

Study the Effect of the Different Levels of Vitamin D3 in Women with Polycystic Ovary Syndrome and Infertility Women

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Abstract: *The most common endocrine disorder in women of childbearing age is polycystic ovarian syndrome (PCOS). Ovulatory dysfunction, clinical and/or biochemical evidence of hyperandrogenism, and polycystic ovaries all contribute to the heterogeneous syndrome. Only a select few foods naturally contain the fat-soluble vitamin D (VD), but you can get it as a supplement if you need it. That's because it's a steroid hormone, the effects of which can be felt in many different ways. This study aims to determine whether there is a relationship between high or low levels of vitamin D3 in women with polycystic ovaries and infertile women. Our results revealed a lower significant difference in vitamin D3 levels among females with infertility when compared with healthy controls according to age groups. While reporting a higher significant difference in vitamin D3 levels among females with polycystic ovary syndrome when compared with healthy controls according to age groups. There is no significant difference when measuring the level of vitamin d3 in both women with PCOS and infertile women compared to each other. We conclude that vitamin D3 levels in infertile women and PCOS, whether these levels are high or low, will have an impact on fertility rates by regulating the ovulation process and increasing the chances of a healthy pregnancy.*

Keywords: Infertile women; Infertility; PCOS; Polycystic ovary syndrome; Vitamin D3.

1. Introduction

The most common endocrine disorder in women of childbearing age is polycystic ovarian syndrome (PCOS) (1). Ovulatory dysfunction, the results of a clinical trial, and/or biological data of hyperandrogenism, and polycystic ovaries all contribute to the heterogeneous syndrome (2).

Emotional morbidity may be a result of the clinical signs of polycystic ovary syndrome (PCOS), issues like hirsutism, acne, and alopecia (caused by hyperandrogenism in PCOS women), obesity, and infertility are all associated with this syndrome (3); having a low standard of living, a lack of confidence, marital and societal strife, and diminished sexual function have all been linked to polycystic ovary syndrome (PCOS) in women. (4). Mood and anxiety disorders that PCOS women are more likely to experience, and they can have a damaging effect on sexual functioning (5). Improper endometrial expression of adhesion proteins is linked to infertility diseases like polycystic ovary syndrome (PCOS) (6). During the menstrual cycle's proliferative stage, expression of the nuclear hormone receptors ER and PR for estrogen and progesterone is increased in the fertile endometrium and then decreases after ovulation, when progesterone levels increase. However, higher ER and PR expression in infertile PCOS patients causes changes in the expression of ER- and PR-regulated proteins important for implantation (7).

Vitamin D, a fat-soluble vitamin that can only be found in a few food sources but is easily supplemented, is essential for health but is difficult to obtain in food alone. Because it is a steroid hormone, it can affect many different bodily functions. Vitamin D's fundamental effects on the metabolism of calcium and bone are just the beginning. It

also has a role in influencing cell formation, neuromuscular and immune function, and decreasing inflammation (8). A lack of vitamin D increases the likelihood of developing high blood pressure, diabetes, and cancer (9). Evidence is mounting that VD insufficiency contributes to the pathophysiology of IR and the metabolic syndrome in polycystic ovary syndrome (8).

The traditional areas of vitamin D's action in the body (the bone, kidney, and intestine) have been expanded upon in the past decade (10). Anti-Müllerian hormone (AMH) (11), follicle-stimulating hormone (12), estradiol (13), and progesterone (14) are only some of the hormones that vitamin D has been shown to affect. Vitamin D insufficiency was also connected to a higher risk of PCOS. Possible mechanisms linking vitamin D and breast cancer risk include actions on LH, sex hormone-binding globulin, testosterone, insulin resistance, and aromatase gene expression by vitamin D receptors (13-15).

The purpose of this research is to find out if polycystic ovary syndrome and infertility are linked to high or low levels of vitamin D3.

2. Materials and Methods

2.1. Sample gathering and methodology

The research was carried out at the Infertility Center between the dates of February 1 and the end of April 2021, and it included a total of 30 female participants. Of these, 15 were diagnosed with primary infertility, which was the focus of the investigation, while the other 15 were healthy mothers who already had at least one child. The information was collected through the use of a questionnaire that was

developed specifically for the research project. This questionnaire included questions regarding the participants' ages, occupations, marital histories, regularity and history of menstruation, genetic diseases, body mass index, and the type of treatment that was utilized for infertility. Additionally, the percentage of vitamin D was determined through the use of Roche Diagnostics' Cobas e411 instrument.

2.2. Statistical Analysis

The data was tabulated and processed using SPSS (Statistical Package for the Social Sciences) V.20 for Mac.

This software was used to analyze the data. The findings of quantitative research are often reported in the form of a percentage or a frequency distribution. When the p-values were lower than 0.05, (16), statistical significance was judged to have been achieved.

