidism and Polycystic Ovary Syndrome

Fatma Al-zaroug Elslimani[1,*], *Mona Elhasi*[2] *and Maraia Farag Elmhdwi*[3]

[1] Department of Chemistry (biochemistry), Faculty of Science, Ajdabiya University, Libya
[2] OB& Gynecology, BMC, Benghazi, Libya.
[3] Department of Chemistry (biochemistry), Faculty of Science, Benghazi University, Libya.

Received: 5 Jan. 2016, Revised: 12 Jun. 2016, Accepted: 15 Jun. 2016.
Published online: 1 Sep. 2016.

Abstract: Polycystic ovarian syndrome (PCOS) is the most common reproductive disorder, affecting up to 12 percent of all women. It is a disorder with many different faces, and it causes great emotional and physical distress to the millions of women worldwide who suffer from it. There's a significant overlap of symptoms between PCOS and Thyroid Disease, despite the fact that they are two very different conditions**.** This study measures the levels of TSH, T3, T4, FSH, LH and E2 in females suffering from polycystic ovarian syndrome (PCOS). The prevalence of TSH, LH and E2 are all significantly higher than those in healthy women. Level of FSH and T3 almost remained normal in polycystic ovarian syndrome. While the T4 slightly decreased in PCOS cases as compared with healthy control group. The data revealed that the patients of PCOS were found to be suffering from hypothyroidism as was evident by increased TSH and LH to FSH ratio. Thus **,**thyroid profile analysis may help in providing a better insight into symptomatology and treatment of PCOS.

Keywords: TSH, T3, T4, LH, FSH, E2 and PCOs.

1 Introduction

Polycystic ovary syndrome (PCOS) is a metabolic syndrome, characterized by anovulation, hyperandrogenism and polycystic ovary. PCOS exists commonly among women at reproductive age with an incidence rate of 6-10%. The clinical manifestation of PCOS includes oligomenorrhea, infertility, acne, hirsutism, fat. In addi¬tion, these patients may develop with many other related endocrine and metabolic diseases, and have increased risk of suffering endometrial cancer, impaired glucose tolerance, diabetes, and cardiovascular disease (Danfeng and Xuelian, 2013).

There are three primary characteristics associated with PCOS. Hyperandrogenism means that there is an excessive amount of androgens, such as testosterone, dihydrotestosterone (DHT), and/or androstenedione. Clinical manifestations of hyperandrogenism include hirsutism (excessive growth of hair), acne, androgenic alopecia (male pattern baldness), and virilization (the development of male characteristics). Oligomenorrhea or amenorrhea is another characteristic of PCOS, oligomennorhea refers to infrequent menstruation, while amenorrhea is the absence of a menstrual period. These conditions are due to the hormone imbalance. Elevated circulating androgen levels are observed in 80–90% of women with oligomenorrhea, as elevated levels of free testosterone account for the vast majority of abnormal findings in the laboratory examination (Moura et al., 2011).

Polycystic ovaries are the third characteristic of PCOS, and this refers to the multiple cysts in the ovaries. However, it's important to understand that just because a woman has multiple ovarian cysts doesn't mean she has PCOS.

PCOS is usually diagnosed by the presence of at least two out of three of the common characteristics I listed. In addition to these three common characteristics I mentioned, there are other signs and symptoms commonly associated with PCOS. These include weight gain or obesity, insulin resistance, oily skin, high cholesterol levels, and/or elevated blood pressure (Moura et al., 2011).

A number of women with polycystic ovary syndrome may also have an underactive thyroid gland, according to some researchers, Shirsath et al., (2015) it has been found that the hypothyroidism can lead to a reduction of sex hormone binding globulin and increase in free testosterone. Free testosterone is one of the factors contributing to PCOS symptoms.

Dysfunction and anatomic abnormalities of the thyroid are among the most common diseases of the endocrine gland. Abnormalities in the supply of thyroid hormone to the peripheral tissue are associated with alteration in a number

of metabolic processes. Infantile hypothyroidism if untreated, leads to sexual immaturity. Untreated juvenile hypothyroidism causes a delay in the onset of puberty followed by anovulatory cycles. In adult woman, severe hypothyroidism may be associated with diminished libido and failure of ovulation. Primary ovarian failure can also be seen in patients with Hashimoto's thyroiditis as a part of autoimmune polyglandular syndrome. Rarely, in primary hypothyroidism, secondary depression of pituitary function may lead to ovarian atrophy and amenorrhoea. Pregnancy complications are associated with overt and subclinical hypothyroidism, although the impact has varied among different studies (Sinha et al., 2013).

