

## Research Article



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## EVALUATION OF VITAMIN D LEVELS AND THYROID PROFILES TO DETERMINE THE LEVEL OF FEMALE INFERTILITY WITHOUT ANY SYSTEMIC DISEASE

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### ABSTRACT

**Background:** Vitamin D receptors are found in the majority of human tissues and cells; vitamin D has historically been regarded as a special hormone which can reduce the chance of developing chronic disease. Thyroid hormone primarily controls metabolism, growth, and many other bodily functions.

**Aim:** In order to examine female infertility, the thyroid profile and blood vitamin D levels were measured in the current investigation.

**Methods:** The history of the subject who was unable to conceive after a year of regular sexual activity in subjects without accompanying systemic disorders such as diabetes, hypertension, or cardiovascular diseases was used to make the diagnosis of infertility. Thyroid and vitamin D profiles were measured in 96 fertile controls and 48 infertile females in the research.

**Results:** The values of vitamin D were shown to be  $13.7 \pm 7.67$ , whereas the controls had considerably higher levels ( $20.7 \pm 6.45$ ) ( $p < 0.01$ ). Regarding vitamin D insufficiency, it was observed that 32.29% ( $n=31$ ) of the controls and 20.83% ( $n=10$ ) of the patients reported having a slight deficit. 22.91% ( $n=11$ ) cases and 2.08% ( $n=2$ ) controls had severe instances, while 33.33% ( $n=16$ ) cases and 7.29% ( $n=7$ ) controls had intermediate cases. About the thyroid profile of the fertile and infertile females, it was observed that the TSH level was significantly higher in the cases ( $6.42 \pm 1.04$ ) with  $p < 0.01$ , T4 levels were significantly higher in the controls ( $6.41 \pm 2.06$ ) than in the cases ( $5.2 \pm 3.54$ ), and T3 levels were significantly higher in the controls ( $0.93 \pm 0.26$ ) than in the cases ( $0.72 \pm 0.55$ ) with  $p < 0.01$ . Among the research participants, euthyroidism, hypothyroidism, and hyperthyroidism were seen in 41.66% ( $n = 20$ ), 8.33% ( $n = 4$ ), and 50% ( $n = 24$ ).

**Conclusion:** The current study comes to the conclusion that there is a negative link between vitamin D and TSH levels and female infertility. But further analysis is required on this. Thyroid profile and vitamin D levels should be routinely checked on all female women with infertility.

Keywords: Thyroid profile, TSH, vitamin D, infertility, female infertility.

### INTRODUCTION

Infertility is the inability to conceive even after a year of regular sex and frequent coitus. A complex condition with economic, psychological, and medical components is infertility. The occurrence and prevalence of infertility vary throughout different regions of the world, as well as within cultures and societies. Infertility affects about 14% of the population as a whole.<sup>1</sup> According to the categorization, 15%, 20%, 35%, and 30% of the population, respectively, had unexplained infertility, combination infertility, female infertility, and male infertility. The causes of female infertility include anovulation, hormonal imbalances, sexually transmitted infections, old age, and disorders of the

reproductive system. Idiopathic, radioactive, toxic lead fume, radiation exposure, alcohol use, smoking, diabetes, and/or hypertension are medical problems thought to be linked to infertility.<sup>2</sup>

When exposed to sunshine, vitamin D is produced in the skin and serves a variety of essential bodily activities, such as reducing inflammation, suppressing the immune system, apoptosis, and cell differentiation. Vitamin D mode of action is facilitated by receptors produced in the uterus, placenta, and ovary, among other reproductive organs. It is also essential for female reproduction because it increases the synthesis of progesterone, which is produced at a rate of 13% by progesterone, 9% by estradiol, and 20% by estrone in the ovaries. Vitamin D increases the generation of steroids in the placenta, secretes and expresses human chorionic gonadotropin in syncytiotrophoblast, and modulates HOXA10 expression in the endometrium, which is essential for uterine implantation and receptivity. AMH (antimüllerian hormone), which is involved in the long-term preservation of ovarian reserve, was significantly impacted by vitamin D. In individuals with PCOS, vitamin D also influences insulin metabolism through gene transcription and hormone regulation (polycystic ovarian syndrome).<sup>3</sup>

Endocrine variables, which include thyroid hormone and have a significant impact on pregnancy maintenance and reproduction, are essential for maintaining fertility. Thyroid dysfunction is a crucial factor to examine when evaluating infertility since it is linked to menstrual irregularities, anovulatory cycles, lower fecundity, and increased morbidity. The increased frequency of hypothyroidism in female infertility is linked to aberrant release of luteinizing hormone due to altered oestrogen metabolism, hyperprolactinemia, and disturbances in GnRH production. Therefore, proper thyroid dysfunction therapy improves oocyte physiology, appropriate LH-to-LHRH response, menstrual disturbance reduction, spontaneous fertility, and fertilisation rate.

