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ANALYSIS OF ROLE OF VITAMIN D DEFICIENCY IN FEMALE INFERTILITY

[1]Dr. Irfan Yousaf, [2]Dr. Rabia Shamshad, [2]Dr. Marien Tariq

[1]Medical Officer at DHQ Hospital, Khanewal

[2]Women Medical Officer at DHQ Hospital, Khanewal

Abstract:

Introduction: *Vitamin D_3 (cholecalciferol) is the main form of vitamin D in the body. It is the form produced in the skin, and it can be found in some food and nutritional supplements. Prescription vitamin D is vitamin D_2 (ergocalciferol).* ***Objectives of the study:*** *The main objective of the study is to analyze the role of Vit-D deficiency in female infertility.* ***Methodology of the study:*** *This study was conducted at DHQ Hospital, Khanewal during 2017 with the permission of ethical committee and with the permission of patients. There were 70 females which was selected for study. By collecting data from these patients we find the role of Vit-D deficiency in female infertility. In these patients, levels of vitamin D were done. Out of total 70 infertile females, 45 were found to have VDD.* ***Results:*** *In vitamin D deficient cases, the mean for vitamin D was higher and AMH was lower. In vitamin D deficient controls, the mean for vitamin D was 4.85 ± 3.02 and AMH was 3.47 ± 2.59. On comparison, the vitamin D levels were lower in fertile than infertile females, which was significant.* ***Conclusion:*** *There was no correlation found between VDD and AMH levels in both the infertile and fertile women groups. Prospective further studies are pressingly needed to confirm a causal relationship and to investigate the potential therapeutic benefits of vitamin D supplementation in this population.*

*** Corresponding author:**

Dr. Irfan Yousaf,

Medical Officer at DHQ Hospital,

Khanewal

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INTRODUCTION:

Vitamin D_3 (cholecalciferol) is the main form of vitamin D in the body. It is the form produced in the skin, and it can be found in some food and nutritional supplements. Prescription vitamin D is vitamin D_2 (ergocalciferol). In general, research shows that we metabolize vitamin D_3 more efficiently than vitamin D_2. Given enough time in the sun, most of us can make all the vitamin D we need. However, many women do not get enough sun exposure to maintain a normal vitamin D level throughout the year. Few foods are naturally rich in vitamin D, so it is also difficult to get enough vitamin D from your diet [1]. Other factors also affect vitamin D status. For instance, if you are overweight or have dark skin, you may be at risk for vitamin D deficiency. For these and other reasons, many women trying to conceive are likely to be low in vitamin D.Vitamin D has been linked to a variety of health benefits. For women trying to conceive, it appears to be linked to better fertility, as well as a healthy pregnancy [2]. Because of these potential benefits, SGF screens all female patients for vitamin D deficiency as part of their initial screening process. There are some studies showing that being vitamin D replete improves success rates in both in vitro fertilization (IVF) as well as transfer of frozen donor egg embryos. Other studies have not demonstrated that connection [3]."

Although the data for vitamin D and fertility is not conclusive, several studies have found that vitamin D blood levels of 30 ng/mL or higher are associated with higher pregnancy rates. Two studies found that among populations of mostly Caucasian and non-Hispanic white women, those with a normal vitamin D level were four times more likely to get pregnant through IVF compared to those who had a low vitamin D level [4]. Another study found that donor egg recipients with a normal vitamin D level had higher pregnancy rates than those with a low vitamin D level [5].

Theoretical Background:

Many researchers have studied the role of vitamin D and its association with reproductive health extensively in the last few years but there is no single consensus on its influence in reproductive health. While it is a general observation that optimal level of vitamin D is essential in PCOS, endometriosis, male infertility and IVF techniques, but there has been no significant correlation between vitamin D levels and ovulation stimulation or embryo development and Vitamin D levels. However, larger studies including all ethnic and racial groups would be required to proclaim the role of Vitamin D in infertility [6]. Vitamin D, also known as "sunshine hormone", is a fat soluble hormone which plays an integral part in calcium and phosphorous homeostasis and maintenance of healthy bones and teeth and is involved in providing protection against a number of diseases such as cancer, diabetes, multiple sclerosis, cardiovascular diseases, obesity and many other diseases including its role in infertility [7].

Objectives of the study

The main objective of the study is to analyze the role of Vit-D deficiency in female infertility.

METHODOLOGY OF THE STUDY:

This study was conducted at DHQ Hospital, Khanewal during 2017 with the permission of ethical committee and with the permission of patients. There were 70 females which was selected for study. By collecting data from these patients we find the role of Vit-D deficiency in female infertility. In these patients, levels of vitamin D were done. Out of total 70 infertile females, 45 were found to have VDD. Of these 35 patients were identified as cases; in whom, the AMH levels were assessed. In these patients, the AMH levels were assessed. The vitamin D levels were classified in three categories as deficiency, insufficiency, and sufficiency. The reference levels for serum (blood) of vitamin D [25(OH)D]: deficiency <10 ng/ml, insufficiency 10 to 20 ng/ml, and adequate levels were taken >20 ng/ml. The fertile females as control group, coming to our OPD for taking consultation due to other causes and normal working staff members were screened for vitamin D levels and who were found vitamin D deficient were enrolled as control.

