The effects of vitamin D in polycystic ovarian syndrome

Najwa Abdulla Mohammed[1] , Ammar Lateef Hussein[2] , Atheer Rashed Atia [3]

[1] *Department of Biology, College of Science, Tikirit University, Kirkuk, Iraq*
[2] *Department of Biochemistry, College of Medicine, Tikirit University, Tikirit, Iraq*
[3] *Kirkuk General Hospital , Kirkuk , Iraq*

ABSTRACT

The common endocrine disorder in women is that Polycystic ovarian syndrome (PCOS) specially in reproductive age. The study included 60 women suffer from the PCOS attending the obstetrics and gynecology unit in Kirkuk General Hospital, ages ranged from 18 to 42 years old. Also, the study included 30 non PCOS women as a control group. To assess the effect of Vitamin D in women suffering from polycystic ovarian syndrome. Serum Vitamin D was evaluated using Enzyme linked immunosorbent assay (ELISA) technique. The study reported that 58.3% of PCOS women enrolled in this study were within the age group 16- 25 year. The study reported that the BMI of PCOS women was (mean 30.98 ± 4.02) Kg/cm^2, whereas (22.77 ± 2.52) Kg/cm^2 of the control group (P: 0.0004). A significant difference recorded in the study in the Vitamin D levels in Polycystic overian syndrom women compared to the healthy group (mean 18.69 ± 5.11 25.99 ± 5.70).

Introduction

Polycystic ovary syndrome (PCOS) is considered as one of the most common endocrine defect in reproductive aged women, impacting 6%-10% of female globally [1]. PCOS is characterized by hyperandrogenism, chronic anovulation and multiple small subscapular cystic follicles in the ovary by Ultrasonography [2].

The diagnosis of PCOS is based on the prescence of at least two criteria of the following: enlarged ovaries comprising over 12 follicles, irregular or absent ovulation and increased androgenic hormones [3]. Although PCOS aetiology isn't understood completely, it is considered as a multifactorial disorder with several metabolic, endocrine, environmental and genetic abnormalities [4]. As well as, PCOS is considered to be a metabolic risk factor for cardiovascular diseases (CVD) and type two diabetes; like obesity and insulin resistance, which are common in PCOS women, also with increased insulin resistance, body weight and impaired glucose tolerance increased in women with the highest values of androgens [5].

Vitamin D3 is a fat-soluble vitamin produced in two ways, the first by intestinal absorption and the second by endogenous synthesis of a precursor from 17-hydroxyl cholesterol on the skin with adequate exposure to ultraviolet sunlight [6]. Besides the role

of vitamin D in calcium and bone metabolism, its deficiency may cause various skeletal and extra-skeletal effects, with effect on cardiovascular disease, autoimmune diseases, glucose homeostasis, cancer and psychological disorders [7].

Some studies suggested that in women with PCOS there is an association between obesity and serum values of vitamin D [8]. Decreased 25(OH) D value was reported to be associated with PCOS salient features that include hyperandrogenism, decreased pregnancy rate, ovulatory and menstrual irregulation, hirsutism, insulin resistance, obesity and cardiovascular disease [9].

The objectives of the current study is to estimate the serum level of Vitamin D in women with PCOS and the healthy group.

Materials and methods

A cross sectional study was done in Kirkuk General Hospital during the period from the first of December 2019 to the end of May 2020, included 60 women under study with PCOS aged between 18 to 42 years old. These patients consult with obstetrics and gynecology unit at the Kirkuk General Hospital. The diagnosis of Polycystic ovarian syndrome was follow the Rotterdam Criteria. When more than one of the criteria were present: clinical and/or biochemical signs of increase indrogen, oligo and/or an ovulation,

and polycystic ovaries in transvagainal ultrasound, meaning presence of 13 or more than follicles measuring 2.5–8.9 mm in diameter in each ovary and/or ovarian volume more than 9.9 cm^3, without treatment and without kidney or liver disease. Also, the study included control group, thirty volunteer females apparently healthy with regular menstrual cycles aged between 18 to 42 years. All 60 women with PCOS and 30 women, which apparently healthy control were subjected to full physical examination and anthropometric measurements, including height, weight. By using the formula: weight (Kg) /height (meters^2) Body Mass Index (BMI) was measured.

