

FREQUENCY OF VITAMIN D DEFICIENCY IN WOMEN WITH POLYCYSTIC OVARIAN SYNDROME

Dr.Ramya Priya pojala¹, Dr.Aparna sarwade ²

¹Resident

Obstetrics and Gynaecology

Dr Dypatil medical college

²Assistant professor

Obstetrics and Gynaecology

Dr Dypatil medical college

KEYWORDS

Polycystic ovary syndrome, Pregnancy, Vitamin D, Infertility, Obesity, Parity, BMI.

ABSTRACT

BACKGROUND

Polycystic ovarian syndrome (PCOS) is the most common endocrine condition characterized by polycystic ovaries, menstrual disruption, infertility, and biochemical and clinical hyperandrogenism. Vitamin D insufficiency is linked to calcium dysregulation, which triggers the development of follicular arrest in women with PCOS

AIMS & OBJECTIVES

Determine the incidence of vitamin D deficiency in women suffering from polycystic ovary syndrome and its correlation with other factors

MATERIALS & METHODS

Our patient consisted of 93 patients within the age range of 18 – 45 years who were assessed for parity, duration of PCOD, BMI and Vitamin D deficiency. Qualitative as well as quantitative analysis was carried out for factors as age, parity, Vitamin D levels, duration of PCO and BMI. All statistical analysis was carried out using SPSS software

RESULTS

The mean age of patients was found to be 34.36 years with mean duration of PCO being 1.54 years. 58(62.36%) of polycystic ovary syndrome women with vitamin D deficiency, wherein 26 PCOD women suffered from it for a duration of <2 years & those suffering from ≥ 2 years had 32 patients

CONCLUSION

A definitive relation was found between women with PCOD and Vitamin D deficiency with variable demographics playing a crucial role in their determination. Thus, we conclude that PCOS women are at a relatively high-risk to be vitamin D deficient, which requires further assessment to determine if they are at definite risk or not.

INTRODUCTION

Polycystic ovarian syndrome (PCOS) is the most common endocrine condition in women of reproductive age, affecting 6 to 10% of the population. PCOD is characterized by polycystic ovaries, menstrual disruption, infertility, and biochemical and clinical hyperandrogenism.^{1,2}

Polycystic ovary syndrome is the leading cause of anovulatory infertility. It is linked to insulin resistance, hyperinsulinemia, dyslipidaemia, as well as central obesity, all of which increase the risk of metabolic syndrome, type II diabetes, and cardiovascular disease.²

More than 75% of the world's population is Vitamin D deficient, which puts them at risk for a variety of health problems such as rickets, tuberculosis, psoriasis, multiple sclerosis, inflammatory bowel disease, type 1 diabetes, high blood pressure, raised heart failure, insulin resistance, depression, obesity, breast and prostate cancer. Many of these disorders can be mitigated by 20% to 50% or more if vitamin D deficiency was treated through increased vitamin D intake from sunlight, fortified foods or pills.³

Vitamin D has very purposeful role in upholding homeostasis of calcium & phosphorus, whilst regulating bone mineralization.

Vitamin D and reproductive function has been observed in the ovary, endometrium, and placenta. Vitamin D insufficiency is linked to calcium dysregulation, which triggers the development of follicular arrest in women with PCOS and causes menstruation and reproductive problems.⁴

Low vitamin D levels in women with PCOS are linked to obesity, metabolic & endocrine disorders, and vitamin D therapy may reduce menstrual frequency and metabolic problems.⁵

The aim of our study is to assess & determine the frequency of vitamin D deficiency amongst women with polycystic ovary syndrome

AIMS & OBJECTIVES

Determine the incidence of vitamin D deficiency in women suffering from polycystic ovary syndrome and its correlation with other factors

MATERIALS & METHODS

We designed & carried out a prospective cross-sectional study in the Department of Obstetrics and Gynecology, during a period of 18 months, while recruiting PCOD patients being admitted to our center who fulfilled both the inclusion & exclusion criteria of our study.

A detailed case history was recorded along with an approval on a written informed consent from the patient. Those patients not consenting were not a part of our study and excluded.

Our patient consisted of 93 patients within the age range of 18 – 45 years who were assessed for parity, duration of PCOD, BMI and Vitamin D deficiency & further any correlation was assessed.

Patients fulfilling any 2 criteria were diagnosed to have PCOS women

- ❖ Oligo &/or ovulation - Menstrual bleeding <2 day/cycle
- ❖ Clinical &/or biochemical signs of hyper-androgenism (hirsutism, weight gain, menstrual disorders)
- ❖ Polycystic ovaries evident on ultrasound (>12 follicle of size 5-7mm).

