

Association of Vitamin D Deficiency in Pakistani Women with Polycystic Ovarian Syndrome

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ABSTRACT

Objective: Females suffering from polycystic ovarian syndrome have an increased likelihood of experiencing a deficiency in vitamin D.

Methods: The Obstetrics and Gynecology department at Indus Medical College Tando Muhammad Khan, conducted a cross-sectional study for six months. The study aimed to investigate 160 women aged 17–44 who presented with the polycystic ovarian syndrome. The researchers collected blood samples from the participants and measured their vitamin D levels. If the serum levels of 25-hydroxyvitamin D3 were less than 20ng/ml, the participants were considered vitamin D deficient. The researchers obtained written informed consent from all participants and used SPSS version 20 to enter and analyze the collected data.

Results: The study included patients aged between 17 and 44 years old, with an average age of 25.721 ± 7.56 years. The majority of patients (n=118, 73.7%) fell within the 17-30 age range, while 52 patients (26.0%) were between the ages of 32–45. In the study group, 74 patients (46.25%) were classified as obese. However, there was no significant contrast in the occurrence of vitamin D insufficiency among different age brackets (17-30 vs. 31-44 years) or body mass index classifications (overweight vs. non-overweight). Specifically, the percentages were 57.6% vs. 57.1% for age categories and 64.8% vs. 52.3% for body mass index divisions, correspondingly, with p-values of 0.643 and 0.045.

Conclusion: Among females with polycystic ovary syndrome (PCOS), the prevalence of insufficient levels of vitamin D was determined to be 58.0%. Nonetheless, there were no significant differences in the occurrence of vitamin D insufficiency across different age and BMI groups.

Keywords: Vitamin D deficiency, polycystic ovarian syndrome, obesity

INTRODUCTION

Polycystic ovarian syndrome (PCOS) is a prevalent hormonal disorder that affects women during their reproductive phase. It has a high occurrence rate of up to 18% within this demographic, making it the most commonly diagnosed endocrine disorder.¹ PCOS is distinguished by the existence of numerous cysts on the ovaries, sporadic menstrual cycles, difficulties with fertility, and heightened levels of androgens in the blood, leading to excessive hair growth (hirsutism) and/or skin blemishes (acne). PCOS has additionally been associated with an increased probability of cardiovascular ailment, type 2 diabetes, dyslipidemia, and compromised glucose tolerance. The emergence of PCOS and its indications are strongly connected to corpulence and insulin insensitivity.² Polycystic Ovary Syndrome (PCOS) is the primary reason for infertility in women with ovulatory problems.³ A multitude of research has revealed correlations between levels of vitamin D and different symptoms of PCOS, such as insulin resistance, infertility, and hirsutism.² It is believed that Vitamin D affects the onset of PCOS by regulating gene transcription and modulating hormones that impact insulin metabolism and fertility regulation.^{4,5} It is prevalent for numerous individuals worldwide to experience inadequate levels of Vitamin D, with 10-60% of adults having values below 20 ng/ml.⁶ This deficiency of Vitamin D can result in the disturbance of the functioning of diverse systems within the body and increase the susceptibility to chronic ailments, including physical ailments like cancer, heart diseases, autoimmune disorders, and infectious diseases, as well as mental conditions such as depression and persistent pain.⁷ A significant number of women with polycystic ovary syndrome (PCOS) experience a deficiency in vitamin D. According to studies, between 67% and 85% of women with PCOS have low levels of 25-hydroxy vitamin D (25OHD), with concentrations below 20ng/ml.⁸ Studies suggest that diminished quantities of 25OHD are connected to heightened insulin resistance, and administering vitamin D may ameliorate insulin resistance and insulin production in overweight females with polycystic ovary syndrome (PCOS). Moreover, insufficiency of vitamin D is correlated with disturbances in calcium levels, which

may result in the halt of follicle development in females with PCOS. Considering the continuous prevalence of obesity, it is anticipated that the occurrence of PCOS will rise. Since vitamin D deficiency is already widespread, determining its prevalence among PCOS patients could offer important insights for developing future treatment approaches for both conditions.