The major effects of abnormal thyroid levels relates largely to changes in ovulation and menstruation. Ovulation may be impaired by changes in the production of sex hormone binding globulin (SHBG), follicle stimulating hormone (FSH), estrogen, and androgens. The body compensates by altering the production of thyroid releasing hormone (TRH) from the hypothalamus. The changes in TRH will affect the feedback loop between the hypothalamus, pituitary, and the ovary, leading to changes in ovulation and menstruation. These changes can be subtle, especially when symptoms of thyroid dysfunction are not obvious and do not lead to changes in menses or ovulation. Early stages of thyroid dysfunction (before symptoms are manifest) can lead to subtle changes in ovulation and endometrial receptivity, which then may have profound effects on fertility (Michael, 2013). Thyroid hormones interact with your reproductive hormones, estrogens and progesterone, to preserve normal function of the ovaries and maturation of the egg (Krassas et al., 2010).

Hypothyroidism is an underactive thyroid is a frequent cause of infertility. If the thyroid in underactive, the hypothalamus and pituitary gland can sense this and try to kick things back to normal by increasing levels of the hormones TRH (thyroid-releasing hormone) and TSH (thyroid-stimulating hormone) in your body. TRH produced by the hypothalamus, prompts the pituitary to release TSH, which in turn stimulates the thyroid to do its job. However, TRH also prompts the pituitary to release more of the hormone prolactin. Elevations of prolactin can interfere with ovulation by suppressing release of the hormones LH and FSH, which stimulate the ovary. Low levels of thyroid hormone can also interfere with the rate at which your body metabolizes sex hormones, which can also cause ovulatory disorders (Dileep, 2012).

2 Patients and Methods

This study will be done on 33 newly diagnosed patients of PCOS (before starting any treatment) in an age group of 18-45 years from Benghazi medical center (BMC) and compared with 23 women's healthy control group. Venous blood samples were obtained in the follicular phase from all patients and analyzed for: TSH - T3 - T4 - FSH - LH and E2.

3 Results

The control group (23) consisted of healthy patients who were check-up without any systemic disorder. All of the women in the control group regular menses, every 21–35 days. None of the women in the control group had polycystic ovary on ultrasound; the results are shown in Table (1).

Thirty three patients with PCOS defining according to Rotterdam criteria, LH levels were significantly elevated in PCOS patients, the LH-to-FSH-ratio was elevated above 2.0 in 27 (81.8%). As compared to controls, PCOS patients showed significant increase in TSH (1.923 ± 0.807 vs. 4.55 ± 1.79) and slightly decreased in thyroxin level (102 ± 17.70 vs. 92.6 ± 18.77) while the serum triiodothyronine (T3) showed no significant difference (2.00 ± 0.29 vs. 2.17 ± 0.41). Tables (1) summarize the comparison between serum hormonal levels in women's healthy control group and PCOS patients. The sequential changes in serum TSH, T3, T4, LH, FSH and E2 are summarized in Figures (2, 3, 4, 5, 6, 7) respectively.

Table (1): The comparison between serum hormonal levels in women's healthy control group and PCOS patients:

Data are expressed as mean ± standard deviation

TEST	Control (n=23) Mean ± S.D	PCOS (n=33) Mean ± S.D
TSH	1.92 ± 0.807	4.55 ± 1.79
T3	2.00 ± 0.29	2.17 ± 0.41
T4	102 ± 17.70	92.6 ± 18.77
FSH	5.90 ± 2.63	6.72 ± 2.53
LH	6.8 ± 2.48	18.1 ± 7.89
LH / FSH	1.15	2.7
E2	191 ± 171.8	249.2 ± 109.1

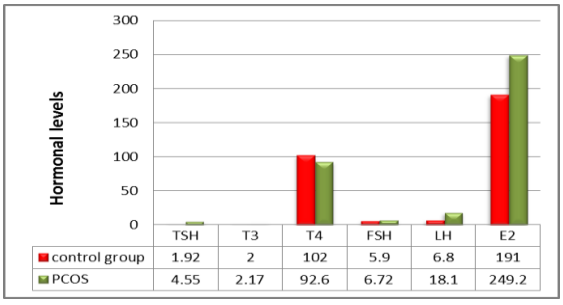

Fig.1. The comparison between serum hormonal levels in women's healthy control group and PCOS patients.