Inclusion criteria

Infertile females with unexplained infertility, of age group between 18 and 40 years, as cases and healthy fertile females between same age group as control.

Exclusion criteria

History of smoking (tobacco use), oral contraceptive pill, any hormonal or steroid drug use, known VDD, obesity, endometriosis, thyroid disorders, autoimmune disease, tubal factor, male factor, or polycystic ovarian syndrome.

Data collection

Age, duration of married life, duration and type of infertility, previous obstetrical history, and education levels were retrieved for all women who met the

inclusion criteria as cases and control.

Vitamin D analysis

Vitamin D levels were measured in duplicate using a Liasion 25OH vitamin D total assay (Randox Kit), using a competitive chemiluminescent immunoassay, as per the manufacturers guidelines.

Statistical analysis

To analyze the correlation between vitamin D and AMH linear regression test and for comparison of both the groups, two sample *t* tests were used.

RESULTS:

Table 01 shows the demographic characteristics of patients and their SD with respect to data. Our study was done in infertile female's population to see the spectrum of vitamin D levels. Overall, 64.28% infertile females had VDD (up to 10 ng/ml), 30.0% displayed vitamin D insufficiency (10–20 ng/ml), whereas 5.71% of the study population exhibited adequate levels of vitamin D levels (>20 ng/ml).

Table 01: Demographic characteristics of participants.

Characteristics	Variables	S.D.
Females	28	-
Mean age in years (standard deviation)	43	14.2
Mean body mass index	29	-
Prevalence of hypertension	25%	-
Mid-upper arm circumference (in centimetres)	32	-
Duration of infertility	Upto 5 years > 5 years < 5 years	-

Table 3 of AMH (P = 0.003) but higher levels of vitamin D (P = 0.04) compared to fertile group in our study. However, no significant correlation was found between vitamin D and AMH levels in both the groups.

Table 02: Level of Vit-D in selected patients

Vitamin D levels	Infertile group (N = 70)	%
Deficient group (<10 ng/ml)	45	64.28
Insufficient (10–20 ng/ml)	21	30.0
Sufficient (>20 ng/ml)	4	5.71

Table 03: Mean value of Vit-D and AMH in control and infertile group

Mean value	Cases (infertile group)	Control (fertile group)
Vitamin D	6.18 ± 2.09 ng/ml (P = 0.04)*	4.85 ± 3.02 ng/ml
AMH	1.94 ± 1.30 ng/ml (P = 0.003)*	3.47 ± 2.59 ng/ml

AMH = antimullerian hormone; $P < 0.05$ by *t* test.

DISCUSSION:

Vitamin D is considered to be a prohormone and is synthesized by skin on exposure to sunlight as Vitamin D3 or cholecalciferol. Vitamin D2 or ergoclaciferol is obtained from yeast and dietary sources[8]. Vitamin D deficiency can result from inadequate exposure to sunlight, malabsorption syndromes and certain drugs like dilantin, phenobarbitol and rifampicin which induce hepatic P450 enzymes to accelerate the catabolism of vitamin D [9].

In recent years, there has been a growing interest in studying the association of vitamin D deficiency and infertility. It has been postulated that vitamin D receptors (VDR) are found in human tissues such as male and female reproductive organs and play a major role in facilitating the biological activity of Vitamin D. In the US, it has been estimated that

about one third of the population is deficient in Vitamin D and infertility affects nearly 15.5% of the US couples and nearly 53 million people all across the globe [10]. Vitamin D deficiency has been advocated as a possible cause of infertility in many studies conducted in the past several years [11].

In our study on comparison of these two groups, vitamin D levels were lower in control group (fertile females) than cases (infertile females), which was significant ($P = 0.04$). The AMH levels were lower in cases than control group ($P = 0.003$), which might be a cause of infertility in infertile females [12]. AMH is a predictor of ovarian reserve and ovarian responsiveness that directly affect the fertility of a women, excluding the other causes if infertility [13].

Vitamin D is also known as "anti-ricketic factor or sunshine vitamin." Dietary intakes generally has only a minor influence on serum levels outside of the consumption of vitamin D supplements. Even in tropical countries, despite of ample sunlight (required for the synthesis of vitamin D endogenously), VDD is prevalent in range of 50 to 90% among all the age groups. Vitamin D levels did not vary according to age or infertility associated disorders. Another study reported the prevalence of VDD significantly higher in the subfertility group than controls (59.0 versus 40.4%; $P < 0.01$). Only one study reported a positive relationship between vitamin D and serum AMH levels. However, this study admits the significant methodological weakness because of very low numbers of subjects [14].

CONCLUSION:

There was no correlation found between VDD and AMH levels in both the infertile and fertile women groups. Prospective further studies are pressingly needed to confirm a causal relationship and to investigate the potential therapeutic benefits of vitamin D supplementation in this population.

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