Blood sample was taken from capital vein, about 5 ml drawn by vein-puncture using disposable syringes from all women included in the study. Serum was separated after centrifugation at 3000 rpm for 10 min. By using mechanical micropipette aspirated serum transferred into clean test tubes which supplied with screw, each sample was labelled and stored in a deep freeze at -20 ^{O}C for measurement Vitamin D level. ELISA (Dynex, USA) system used to evaluate the level of Vitamin D. ELISA test kit was used for *in vitro* determination of 25-OH vitamin D in (Abcam, Germany).

Results

The study reported that 58.3% of PCOS women enrolled in this study were within the age group 16-25 year with mean age 25.36 year, Table 1. and Figure 1.

Table 1: Distribution of PCOS women according to age.

Age group (years)	No.	%
16-25	35	58.3 %
26- 35	21	35 %
36 >	4	6.66
Total	60	100
Mean age= 25.36 year		
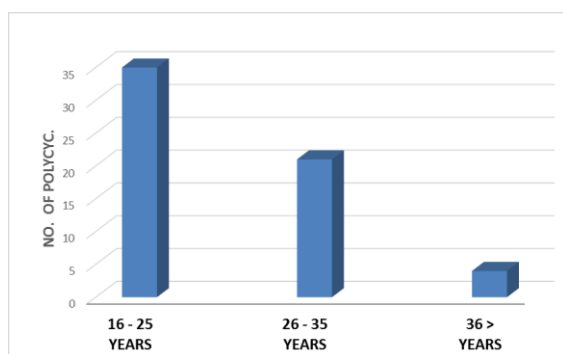
Fig. 1: Distribution of PCOS women according to age.

This study determined that the mean of BMI was recorded in PCOS women when compared with healthy women (30.98 ± 4.02) Kg/cm^2 versus (22.77±2.52) Kg/cm^2 at a P value P: 0.0004, as shown in Table 2.

Table 2: The mean of BMI in patients with PCOS.

BMI (Kg/cm^2)	PCOS women	Control group	t-test	P value
No.	60	30		
Mean	30.98	22.77	-12.21	P = 0.0004
SD.	4.02	2.52		

This study showed a significant difference between PCOS women and the healthy group concerning serum vitamin D level and the mean of vitamin D was occurred in PCOS women (18.69±5.11 25.99±5.70), Table 3.

Table 3: The mean of Vitamin D Level in patient with PCOS.

Vitamin D level (ng/ml)	PCOS women	Control group	t-test	P value
No.	60	30		
Mean	18.69	25.99	5.93	P = 0.0002
SD.	5.11	5.70		

Discussion

The study determined that the majority of women with PCOS were within the age range from 16 to 25 years. Koivunen *et al.* [10] agreed with our study, they determined that PCOS varies with age, but remains to be more common amongst women aged less than 25 years than above 25 years women. These findings may be attributed to that during this period of their lives women are physiological active concerning the ovulation and fertility. The prominent biochemical abnormality in PCOS women is hyperandrogenism. Yet, Winter *et al.* [11] revealed that women who have PCOS in young age the hyperandrogenism partly resolves before menopause. PCOS is a heterogeneous collection of symptoms and signs that combined together to form a spectrum disorder of a metabolic function, reproductive and endocrine, with a mild disturbance in some women to severe disturbance in others. The distribution of PCOS cases within the age range (16 to 25) years; suggested that PCOS is an age-dependent disorder, so PCOS was linked to women age of hormonal activity and instability [12].

This study reported the majority of women with polycystic ovary syndrome under study were obese when compared with control group who were within normal range. This finding was in agreement with Jahromi *et al.* [13] who determined more prevalence of obesity and overweight in women with PCOS. Also, Alnakash and Al-Taee [14] study, they reported overweight or obese in about 63% of 107 women with PCOS. Some data supported the evidences that the PCOS prevalence in women could be increased with increasing BMI. Anderson *et al.* [15] and Ollila *et al.* [16] reported that weight gain, particularly in early adulthood, associated with later diagnosis of PCOS. Yuan *et al.* [17] suggested that PCOS patients with high BMI tend to have androgen excess and functional disorders; therefore, BMI may be a strong predictor of hyperandrogenism in PCOS.