MATERIAL AND METHODS

A study was conducted at the Obstetrics and Gynecology Department of Indus Medical College Tando Muhammad Khan for six months. The investigation employed a cross-sectional research plan and acquired prior consent from the institutional ethical review board. The scientists determined a sample size of 160 instances with a 95% assurance level and a 5% tolerance for error. The anticipated rate of insufficient vitamin D, particularly 25(OHD) <20 ng/ml, among females with PCOS was estimated to be 31.2%, upon which the sample size was established. The study enrolled women between the ages of 17 to 44 years who had been diagnosed with polycystic ovary syndrome (PCOS) using non-probability, consecutive sampling. Polycystic ovary syndrome (PCOS) was recognized by using ultrasound imaging to detect 12 or greater follicles measuring 2-9 mm, along with an LH/FSH ratio >1 IU/L (a typical LH/FSH ratio value is equal to or <1 IU/L), and the existence of infrequent or absent menstrual periods (cycles >35 days or fewer than 3 cycles in the past 6 months). The research excluded women who were pregnant or breastfeeding, as well as individuals who were consuming calcium and vitamin D supplements. Moreover, females with preexisting medical conditions like high blood pressure, diabetes, atypical liver or kidney function results, digestive problems, and malnutrition were excluded. In order to identify polycystic ovary syndrome (PCOS), individuals who consented were subjected to a comprehensive assessment, which encompassed a review of their medical records, a physical check-up, analysis of hormone levels, and imaging using ultrasound technology. All of these details were documented on a prearranged form.

The information that had been collected was analyzed and assessed using the SPSS version 22.0 program. The age data, which was a quantitative variable, was presented by specifying the average and deviation values. On the other hand, the vitamin D deficiency data, which was a categorical variable, was presented in terms of the frequency and percentage of cases. The data was categorized based on age and body mass index (BMI), with two categories being used for BMI: <30 kg/m² and >30 kg/m². This was carried out to consider any variables that could impact the outcomes. A post-stratification chi-square test was employed with a significance threshold of p<0.05 to identify any notable disparities.

RESULTS

Table 1 presents certain attributes of the subjects who participated in the investigation, encompassing their age bracket, their BMI condition (whether they were overweight or not), and the count of subjects in each grouping. The average age of the patients was 25.721 years, with a SD of 7.56 years. A significant proportion of participants (73.7%) were aged between 17 and 30 years, whereas the rest (26.25%) were between 31-44 years of age.

Out of all the individuals involved, 74 (46.25%) were identified as obese, having a BMI of ≥30kg/m² or above, whereas 86 (53.75%) were recognized as non-obese, having a BMI of <30kg/m². **Table 1**

Table 2 showcases information regarding the attributes of persons afflicted with insufficient amounts of vitamin D. The information is categorized into three groups: age range, BMI condition, and duration of polycystic ovary (PCO). Furthermore, the table enumerates the overall number of individuals within each classification, along with the proportion of those who exhibit a deficiency in vitamin D.

The findings suggest that there is a comparable occurrence of vitamin D inadequacy among various age brackets, where 57.6% of people between 17-30 years old and 57.1% of individuals aged 31-44 years old are lacking in vitamin D (p-value=0.643).

Regarding the BMI classification, the findings indicate a notable correlation linking obesity to insufficient levels of vitamin D (p-value=0.045). Precisely, 64.8% of individuals classified as obese exhibit a deficiency of vitamin D, whereas only 52.3% of those not classified as obese have an insufficiency.

Ultimately, there is no noteworthy distinction in the occurrence of insufficient levels of vitamin D among people who have experienced PCO for less than 2 years and those who have had the condition for 2 years or more (p-value=0.751).

These results indicate that being overweight is a substantial determinant of a lack of vitamin D, although advancing age and the length of time someone has had PCO may not be potent indicators of deficiency. **Table 2**

Table 1: Baseline characteristics of the participants (n=160)

Characteristics	Participants
Age (years)	25.721 ± 7.56 (17-44)
17-30 years	118 (73.7%)
31- 44 years	42 (26.25%)
Obese (BMI ≥30kg/m ²)	74 (46.25%)
Non-obese (BMI <30kg/m ²)	86 (53.75%)

Table 2: Incidence of Vitamin D Deficiency by Age Groups and BMI Status among Patients with PCOS. (n=160)

Characteristics	Vitamin D deficiency	Total	P-value
Age Groups	17-30 Years	68 (57.6%)	0.643
	31-44 Years	24 (57.1%)	
BMI Status	Obese (BMI ≥30kg/m ²)	48 (64.8%)	0.045
	Non-obese (BMI <30kg/m ²)	45 (52.3%)	
Duration of PCOS	< 2 years	41 (58.5%)	0.751
	≥ 2 years	52 (57.7%)	

Table 3 seems to demonstrate the connection between insufficiency of vitamin D and parity (the number of instances a woman has given birth).