Qualitative as well as quantitative analysis was carried out for factors as age, parity, Vitamin D levels, duration of PCO and BMI. All statistical analysis was carried out using SPSS software

RESULTS

We found the mean age of patients to be 34.36 years with mean duration of PCO being 1.54 years. (Table 1 & 3). 43(46.24%) & 50(53.76%) patients were suffering from PCOD for a duration of <2 years & ≥ 2 years respectively. On further correlation, we recorded 58(62.36%) of polycystic ovary syndrome women with vitamin D deficiency, wherein 26 PCOD women suffered from it for a duration of <2 years & those suffering from ≥ 2 years had 32 patients.

On assessing BMI amongst our study subjects, we found the mean BMI to be 23.29. Amongst these 93 patients, we found that BMI of <25 in 60 (64.52%) patients & BMI of >25 33 (35.48%) patients. (Table 4) A correlation of between the BMI & Vitamin D levels showed that 34 patients presented with BMI of <25 & only 24 patients with BMI of >25 were suffering from vitamin D deficiency, which was found to be statistically insignificant.

Parity wise, out of these 93 patients, 34(36.56%) had no parity, 40 (43.01%) had single parity, 15(16.13%) had two parity and only 04(4.30%) had more than two parity, which was found to be statistically significant. (Table 2) A correlation between parity & deficiency in vitamin D levels showed that women; almost 75% of women with single parity had vitamin D deficiency, 100% of women with more than two parity had vitamin D deficiency.

DISCUSSION

Vitamin D insufficiency is prevalent in women with PCOS, ranging from 67 to 85% with the hypothetical notion confirmed by the discovery that the active vitamin D-vitamin D receptor (VDR) complex influences approximately 300 genes, including those responsible for glucose and lipid metabolism, as well as blood pressure regulation. There is a relationship between poor vitamin D status along with IR in patients suffering from type II diabetes mellitus.^{6,7}

It is uncertain maybe vitamin D & IR are casually related or whether they are two distinct traits in women with PCOS. Thomson et al.,⁸ found a connection amongst vitamin D status & metabolic as well as hormonal problems in women with PCOS. There is increasing evidence that vitamin D affects insulin and glucose metabolism, and a low vitamin D status is suspected to be a risk factor for impaired glucose tolerance, IR, and type II diabetes mellitus.⁹

Women with polycystic ovarian syndrome (PCOS) typically experience metabolic abnormalities, including insulin resistance. Growing research indicates that vitamin D deficiency could influence the formation of insulin resistance. The relationship between vitamin D and endocrine, metabolic, & genetic factors in PCOS is mainly unknown.¹

Currently, the most specific criteria for PCOS are an enlarged ovarian volume (>10 mL) and/or the existence of 12 or more follicles in each ovary measuring 2 to 9 mm. Using a criterion of 12 for the follicle number per ovary, 0.75 percent of PCOS.²

We found the mean age of patients to be 34.36 years, which was almost similar to the results obtained by Jameel et al.,¹ who also reported the mean age to be 34.5 years. However, other studies had a significantly lower age group, with Mukhopadhyay et al.,¹⁰ reporting the mean age to be 23.78 years, whereas VA Holmes et al.,¹¹ reported the mean age to be 28.8 years in pregnant women.

An assessment for characteristics of PCOD reportedly found the mean duration of PCO being 1.54 years. We also found that 43(46.24%) & 50(53.76%) patients were suffering from PCOD for a duration of <2 years & ≥ 2 years respectively. On further correlation, we recorded 58(62.36%) of polycystic ovary syndrome women with vitamin D deficiency, wherein 26 PCOD

women suffered from it for a duration of <2 years & those suffering from ≥ 2 years had 32 patients.

Jameel et al.,¹ reported a higher PCOD period; wherein the mean PCOD period was found to be 2.5 years. Even though the period of PCOD was almost double in Jameel et al., study, yet the age of incidence of PCOD was almost same as ours

On assessing BMI amongst our study subjects, we found the mean BMI to be 23.29. Amongst these 93 patients, we found that BMI of <25 in 60 (64.52%) patients & BMI of >25 33 (35.48%) patients. A correlation of between the BMI & Vitamin D levels showed that 34 patients presented with BMI of <25 & only 24 patients with BMI of >25 were suffering from vitamin D deficiency, which was found to be statistically insignificant.

