Comparative Study of Antioxidant Levels (Vitamin E &Selenium) In Serum of Polycystic Ovary Syndrome Patients and Control

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Abstract

Polycystic ovary syndrome (PCOS) is the most common endocrine disorder of reproductive women. The antioxidant (Vitamin E and Selenium) have important role in infertility and in PCOS. The aim of this study, to know the role of Vitamin E and Selenium during the phases of menstrual cycle and its effect on ovulation in (PCOS) patients and effect of body mass index in PCOS patients. This study, include 25 untreated and 26 treated PCOS patients comprised with 42 control. Vitamin E and selenium were measured by high performance liquid chromatography (HPLC) and atomic absorption spectrophotometer (AAS), respectively. Our results were observed vitamin E have significant ($p<0.0005$) between PCOS groups and control in pre-ovulation period (11-15) days and Selenium have highly significant difference ($p<0.000005$) between PCOS groups and control in each phase of menstrual cycle. From these results, concluded that vitamin E have role in ovulation and Selenium lowered significantly in untreated PCOS, suspecting presence of oxidative stress.

Keywords: Polycystic ovary syndrome (PCOS), antioxidants (vitamin E & Selenium) and Body mass index (BMI).

Introduction

Polycystic Ovary Syndrome (PCOS) is an anovulatory cause of infertility affecting 6-10% of premenopausal women PCOS often can be characterized by hyperandrogenism, hirsutism, and oligomenorrhea or amenorrhea. Metabolic, endocrinologic, and cardiovascular disorders may also coexist.[1] It was first described in 1935 by Stein and Leventhal[2]. No single etiologic factor fully accounts for the wide spectrum of metabolic abnormalities seen in PCOS [3]. More than 40 % of PCOS patients are obese [4].

Reactive Oxygen Species (ROS) like superoxide anion O_2^-, hydrogen peroxide (H_2O_2) and hydroxyl radical ($OH\cdot$) appears to have physiological role in female reproductive tract in many different processes such as: oocytes maturation, fertilization, luteal reprogression, and endometrial shedding[5]. Ovary is a metabolically active organ and, hence, is under a variety of stresses continuously. it is reasonably hypothesized that ROS is released in connection with follicle rupture and is involved in the process[6]. Whenever ROS levels become pathologically elevated, antioxidants begin to work and help minimize the oxidative damage, repair it or prevent it altogether[7, 8]. Many studies reported that deficiency of antioxidants such as vitamin E, vitamin C, uric acid, glutathione, taurine, albumin or a group of enzymes that help to scavenge the oxygen radicals throughout the female reproductive tract[9]. Administration of vitamin E or the combination of vitamin E and selenium has been reported to reduce the incidence of postpartum reproductive disorders such as retained fetal membranes, metritis, and cystic ovaries and to improve fertility[10]. The aim of this study, to know the role of Vitamin E and selenium during menstrual cycle and effect of body mass index (BMI).

Experimental Part

This study was conducted at College of Science / Chemistry Department and College of Medicine at Al-kadhymia Teaching Hospital, Department of Obstetric and Gynecology and IVF Institute of Embryo Research and Infertility Treatment throughout the period from Dec., 2006 to Apr., 2007. It include Seventy-five women were divided to three groups and each group was subdivided in three groups according to their phases of menstrual cycle. The first two groups were fifty-one patients diagnosed clinically and biochemically for PCOS patients. The first group includes twenty-five patients untreated with clomiphene citrate and the second group included twenty-six new patients were treated

by clomiphene citrate. Twenty-four control, age and body mass index matched normal healthy women were not taking any drugs and their ages were reproductive women age. Serum was collected at each phases of menstrual cycle, follicular phase, 1-9 days, pre-ovulation, 10-15 days and luteal phase, over 15 days to measure vitamin E and Selenium.

Vitamin E was measured by HPLC 10AVP Shimadzu (Kyoto, Japan) and determination of selenium was performed using Perkin-Elmer model 305 flameless Atomic Absorption Spectrophotometry equipped with a heated graphite furnace model (HGA) 2200.

Statistical Analysis

Statistical analysis was performed using SPSS for windows TM version 10and Microsoft EXCEL for windows 2007. This study included Descriptive statistics:Statistical tables, Arithmetic mean and Standard deviation and Differential statistics: T-test, ANOVA test and The correlation coefficient.

Results and Discussion:

In this study, the results of significant difference ($p<0.05$) in serum vitamin E between follicular phase and pre-ovulation while it was not found between pre-ovulation and luteal phase in treated and control groups, are shown in Table (1)

Table (1)
Comparison of vitamin E levels among untreated, treated cases of PCOS and control group during follicular, pre-ovulation and luteal phase.

Cycle phase	Vit. E (µg/ml) Untreated PCOS Mean ± SD	Vit. E (µg/ml) Treated PCOS Mean ± SD	Vit. E (µg/ml) Control Mean ± SD	ANOVA
Follicular phase	2.040±0.340	4.000±1.307	4.073±2.070	P<0.05
Pre-ovulation	3.261±1.314	2.081±0.490	1.385±0.546	P<0.0005
T-test	N.S.	P<0.05	P<0.05	
Pre-ovulation	3.261±1.314	2.908±0.499	1.385±0.546	
Luteal phase	4.011±1.032	3.379±2.116	3.340±1.874	N.S.
T test	P<0.05	N.S.	N.S.	

N.S.: no significant.

These results were agreed with Rapoport *et al.*, 1998 [11] for decrease of Vitamin E level in pre-ovulation and luteal phase. It may be due to balance the superoxide that generate from macrophages and neutrophiles, as they are present in ovary at ovulation and during corpus luteum regression[12, 13] and because of these processes do not occur in untreated group, there are no significant difference between follicular phase and pre-ovulation.