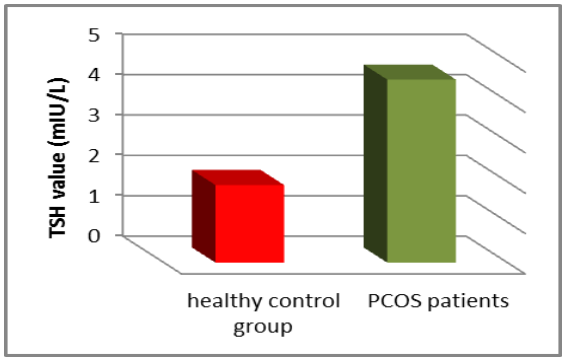

Fig.2. The comparison between serum TSH value in women's healthy control group and PCOS patients.

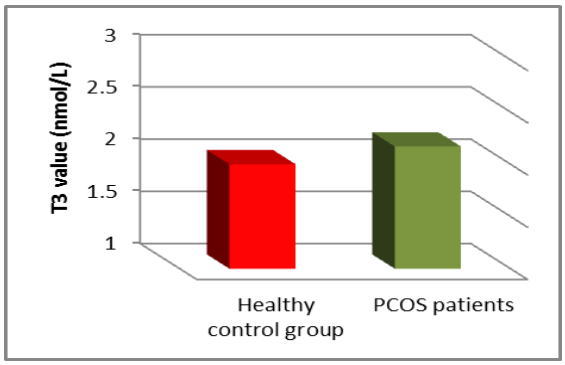

Fig.3. The comparison between serum T3 value in women's healthy control group and PCOS patients.

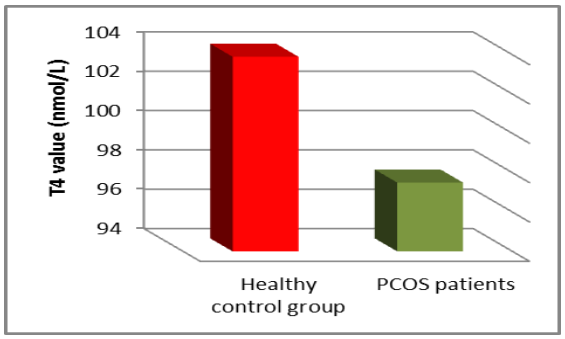

Fig.4. The comparison between serum T4 value in women's healthy control group and PCOS patients.

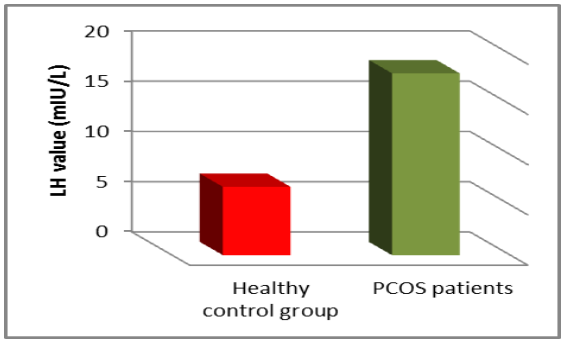

Fig.5. The comparison between serum LH value in women's healthy control group and PCOS patients.

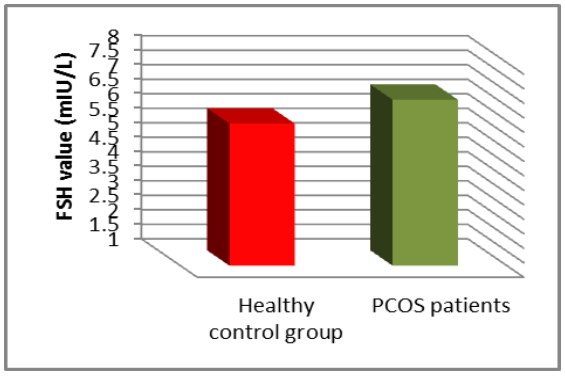

Fig.6. The comparison between serum FSH value in women's healthy control group and PCOS patients.

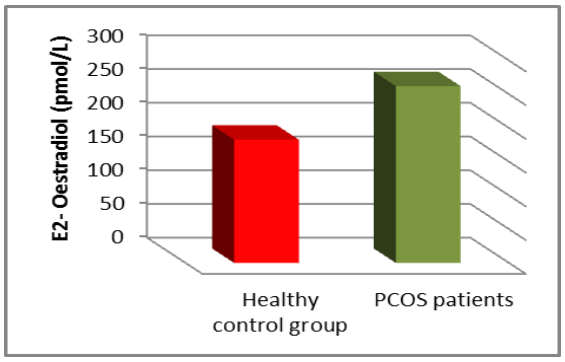

Fig.7. The comparison between serum E2-Oestradiol value inwomen's healthy control group and PCOS patients.