Mukhopadhyay et al.,¹⁰ almost reported similar BMI of 25.35. The study by VA Holmes et al.,¹¹ was also in agreement with our study results, as they found the mean BMI to be 25.4 & 24.3 years in pregnant & non-pregnant women.

Jameel et al.,¹ reported a lower mean BMI of 20.1; with majority of the 42 patients having BMI of < 25 kg/m²; wherein they put forward that obesity was significantly allied with vitamin D deficiency. Research data shows that low 25(OH)D level in PCOS women is associated with obesity and insulin resistance but not with PCOS per se.¹²

Many researches have looked into the relationship between vitamin D levels and hormonal or metabolic characteristics in PCOS. Low vitamin D levels in women with PCOS are known to be associated with metabolic risk variables such as insulin resistance, high total cholesterol, blood pressure, hyperglycemia, C-reactive protein, triglycerides, and low HDL cholesterol.^{11,13}

Vitamin D is well-known for its role in upholding calcium and phosphorus balance and stimulating bone mineralization. In alongside sex steroid hormones, the classic regulators of human reproduction, vitamin D influences reproductive processes in both men and women. Women with polycystic ovarian syndrome (PCOS) frequently have vitamin D deficiency, with blood concentrations of 25-hydroxy vitamin D (25OHD) below 20 ng/ml in 67-85% of cases.¹⁴

Women with PCOS and metabolic syndrome had lowered 25(OH) D levels than PCOS women without these features.¹⁵

The vitamin D levels amongst 62% of our patients was <20 ng/mL, whereas only 38% were non-deficient in vitamin D levels. Deficiency of vitamin D has been associated over the years with many disorders/ conditions. Therefore, it is important to understand the exact etio-pathogenetic dependence between vitamin D deficiency and PCOD patients, which was already highlighted in our earlier part of our discussion.

We found the mean vitamin D levels amongst our study subjects to be 14.4 ng/mL; irrespective of the deficiency amongst all 93 patients of our study. However, Mukhopadhyay et al.,¹⁰ reported comparatively higher mean vitamin D levels of 19.40 ng/mL

Jameel et al.,¹ reported the mean 25-(OH)D₃ level in PCOS women with PCOS of 12.1 ± 6.6 ng/mL with 65% vitamin D deficient PCOS women (< 20 ng/mL).

In another study by Kuhr DL et al.,¹⁶ carried out to assess the prevalence of insufficient 25(OH)D levels (<30 ng/mL) was reported to be 72.8% in women. However, there was very less deficiency in the cohort study carried out by Cappy H et al.,¹⁷ accounting for 37% of the patients with low 25(OH)D < 50 nmol/L).

As per research data derived from various studies, on an average serum vitamin D levels in PCOD women with PCOS were in the range of 11 ng/mL and 31 ng/mL, with mean always remaining <20 ng/mL.^{11-13,15,17}

Parity wise, out of these 93 patients, 34(36.56%) had no parity, 40 (43.01%) had single parity, 15(16.13%) had two parity and only 04(4.30%) had more than two parity, which was found to be statistically significant. A correlation between parity & deficiency in vitamin D levels showed that women; almost 75% of women with single parity had vitamin D deficiency, 100% of women with more than two parity had vitamin D deficiency.

Jameel et al.,¹ reported 35(37%) had no parity, 36 (39%) had single parity, 15(16%) had two parity and 07(08%) had more than two parity

Polycystic ovarian syndrome (PCOS) is the most common endocrine condition in women of reproductive age, defined by polycystic ovaries, menstrual disruption, infertility, and biochemical and clinical hyperandrogenism.

The European Union recommends only 5 µg (200 IU) of calcium per day for healthy bones, based on absorption. Experts recommend a daily intake of at least 25 µg (1,000 IU) for optimal health, particularly during fertility attempts. According to the European Food Safety Authority, people, including pregnant and lactating women, can consume up to 100 µg/day (4,000 IU) of vitamin D from any source.²

Early management with clear protocols will help in efficient evaluation & treatment to counteract vitamin D deficiency in PCOD women.

Thus, vitamin D replacement therapy might help women with PCOS by reducing insulin resistance or fasting, as well as stimulating glucose and lipid levels, which makes assessment of vitamin D levels & adjusting the dose accordingly makes it an irrevocable factor.¹⁵

We had a limited sample size in our study which increases the associated bias requiring a larger sample size with more demographics. Therefore a high-quality, Multi-centric, large-scale RCTs are desirable for identifying the optimal 25(OH) D3 levels during the reproductive period, as well as the quantity of vitamin D supplementation needed to attain those levels for vitamin D's various activities throughout a woman's lifetime.