Thyroid dysfunction and vitamin D deficiency both contribute significantly to infertility by altering the anti-inflammatory and immunological regulatory functions of the receptor binding site RXR, also known as the steroid receptor. Serum vitamin D and thyroid hormone levels can be measured to aid in the early detection of infertility linked to these deficiencies, which increases the conception rate in infertile individuals.<sup>5</sup> Therefore, in order to analyse female infertility, compare the thyroid profile and vitamin D in infertile females, and detect vitamin D insufficiency in infertile females, the current study was carried out to measure the thyroid profile and vitamin D blood levels.

## **MATERIALS AND MATERIALS**

The goal of the current prospective clinical study is to analyse female infertility by measuring serum levels of vitamin D and thyroid profile, comparing these parameters in infertile females, and determine if these females are deficient in vitamin D. The study was carried out at...from.. to.. after approval from the relevant ethics committee. The patients who visited the Institute's outpatient department of obstetrics and gynaecology made up the study population.

Based on the patient's history of not being able to conceive after 12 months of frequent coitus and sexual activity and the absence of any systemic disorders such as diabetes, hypertension, or cardiovascular diseases, infertility was diagnosed. All subjects gave their verbal and written informed permission after being fully told about the study's design. In sterile and aseptic settings, 5 millilitres of fasting intravenous blood were drawn to evaluate the research parameters, which included TSH, T4, T3, and vitamin D levels. An analyzer in the lab was used to evaluate the parameters.

There were 96 fertile controls in the research and 48 infertile females between the ages of 18 and 40 who were infertile, free of concomitant conditions such as diabetes, hypertension, or cardiovascular disorders, and willing research participants were the inclusion criteria. The criteria for exclusion included females who were infertile and had structural abnormalities in their reproductive organs, such as polyps, septate uterus, fibroids in the uterus or fallopian tube, females older than 18 or older than 40, and participants who refused to take part in the study. The serum was isolated from the blood samples by centrifuging them for 10 minutes at 3000 rpm in order to evaluate the study's parameters. Chemiluminescence Competitive Immunoassay was used to measure vitamin D, TSH, T4, and T3. Chemiluminescence Two-site Sandwich Immunoassay was used to measure TSH, T4 levels, and T3 levels.

## **RESULTS**

The goal of the current prospective clinical study is to analyse female infertility by measuring serum levels of vitamin D and thyroid profile, comparing these parameters in infertile females, and determine if these females are deficient in vitamin D. Table 1 contains a list of the research individuals' demographic details. There were 96 fertile controls in the research and 48 infertile females. Females in the 18–40 age groups met the inclusion criteria. The research subjects' mean age for the cases and controls was  $30.1 \pm 6.5$  years and  $28.4 \pm 6.5$  years, respectively. These differences were not statistically significant.

The majority of the subjects in cases and controls were within the age range of 31-40 years with 45.83% (n=22) subjects and 35.4% (n=34) subjects respectively. According to Table 1, patients from cases and controls had serum

vitamin D levels of <20 in 72.91% (n=35) and 41.66% (n=40) respectively, and of >30 in 6.25% (n=3) and 10.41% (n=10).

When the vitamin D profile of the research participants was evaluated, the mean levels of vitamin D were found to be  $13.7\pm 7.67$ , but the values of  $20.7\pm 6.45$  ( $p<0.01$ ) were substantially higher in the controls. Table 2 shows that with regards to vitamin D insufficiency, there were reports of mild deficiency in 20.83% (n=10) patients and 32.29% (n=31) controls, moderate deficiency in 33.33% (n=16) cases and 7.29% (n=7) controls, and severe shortage in 22.91% (n=11) cases and 2.08% (n=2) controls.