4 Discussion

Thyroid hormones have various effects on the reproductive system of the human female. Alteration in thyroid function, particularly hypothyroidism, can cause ovulatory dysfunction and lead to impaired female fertility. Hypothyroidism and PCOS are often accompanied by increased serum free testosterone, luteinizing hormone (LH) and high cholesterol. When the ovaries of hypothyroid women with PCOS are viewed with an ultrasound an increase in ovarian volume and the appearance of bilateral multicystic ovaries are often visible. When thyroid hormone replacement therapy is initiated, in addition to stabilizing thyroid hormone levels, ovarian cysts regress and ovarian volume is reduced (Sergei, 2012).

Limited data are available regarding the relation of thyroid function and volume in PCOS women. Previous studies tried to explore thyroid changes in PCOS. Mostly the results of these studies showed elevated TSH and higher autoimmune thyroiditis in PCOS women as compared to control women without PCOS (Sinha et al., 2013).

Goush et al., (1993) summarized the plausible underlying pathophsiological mechanism of ovarian cyst formation in patients with subclinical and overt hypothyroidism.

In the current study, thyroid function was assessed in

women with PCOS matched healthy control women. We found that hormonal changes associated with the subclinical hypothyroidism include increased level in TSH and increased LH-FSH ratio also had polycystic ovaries on ultrasound.

One important mechanism of PCOS is insulin resistance. There is a relationship between thyroid function and insulin sensitivity, alterations in lipids and metabolic parameters. In (Danfeng, Xuelian, 2013) study, women with thyroid stimulating hormone > or =2.5 mIU/L had a significantly higher body mass index, higher fasting insulin concentrations and altered insulin resistance indices, higher total testosterone, free androgen indices and decreased sex hormone-binding globulin concentrations in comparison with women with thyroid-stimulating hormone < 2.5 mIU/L.

Comparison of values of estrogen controls to that of PCOS cases showed slight increase in levels of PCOS cases against normal controls. High levels of androgens in PCOS peripherally converted to estrogens may lead to their increased concentration. High levels of estrogen in PCOS patients have also been reported in other studies (Rabail et al., 2012).

5 Conclusions

In conclusion, although the cause effect rela¬tionship between PCOS and thyroiditis remains unknown, our study have found that the prevalence of PCOS, serum TSH are significantly higher in PCOS patients than those in control group, which suggests PCOS may be a kind of autoimmune disease and has close association with hypothyroidism. So, it will be helpful to assess thyroid function routinely in patients with PCOS and offer thyroid hormone replacement therapy if necessary.

References

[1] D. Danfeng, L. Xuelian; The relationship between thyroiditis and polycystic ovary syndrome, Int J Clin Exp Med. **2013**, 6(10), 880-889.

[2] Michael guarnaccia; The hormonal causes of ovulatory disorders, **2013**.

[3] G. E. Krassas, K. Poppe and D. Glinoer; Thyroid Function and Human Reproductive Health, edrv.endojournals.org. **2010**, 31(5), 702-755.

[4] Dr. Dileep; Thyroid disease and fertility, Kerala agriculture university, **2012**.

[5] S. Avdiushko; Ph.D. Connection between hypothyroidism and PCOS. Hormones Matter, **2012**.

[6] U. Sinha, K. Sinharay, S. Saha, T.A. Longkumer, S.N. Baul and S. K. Pal; Thyroid disorders in polycystic ovarian syndrome subjects: A tertiary hospital based cross-sectional study from Eastern India. Indian J Endocrinol Metab. **2013**, 17(2), 304-309.

[7] S. Ghosh, S.N. kabir, A. pakrashi, S. chatterjee, B. chakravarty; Subclinical hypothyrodisim: a determination of polycyctic ovary syndrome. Horm res. **1993**, 39, 61-6.

[8] R. Javed, S. Younas, F. Ghafoor and M. A. Jajja; Effect of female hormones in different ovarian conditions. Asian Research Publishing Network Journal of Agricultural and Biological Science. **2012**, 7(1), 1990-6145.

[9] A. Shirsath, N. Aundhakar , P. Kamble; Does the thyroid hormonal levels alter in polycystic ovarian disease? A comparative cross sectional study. Indian Journal of Basic and Applied Medical Research. **2015**, 4(3), 265-271.

[10] H.H.G. Moura, D.L.M. Costa, E. Bagatin,C.T. Sodré, M.M. Azulay; Polycystic ovary syndrome: a dermatologic approach. Anais Brasileiros de Dermatologia. **2011**, 86(1), 111-9.