CONCLUSION

A definitive relation was found between women with PCOD and Vitamin D deficiency with variable demographics playing a crucial role in their determination. Thus, we conclude that PCOS women are at a relatively high-risk to be vitamin D deficient, which requires further assessment to determine if they are at definite risk or not. Therefore, we recommend high-quality, multi-centric, large-scale RCTs is the need of the hour to understand and link the probable associations amid vitamin D and PCOS, as vitamin D

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TABLE 1: AGE DISTRIBUTION

AGE DISTRIBUTION	N	%	VITAMIN D DEFICIENCY		P VALUE
			YES	NO	
18-32	38	40.86	23	15	0.93 NOT SIGNIFICANT
33-45	55	59.14	35	20	
TOTAL	93	100.0	58	35	
MEAN	34.36				

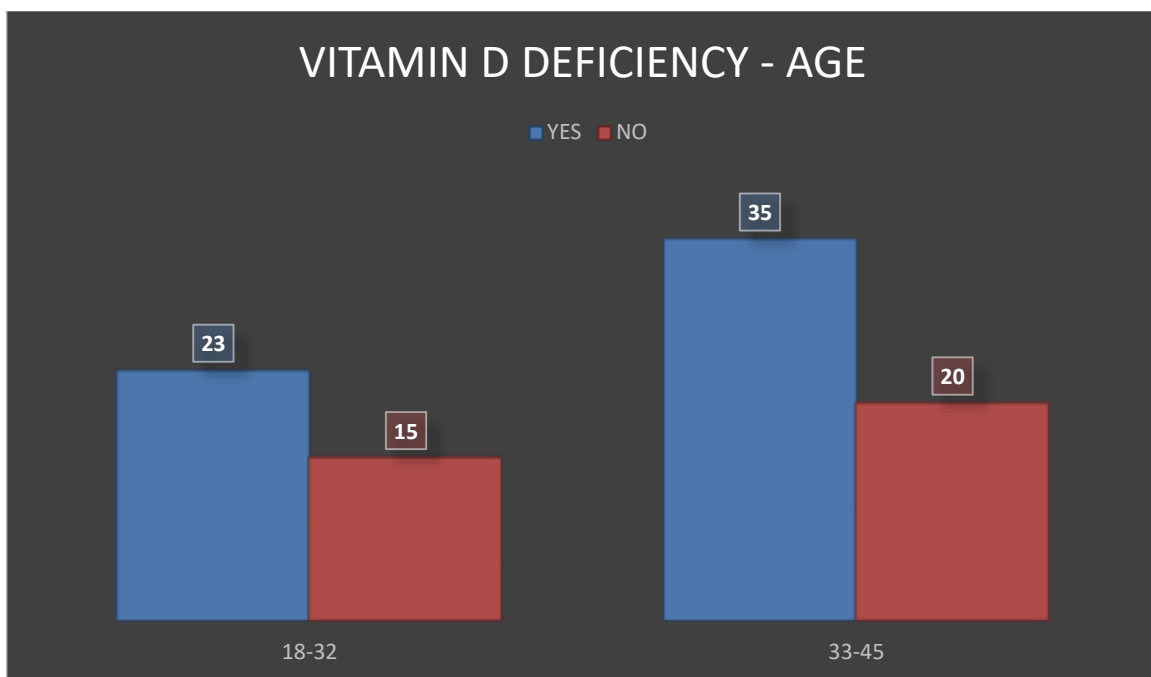


TABLE 2: AS PER PARITY

PARITY	N	%	VITAMIN D DEFICIENCY		P VALUE
			YES	NO	
0	34	36.56	14	20	0.11 SIGNIFICANT
1	40	43.01	31	9	
2	15	16.13	9	6	
>2	4	4.30	4	0	
TOTAL	93	100.0	58	35	