3. Results and Discussion

Table 1: The mean concentration of Vitamin D3 levels among females with infertility and control group according to age groups

Variables	Age	Case study	Age group: (15-25years)	Age group: (26-35 years)	Age group: (Above 36 years)	LSD value
			Mean ± SD	Mean ± SD	Mean ± SD	
Vitamin D3		Controls	20.33 ± 3.44 B	16.5 ± 5.56 A	16.20 ± 3.70 A	0.923
		Infertile Women	10.2 ± 7.23 A	9.75 ± 4.92 A	11.2 ± 3.54 A	

In Table (1): a control group of women in age (15-25 years) a significant difference was observed when compared with infertile women. While There was no discernible difference in the other age group. Given the importance of vitamin D3 in the opportunity to obtain high-quality embryos and transfer them to the blastocyst stage, it is necessary to provide adequate levels of vitamin D3 at both the level of the ovary and the endometrium (17). Vitamin D3 deficiency is associated with preeclampsia (18) and endometriosis (19), PCOS (20), and miscarriage (21). Researchers have found that insufficient amounts of vitamin D3 lead to decreased fertility, higher pregnancy difficulties, and uterine hypoplasia. (22) Both Rudick and coworkers' analyses yield

findings that are consistent with ours (23, 24). They conflict with the findings of the two Iranian research (25, 26). Also, deficiencies in vitamin D3 in women affect the production of hormones such as testosterone, and thus this causes hypoactive sexual disorders (27). Vitamin D3 receptors play a regulatory role in reproductive physiology, and if there is a deficiency in the level of vitamin D3 this can cause an impact on the functions of female and sexual organs (28). The researcher has found that infertile women with low levels of vitamin D3 have a higher prevalence of female sexual impotence than women with a normal vitamin D3 level. All sexual areas are affected by low d3 levels (29).

Table 2: The mean concentration of Vitamin D3 levels among females with Polycystic ovaries and control group according to age groups

Variables	Age	Case study	Age group: (15-25years)	Age group: (26-35 years)	Age group: (Above 36 years)	LSD value
			Mean ± SD	Mean ± SD	Mean ± SD	
Vitamin D3		Controls	20.33 ± 3.44 B	16.5 ± 5.56 A	16.20 ± 3.70 A	1.254
		Polycystic ovaries	24.6 ± 6.18 A	35.2 ± 3.39 A	43.6 ± 1.49 A	

In Table (2): control group of women in age (15-25 years) a significant difference was observed when compared with Polycystic ovaries of women. While there was no discernible difference in the other age group. Whereas, the results of this study are in agreement with (30), When people of the same race and family history are studied together, researchers find that the age range of the tongue determines the effect of age on vitamin D levels (31,32). Vitamin D levels can be affected by the receptors of the vitamin itself (33), Variations in the expression of numerous genes involved in lipid and glucose metabolism are correlated with variations in the genetic makeup of vitamin D receptors. (34), and this polymorphism in the receptors is also associated with a higher risk of developing PCOS, and this may come through the effect of insulin and testosterone

levels (33, 35, 36). PCOS can be considered a polygenic disease closely related to metabolic disorders (18). Vitamin D has been shown to possibly have anti-inflammatory properties and to contribute favorably to glucose metabolism (37). However, in the PCOS group, increased D levels were not associated with decreased hs-CRP levels. We need to find out if this contributes to the lower-than-expected prevalence of cardiovascular disease (CVD) in PCOS-affected women (38). While our results are fundamentally inconsistent with the results of previous research (39, 34, 40), a decrease in this vitamin can cause an imbalance in the regulation of calcium, and this leads to an increase in follicles stopping, and consequently, menstrual disorders and fertility in women with PCOS (40).

Table 3: The mean concentration of Vitamin D3 levels among females with Polycystic ovaries and Infertile Women according to age groups

Variables	Age	Case study	Age group: (15-25years)	Age group: (26-35 years)	Age group: (Above 36 years)	LSD value
			Mean \pm SD	Mean \pm SD	Mean \pm SD	
Vitamin D3		Infertile Women	10.2 \pm 7.23 A	9.75 \pm 4.92 A	11.2 \pm 3.54 A	0.841
		Polycystic ovaries	24.6 \pm 6.18 A	35.2 \pm 3.39 A	43.6 \pm 1.49 A	

In Table (3): There is no significant difference when measuring the level of vitamin d3 in both women with PCOS and infertile women compared to each other because vitamin d3 has been observed to have the same effect on the formation of follicles as well as ovulation and other reproductive processes in women as the receptors for this vitamin are present in each of placenta, fetal membranes, uterus, oviduct, and ovaries how much was stated in previous research (41, 42).

4. Conclusion

We conclude that vitamin D3 levels in infertile women and PCOS, whether these levels are high or low, will have an impact on fertility rates by regulating the ovulation process and increasing the chances of a healthy pregnancy

5. Declaration of generative AI and AI-assisted technologies in the writing process

During this study, the writers used [chat GPT] to rephrase the references. After utilizing this tool, the writers examined and modified the text as appropriate and bear full responsibility for the content of the publication.

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