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Study of estimation of level of vitamin D3 in patients of polycystic ovary syndrome and their correlation

[1] Dr. Ujjval Parikh, [2] Dr. Jignesh Sanghvi

[1] Assistant Professor, Department of obstetrics and gynecology, Parul Institute of medical science and Research, Vadodara, Gujarat, India
[2] Gynecologist, Kailash cancer hospital and Research center, Goraj, Vadodara, Gujarat, India

Abstract
Background: Polycystic ovary syndrome (PCOS) is among the most common endocrine disorders in women of reproductive age and has a strong genetic component. It is characterized by ovarian dysfunction and its clinical manifestations may include obesity, increased insulin resistance and compensatory hyper-insulinemia, oligo-/anovulation and infertility.
Methods: This prospective study was conducted on 100 patients of PCOS both suspected as well as already diagnosed at department of obstetrics and gynecology at kailash cancer hospital and Research center, Goraj,Vadodara,Gujarat from 2012-2013. Diagnosis of PCOS was made by Rotterdam 2003 criteria. A detailed assessment was done and preformed proforma was filled. Estimation of serum vitamin D3 was done from all participants by chemiluminence method in central laboratory of our institute. Obtained data was analysed statistically by calculating p value and chi square test.
Results: In this study, the prevalence of vitamin D3 deficiency in patients of PCOS was found to be 86% which is significant. Various parameters associated with PCOS like waist-hip ratio, obesity, AN of neck and hirsutism score showed positive significant correlation with vitamin D3 deficiency and physical activity of patients of PCOS showed negative correlation with the same.
Conclusions: From Our study we would like to conclude that improvement of vitamin D3 levels at a younger age can contribute to prevention of PCOS. Each and Every patients of PCOS should be screened by measuring the level of serum vitamin D3.Correction of Vitamin D3 deficiency may prevents the complication of PCOS.

Keywords: vitamin D3, PCOS, deficiency

Introduction

Polycystic ovarian syndrome is a common endocrine disorders among women of reproductive age. Its worldwide prevalence has been estimated between 2.2% and 26%, which is reported about 7.1% among Iranian population [1]. These patients generally are more likely have irregular menstruation, hyperandrogenism, and defects in ovulation and polycystic ovaries [2].

Studies regarding Vitamin D status in patients with PCOS show an inverse correlation between Vitamin D levels and metabolic risk factors, e.g. insulin resistance, BMI, waist-to-hip-ratio, triglycerides, total testosterone and a positive correlation with insulin sensitivity [3, 4]. Data on the role of gene variants involved in Vitamin D metabolism in PCOS are sparse but suggest an association of VDR and Vitamin D level-related variants with metabolic and endocrine parameters in women with PCOS. Several studies although limited by modest sample sizes have suggested associations between VDR polymorphisms and the development of PCOS as well as insulin resistance [5, 6].

Stress is one of the important factors in the aetiology of PCOS; it is seen in patients of PCOS from the young age till old. There are three major sets of diagnostic criteria for the diagnosis of PCOS [7].

Vitamin D deficiency is a global health issue. Inadequate exposure to sun light is one of the main causes of this deficiency, since food dietary contains natural sources of vitamin D supplement [8]. In addition, older individuals with increased fat deposits are also prone to develop vitamin D deficiency. Hypovitaminosis D may be associated with a number of mental and physical disorders such as MBS, type 2 diabetes, PCOS and cancer.

Material & method

This prospective study was conducted on 100 patients of PCOS both suspected as well as already diagnosed at department of obstetrics and gynecology kailash cancer hospital and Research center, Goraj, Vadodara, Gujarat from 2012-2013.

Inclusion criteria

All newly suspected and diagnosed cases of PCOS.

Exclusion criteria

Any diagnosed case of PCOS who was on and had history of taking vitamin D and calcium supplement within period of one year. Diagnosed cases of PCOS who was under treatment and recovered with treatment (medical and surgical) Patients who were not willing to take part in the study.

Diagnosis of PCOS was made by Rotterdam 2003 criteria. A detailed assessment was done and performed proforma was filled. Demographic data was collected, relevant history and

chief complaints were noted. Any comorbidities like diabetes, hypertension and thyroid dysfunction present or absent in subjects was mentioned.

Lifestyle of subjects was assessed by physical activity which was graded as 1) active, 2) moderate and 3) sedentary activity.

Standard anthropometric data height, weight, BMI, waist circumference, hip circumference was measured. Waist-hip ratio (WHR) was calculated and classified according to WHO guided health risks into low, moderate and high risks as <0.80, 0.80-0.85 and >0.85 respectively.