For this reason, there were highly significant differences ($p<0.0005$) between study groups in pre-ovulation and there are significant difference ($p<0.05$) between them in follicular phase with low level of vitamin E in untreated group, then increased the level in luteal phase leading to significant ($p<0.05$) between pre-ovulation and luteal phase of the same group, may be caused by oxidative stress at level of follicular phase causing to stop growing of follicular.

There are no significant difference was found between certain BMI among study groups, as show in Table (2).

Table (2)
Comparison of vitamin E levels among untreated, treated and control group with body mass index.

BMI (Kg/m²)	No.	Vit. E (µg/ml) Untreated PCOS Mean ± SD	No.	Vit. E (µg/ml) Treated PCOS Mean ± SD	No.	Vit. E (µg/ml) Control Mean ± SD	ANOVA
<25	5	3.101±2.170	6	2.734±0.524	5	3.259±1.307	N.S.
25-30	15	3.710±1.380	15	2.100±1.020	14	3.304±2.025	N.S.
>30	5	[illegible]	5	[illegible]	5	[illegible]	N.S.
ANOVA		N.S.		N.S.		N.S.	

Also, in this study, the results of serum Selenium were found significant difference ($p<0.01$) between follicular phase and pre-ovulation for treated and control groups, as shown in Table (3). The results were agreed with Ha, and Smith, in 2003[14], from the lowest level during the follicular phase to a maximum level during pre-ovulation, which coincided with elevated of 17-β-estradiol.

Ohwada *et al.*, 1996, found that endometrial Glutathion peroxidase (GPx) activity in women is stimulated by estrogen and that uterine GPx activity in spayed rats can be elevated by exogenous

Table (3)
Comparison of selenium levels among untreated, treated cases of PCOS and control group during follicular, pre-ovulation and luteal phase.

Cycle phase	Se (ng/ml) Untreated PCOS Mean ± S.D	Se (ng/ml) Treated PCOS Mean ± SD	Se (ng/ml) Control Mean ± S.D	ANOVA
Follicular phase	[illegible]	[illegible]	98.501±5.101	P<0.000005
Pre ovulation	63.200±10.321	90.923±7.217	101.222±4.314	P<0.000005
T test	N.S	P<0.01	P<0.01	
Pre ovulation	75.100±10.321	90.923±7.217	101.222±4.314	
Luteal phase	77.125±6.854	88.333±5.918	101.000±3.717	P<0.000005
T-test	N.S	N.S.	N.S	

Table (4)
Comparison of selenium levels among untreated, treated and control group with body mass index.

BMI (kg/m²)		Se (ng/ml) Untreated PCOS Mean ± SD		Se (ng/ml) Treated PCOS Mean ± SD		Se (ng/ml) Control Mean ± SD	ANOVA
<25	5	73.800±7.425	6	[illegible]	5	102.200±2.588	P<0.005
25-30	15	[illegible]	15	[illegible]	11	[illegible]	P<0.005
>30	5	72.444±12.290	5	91.333±16.669	5	102.833±9.724	P<0.005
ANOVA		N.S.		N.S		N.S.	

estradiol treatment[15]. Massafra *et al.*, 1997, have suggested that estradiol have suggested that estradiol affects the maturation of bone marrow to stimulate the synthesis of active GPx [16]. From those studies, concluding that estrogens have indirect effect on selenium by GPx. And that effect appeared highly significant (p<0.000005) between studies groups while the significant (p<0.01) that appeared between follicular phase and pre-ovulation with lower level of selenium concentration in untreated PCOS. It may be because of oxidative stress.

But that effect is no significant in untreated group between follicular phase and pre-ovulation because of plasma GPx has been shown to 10% to 15% of the plasma selenium[17] and beside of this the different in metabolism and genetics from person to another causing to disappear the significant. For the same reason which was mentioned above, there were strongly significantly different (p<0.005) between studies groups in certain BMI, but no significant in different BMI for one group, shown in Table (4).

Conclusion

In this study a conclusion could be drawn that vitamin E have a role in ovulation while Selenium had lower significant in untreated PCOS, suspecting presence of oxidative stress. Also, no correlation was found between Selenium, Vitamin E and BMI.

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الخلاصة

ان مرض المبيض المتعدد الاكياس هو حالة مرضيه شائعة في الاناث خلال سنوات الاخصاب و بنسبة (5-10 %) ويعتبر أحد اسباب العقم عن النساء. ان المضادات للأكسدة (السيلينيوم و الفيتامين إي) لهما دور مهم في العقم. الهدف من هذه الدراسة معرفة دور فيتامين اي والسيلينيوم خلال اطوار الدورة الشهرية وتاثيرهما في مرحلة التبويض في مرضى المبيض المتعدد الاكياس ودراسة تاثير كتلة الجسم في هؤلاء المرضى. وتضمن هذه الدراسة خمسة وعشرون مريضه غير معالجه بعقار الكلوميفين ستريت، و ستة وعشرون مريضه معالجة بعقار الكلوميفين ستريت، بالمقارنة مع أربعة و عشرون من النساء الاصحاء. وتم قياس كل من فيتامين إي بواسطة كرموتوكرافيا السائل,السيلينيوم بأستخدام تقنية مطيافية الامتصاص الذري عديم اللهب. لوحظ ان فيتامين اي له اختلاف معنوي ($p<0.0005$) بين المرضى و الاصحاء في مرحلة التبويض (11-15) يوم و كذلك اختلاف معنوي ($p<0.000005$) للسيلينيوم في كل مراحل الدورة الشهرية واستنتج بان للفيتامين اي دور في عملية التبويض والانخفاض المعنوي للسيلينيوم في مرحلة التبويض لمرضى يشكك حدوث جذر حر.