The study reveled that there is a negative correlation between vitamin D and PCOS women. The study showed that there is a significant difference between PCOS women and the control group concerning

vitamin D level and the lowest mean of vitamin D was recorded among in PCOS women (18.69±5.11 , 25.99±5.70).

Several studies done to improve these findings, particularly the IR mechanisms that included in metabolic disorders in women with PCOS [18, 19]. Gene transcription is thought to be regulated by Vitamin D through vitamin D receptors (VDRs), which are distributed widely throughout the tissues of the body, including the ovaries. Gene polymorphisms that are associated with VDRs have been linked to testosterone, sex hormone-binding globulin (SHBG), and insulin serum luteinizing hormone (LH) levels [18].

Onther studies [20,21] reported that serum vitamin D levels in women with PCOS were lower than the healthy groups. Also, Wehr *et al*. [22] explained lower serum vitamin D levels in the women with PCOS (25.7 vs. 32.0 ng/mL, respectively) when compared to control group. In previous studies, the average serum vitamin D levels in PCOS patients were determined to be between 11 ng/mL and 31

ng/mL, with the majority having mean values< 20 ng/mL [23,24]. Other studies [25,26] suggested that there is an association between PCOS with low vitamin D levele. Forouhi *et al*. [27] suggested that there is a relationship between metabolic syndrome and low vitamin D, stored vitamin D in fat tissue will affect the amount of adipokines secreted from adipose tissue. Many previous studies [28, 29] of women with PCOS showed that a low vitamin D levels could be associated with worsening metabolic disorders such as IR, hirsutism and infertility. Thomson *et al*. [28] revealed that vitamin D deficiency may exacerbate PCOS symptoms, that is associated with obesity, hirsutism, hyperandrogenism, insulin resistance, ovulatory with menstrual irregularities, lower pregnancy success and elevated cardiovascular disease risk factors and there is some limited evidence for vitamin D supplementation beneficial effects on insulin resistance and menstrual dysfunction in women with PCOS.

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دور فيتامين د في النساء المصابات بمتلازمة تكيس المبايض

نجوى عبدالله محمد[1] ، عمار لطيف حسين[2] ، اثير رشيد عطية[2]

[1] قسم علوم الحياة ، كلية العلوم ، جامعة تكريت ، تكريت ، العراق

[2] كلية الطب ، جامعة تكريت ، جامعة تكريت ، تكريت ، العراق

[3] مستشفى كركوك العام ، كركوك ، العراق

الملخص

ان من اكثر اضطرابات الغدد الصماء شيوعيا لدى النساء وخصوصا في سن الانجاب هي متلازمة تكيس المبايض. تضمنت الدراسة الحالية 60 امرأة تعاني من متلازمة تكيس المبايض واللواتي كن يراجعن وحدة امراض النسائية والتوليد في مستشفى كركوك العام, اعمارهن كانت تتراوح بين 18 الى 42 سنة. كذلك شملت الدراسة 30 امرأة لا يعانين من متلازمة تكيس المبايض كمجموعة مقارنة. ولغرض تقييم الاصابة بمتلازمة تكيس المبايض, تم قياس فايتمين د في مصل دم النساء المصابات باستخدام تقنية انزيم الارتباط المناعي. اوضحت الدراسة ان58.3% من النساء المصابات بمتلازمة تكيس المبايض كن في اعمار تتراوح ما بين 16 الى 25 سنة. كما اشارت الدراسة الى ان مؤشر كتلة الجسم للنساء المصابات بتكيس المبايض كان (بمعدل 38.98 ± 4.02) كغم /سم^2 بينما كانت (22.77 ± 2.52) كغم/سم^2 لمجموعة المقارنة. تم تسجيل فرق معنوي في مستوى فيتامين د لدى النساء المصابات بتكيس المبايض مقارنة بمجموعة السيطرة حيث كانت (18.69 ± 5.11 , 25.99 ± 5.70)