BMI was classified by WHO classification and cases were divided into non-obese (BMI<25) and obese (BMI >25) then mean was calculated and compared.

Hirsutism was quantified according to modified Ferriman-Gallwey-Score which was filled by subjects in the chart Figure 2 and total score was calculated and quantified as <8 non-hirsutisms, hirsutism >8-15 and overt hirsutism >15 [9].

Estimation of serum vitamin D3 by Chemiluminence method in fully automated analyzer.

Table 1

Vitamin D3	Levels
Vitamin D3 sufficient	(25[OH]D ≥30 ng/ml)
Vitamin D3 insufficient	(25[OH]D 20-29 ng/ml)
Vitamin D3 deficient	(25[OH]D <20 ng/ml]

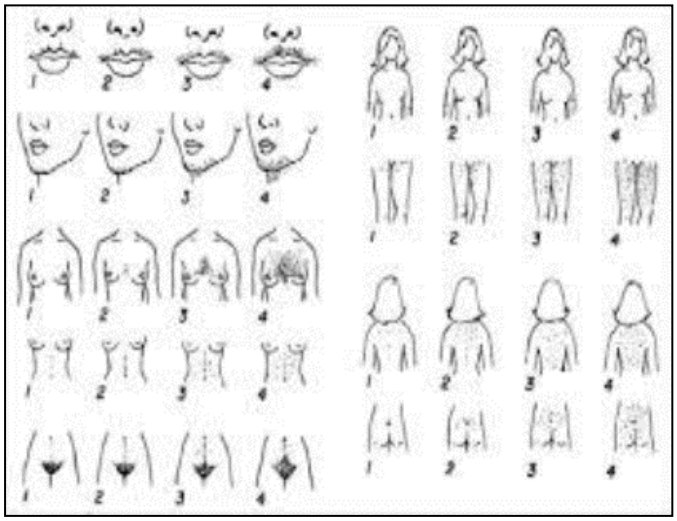

Fig 1: Ferrimann-Gallwey hirsutism scoring system.

Results

Out of 100 PCOS patients, 38% of the patients having age group between 16-20 year followed by 30% 21-25 years and 15% 26-30 years.

Age wise distribution of the participants is mentioned below Table 2.

Table 2: Age wise distribution of participants

Age Group	Number(n)	Percentage
<15 yr	02	2%
16-20 yr	38	38%
21-25 yr	30	30%
26-30 yr	15	15%
31-35 yr	13	13%
>35 yr	02	2%

86% (86) had serum vitamin D3 levels less than required i.e. 30ng/dl and only 14% (14) had sufficient levels (Table 3).

Table 3: Concentration of Vit D3 level in participants

Vit D3 Level	Number (n)	Percentage
Deficiency (<20 ng/ml)	54	54%
Insufficiency (20-30 ng/ml)	32	32%
Sufficiency (>30%)	14	14%

Table 3: Distribution of Vit D3 level in PCOS patients based on their complain

Presenting complaints	Vitamin D3 Sufficient	Vitamin D3 Insufficient	Vitamin D3 Deficient	Total
Menorrhagia	2 (6.0%)	11(33%)	20 (60.60%)	33
Amenorrhoea	3 (9.0%)	11(33%)	19 (57.57%)	33
Acne	9 (17.30%)	15 (28.84%)	28(53.84%)	52
Acanthosis nigricans	2 (7.6%)	11 (42.30%)	13 (50%)	26
Oligomenorrhea	10 (14.7%)	43 (63.23%)	47 (69.11%)	34
Alopecia	1 (4.76%)	5(14.7%)	15 (71.42%)	21
Infertility	5 (14.70%)	13(38%)	16 (47.05%)	34
Weight gain	9 (14.75%)	21 (34.44%)	31 (50.81%)	61
Hirsutism	6(12%)	18(36%)	26(52%)	50

Table 4: Distribution of Vit D3 level in PCOS patients according to physical activity

Activity	Vitamin D3 Sufficient	Vitamin D3 Insufficient	Vitamin D3 Deficient	Total
Active	9 (50%)	3 (16.66%)	6 (33.33%)	18 (18%)
Moderate	3 (4.8%)	27 (43.54%)	32 (51.61%)	62 (62%)
Sedentary	2 (10%)	2(10%)	16 (80%)	20 (28.6%)
Total	14	32	54	100(100%)