The evidence implies that women with greater parity might have a reduced probability of experiencing vitamin D insufficiency, as the proportion of women with this deficiency declines with increasing parity. Nevertheless, the p-value of 0.334 suggests that this association lacks statistical significance according to conventional standards (p < 0.05). **Table 3**

Table 3: Distribution of Vitamin D deficiency among patients based on their parity level (n=160)

		Vitamin D deficiency	Total	P-value
Parity	0	39 (66.1%)	59	0.334
	1	50 (80.6%)	62	
	2	10 (38.4%)	26	
	>2	6 (46.1%)	13	

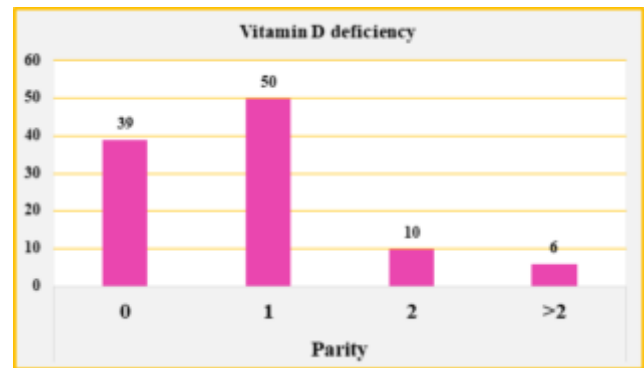


Figure 1: Distribution of Vitamin D deficiency among patients based on their parity level

DISCUSSION

Polycystic Ovarian Syndrome (PCOS) is a intricate hormonal condition that impacts a substantial population of females globally, including individuals in Pakistan.⁹ PCOS is characterized by hormonal imbalances, irregular menstrual cycles, and the presence of cysts on the ovaries. Vitamin D deficiency has emerged as a potential contributing factor in the development and progression of PCOS.⁵ Research conducted on individuals has identified associations between indicators suggesting elevated levels of male hormones (hyperandrogenism) and the quantity of vitamin D present in their systems. Females diagnosed with polycystic ovary syndrome (PCOS) who encounter undesirable hair growth (hirsutism) have been observed to exhibit diminished levels of 25OHD (a form of vitamin D) when compared to those with PCOS but without hirsutism. More precisely, the mean 25OHD levels were 21.4 ng/ml and 26.8 ng/ml, respectively.¹⁰ A different research showed that among 60 women diagnosed with PCOS, 41 (or 68%) had low levels of vitamin D (<20 ng/ml). There was no notable disparity in vitamin D insufficiency between the non-obese and obese cohorts, as the findings indicated that 22 (or 37%) of non-obese women and 19 (or 31%) of obese women experienced a deficiency in vitamin D. The p-value for this difference was 0.054.¹¹ The patients' ages varied between 17 and 44 years old, with an average age of 25.721 ± 7.56 years. Earlier studies conducted on the local population by Akram et al.,¹² in 2014 (with a mean age of 26.23±4.46 years), Baqai et al.,¹³ in 2010 (with a mean age of 27.0 ± 8.0 years), and Rehman et al.,¹⁴ in 2005 (with a mean age of 26.47 ± 2.15 years) have reported similar mean ages for women who have presented with PCOS. Kim et al.,¹⁵ found that the mean age of the Korean population with the condition was relatively higher at 34.1±4.6 years, whereas Zandi and colleagues,¹⁶ reported a much lower mean age of 22.1±4.2 years among patients with the same condition in Iran. Kim et al.,

endeavored to establish the correlation between low levels of vitamin D and the emergence of PCOS, and their investigation unveiled that the frequency of insufficient vitamin D levels was equally widespread among both individuals with the condition and the comparison group.¹⁵ In the study group, almost half of the patients (46.25%) were identified as obese. Anjum et al.¹⁷ also noted a comparable prevalence of obesity (45.5%) among PCOS patients who visited Dow University of Health Sciences, Karachi in 2013. In 2016, Fouzia conducted research at Railway Hospital Rawalpindi and revealed that 56% of PCOS patients exhibited profound deficiency of Vitamin D.¹⁸ In women with PCOS, it was discovered that 58.0% of them had a lack of vitamin D. This finding corresponds to the results of a previous study by Kim et al in the Korean population, which found that 57.9% of women with PCOS also had a deficiency in vitamin D.¹⁵ Wehr et al found a lower frequency rate of 31.2% in Austria compared to other rates.¹⁹ The prevalence of vitamin D deficiency did not vary significantly across different age groups, specifically between 17-30 and 31-44 years (57.6% versus 57.1%, respectively; $p=0.643$), nor among different BMI groups, such as obese versus non-obese individuals (64.8% versus 52.3%, respectively; $p=0.045$). Therefore, age and obesity did not have a significant impact on the frequency of vitamin D deficiency.²⁰ It is important to investigate how replacing vitamin D affects the symptoms of diseases in patients who are deficient in this nutrient. Consequently, it is advisable to conduct a study on this topic in future medical practice.

CONCLUSION

Among females diagnosed with polycystic ovary syndrome (PCOS), 58.0% exhibited insufficient levels of vitamin D. The occurrence of vitamin D insufficiency demonstrated no notable variation across various age brackets ($p=0.643$) or body mass index (BMI) categories ($p=0.045$).

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