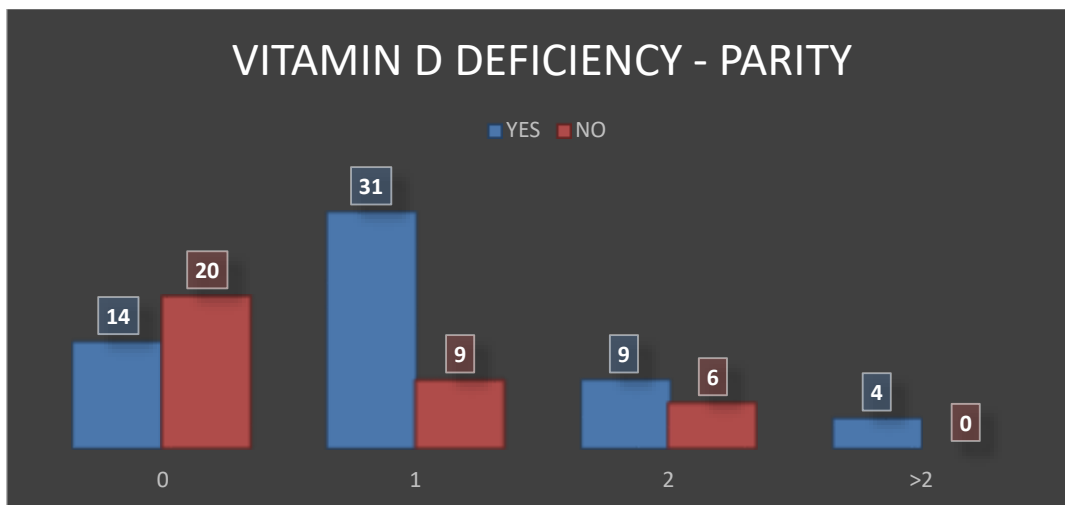


TABLE 3: DURATION OF PCO

DURATION OF PCOD	N	%	VITAMIN D DEFICIENCY		P VALUE
			YES	NO	
<2 YEARS	43	46.24	26	17	0.89 NOT SIGNIFICANT
≥ 2 YEARS	50	53.76	32	18	
TOTAL	93	100.0	58	35	
MEAN	1.54				

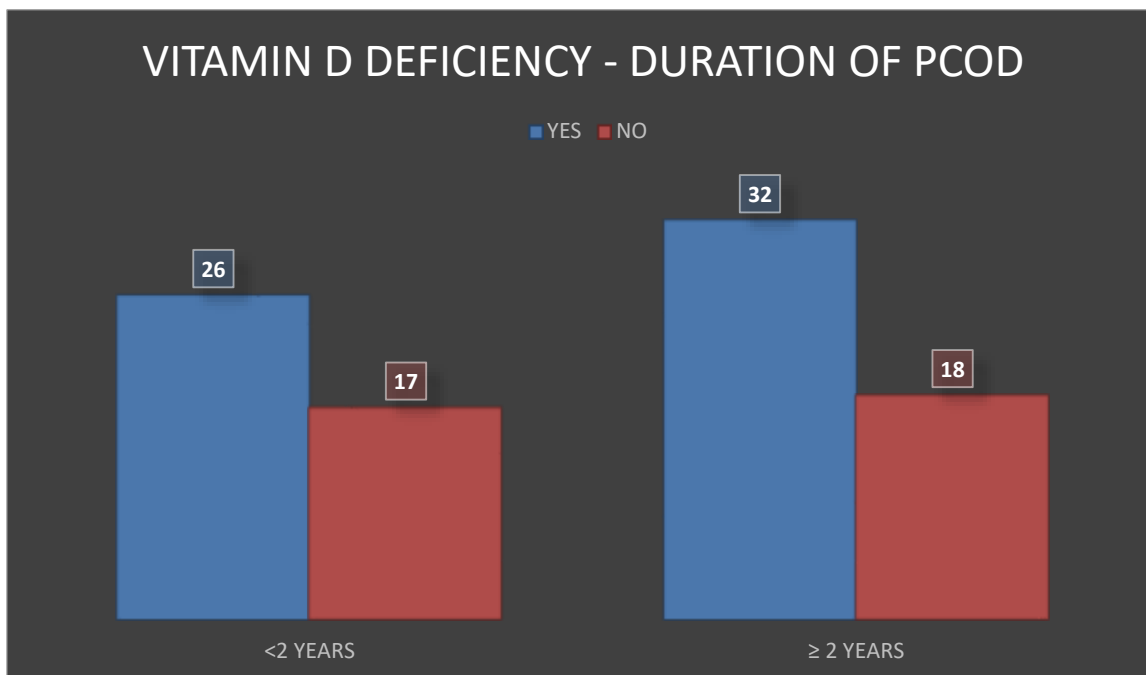


TABLE 4: BMI DISTRIBUTION

BMI DISTRIBUTION	N	%	VITAMIN D DEFICIENCY		P VALUE
			YES	NO	
<25 kg/m ²	60	64.52	34	26	0.19
> 25 kg/m ²	33	35.48	24	9	
TOTAL	93	100.0	58	35	
MEAN	23.39				NOT SIGNIFICANT