Table 5: Distribution of Vit D3 level in PCOS patients Based on hirsutism score

Hirsutism score	Vitamin D3 Sufficient	Vitamin D3 Insufficient	Vitamin D3 Deficient	Total
Non-hirsutism	4(12.5%)	14 (43.75%)	14 (43.75%)	32 (32%)
Hirsutism	10 (17.24%)	14 (24.13%)	34 (58.62%)	58 (58%)
Overt hirsutism	0 (0%)	4 (40%)	6 (60%)	10(10%)
Total	14	30	54	100 (100%)

Table 6: Comparison of Vit D3 level between obese and non obese PCOS patients based on BMI

BMI	Number(n)	VitD3 concentration(ng/ml) Mean SD
Non obese (BMI <25)	46	21.54 ±5.45
Non obese (BMI >30)	54	14.52±7.53

Table 7: Distribution of Vit D3 level in PCOS patients Based on Waist hip ratio (W/H ratio)

Waist - Hip Ratio	Vitamin D3 Sufficient	Vitamin D3 Insufficient	Vitamin D3 Deficient	Total
Low risk (<0.8)	5 (62.50%)	3 (37.50%)	0(0.0%)	8 (8.0%)
Moderate risk (0.8-0.85)	3 (13.63%)	5 (22.72%)	14 (63.63%)	22 (22.0%)
High risk (>0.85)	6 (8.5%)	24 (34.28%)	40 (57.14%)	70 (70%)
Total	36	23	11	70 (100%)

Table 8: Distribution of Vit D3 level in PCOS patients according to Presence of Acanthosis nigricans

Acanthosis nigricans	Vitamin D3 Sufficient	Vitamin D3 Insufficient	Vitamin D3 Deficient	Total
Neck	1 (2.1%)	20(43.47%)	27 (58.69%)	46
Axilla	5 (14.28%)	11(31.42%)	19 (54.28%)	35
Elbow	0 (0%)	5 (21.73%)	18(78.26%)	23
Knuckles	0 (0%)	10 (41.66%)	14 (58.33%)	24
Knee	0 (0%)	05 (21.73%)	18 (78.26%)	23

Discussion

Vitamin D plays a physiologic role in reproduction including ovarian follicular development and luteinization via altering anti-müllerian hormone (AMH) signalling, follicle-stimulating hormone sensitivity and progesterone production in human granulosa cells[1]. It also affects glucose homeostasis through manifold roles. The potential influences of vitamin D on glucose homeostasis include the presence of specific vitamin D receptor (VDR) in pancreatic β-cells and skeletal muscle, the expression of 1-α-hydroxylase enzyme which can catalyze the conversion of 25-hydroxy vitamin D [25(OH)D] to 1,25-dihydroxyvitamin D, and the presence of a vitamin D response element in the human insulin gene promoter [10].

Li HW *et al*, in an observational study 2011 including 25 women with PCOS and 27 controls to the prevalence of vitamin D deficiency in PCOS women in Scotland found the majority of PCOS subject's n=18, 72% were found to be vitamin D deficient [11].

In an observational study, involving 206 PCOS women were studied by Wher *et al*, wherein 72.8% (150 women) of PCOS population demonstrated vitamin D deficiency [12].

Majority of cases in this study had complaint of oligomenorrhea and 86.2% of them were noted with vitamin D3 deficiency. Clinical features of hyperandrogenism include hirsutism, acne and alopecia in the women with PCOS. In our study, low levels of vitamin D3 associated with higher hirsutism score, that was found to be statistically significant.

Wehr *et al*, also observed negative correlation between serum vitamin D3 levels with hirsutism score who statistically significant had lower levels of vitamin D than non-hirsute women [12].

Obesity is one of the most important features of PCOS, BMI and WHR are well defined parameters to assess it. In this study, also both were found statistically significant inversely correlated with vitamin D3 levels, inferring association between central obesity and vitamin D3 level. Li HW *et al*, showed inverse association of vitamin D3 level with BMI in PCOS patient with pvalue <0.05, in contrast no relationship found in control ovulatory group [13]. Mahmoudi *et al*, also reported overweight and obese women with PCOS had significantly decreased levels of vitamin D3 compared with normal weight women with PCOS but that was not found statistically significant [14].

Conclusion

From Our study we would like to conclude that improvement of vitamin D3 levels at a younger age can contribute to prevention of PCOS. Each and Every patients of PCOS should be screened by measuring the level of serum vitamin D3.Correction of Vitamin D3 deficiency may prevents the complication of PCOS.

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