About the thyroid profile of the fertile and infertile females, it was observed that the TSH level was significantly higher in the cases ( $6.42\pm 1.04$ ) with  $p<0.01$ , T4 levels were significantly higher in the controls ( $6.41\pm 2.06$ ) than in the cases ( $5.2\pm 3.54$ ), and T3 levels were significantly higher in the controls ( $0.93\pm 0.26$ ) than in the cases ( $0.72\pm 0.55$ ) with  $p<0.01$ . Table 3 shows that among the study individuals, euthyroidism, hypothyroidism, and hyperthyroidism were seen in 41.66% (n = 20), 8.33% (n = 4), and 50% (n = 24).

## DISCUSSION

The goal of the current prospective clinical study is to analyse female infertility by measuring serum levels of vitamin D and thyroid profile, comparing these parameters in infertile females, and determine if these females are deficient in vitamin D. There were 96 fertile controls in the research and 48 infertile females. Females in the 18–40 age groups met the inclusion criteria. The research patients mean age for the cases and controls was  $30.1\pm 6.5$  years and  $28.4\pm 6.5$  years, respectively. These differences were not statistically significant. The age group of 31 to 40 years old included the majority of individuals in both the cases and controls, with 45.83% (n = 22) and 35.4% (n = 34) participants, respectively.

Serum vitamin D levels of <20 were seen in 72.91% (n=35) and 41.66% (n=40) of the participants in the case and control groups, respectively, and of >30 in 6.25% (n=3) and 10.41% (n=10) of the subjects. The findings aligned with the research conducted by Gabedian K et al.<sup>6</sup> (2013) and Pagliardani L et al.<sup>7</sup> (2015), which evaluated participants with comparable demographics and Vitamin D levels to those in the current investigation.

When the vitamin D profile of the research subjects was evaluated, the mean levels were found to be  $13.7\pm 7.67$ , whereas the values of  $20.7\pm 6.45$  ( $p<0.01$ ) were substantially higher in the controls. Regarding vitamin D insufficiency, it was observed that 22.83% (n=10) patients and 32.29% (n=31) controls had mild deficit, 33.33% (n=16) cases and 7.29% (n=7) controls had moderate deficiency, and 22.91% (n=11) cases and 2.08% (n=2) controls had severe deficiency. These findings corroborated those of research by Lata I et al.<sup>8</sup> in 2017 and Mansournia N et al.<sup>9</sup> in 2014, in which the authors observed similar vitamin D levels in infertile females.

TSH was significantly higher in cases, while T3 levels were significantly higher in controls ( $0.93\pm 0.26$ ) compared to cases ( $0.72\pm 0.55$ ) with  $p<0.01$ , and T4 levels were significantly higher in controls ( $6.41\pm 2.06$ ) than in cases ( $5.2\pm 3.54$ ) with  $p<0.01$ , according to an assessment of the thyroid profiles in infertile and fertile females. Among the research participants, euthyroidism, hypothyroidism, and hyperthyroidism were seen in 41.66% (n = 20), 8.33% (n = 4), and 50% (n = 24). These findings were in line with those of studies conducted in 2006 by Trokoudes KM et al.<sup>10</sup> and in 2016 by Nasir S et al.<sup>11</sup> which also found a similar thyroid profile in female infertiles.

Within its limitations, the current study indicates that there may be a connection between female infertility and a variety of challenging circumstances, such as stress, sexual dysfunction, depression, psychological effects, personal suffering, and social repercussions.

## CONCLUSION

Hormonal assessment and relevant research are therefore necessary for the efficient management of infertility. When females require early medication for infertility, there is a negative correlation between their levels of TSH and vitamin D. Nevertheless, the current study included several drawbacks, such as biases related to geographic location, a limited sample size, and a brief monitoring time. Therefore, further long-term research with bigger sample sizes and longer observation periods will aid in coming to a conclusive result.

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#### TABLES

Characteristics	Cases % (n=48)	Controls % (n=96)	Total/p-value
<b>Mean Age (years)</b>	30.1±6.5	28.4±6.5	>0.05
<b>Age range (years)</b>			
18-24	20.83 (10)	31.25 (30)	
25-31	33.33 (16)	33.33 (32)	
31-40	45.83 (22)	35.41 (34)	
<b>Serum Vitamin D</b>			
<20	72.91 (35)	41.66 (40)	
21-39	20.83 (10)	47.91 (46)	
>30	6.25 (3)	10.41 (10)	

**Table 1: Demographic characteristics of the study subjects**

Vitamin D status	Cases % (n=48)	Controls % (n=96)
<b>Mean Vitamin D level</b>	13.7±7.67	20.7±6.45
<b>p-value</b>	<0.01	
<b>Deficiency</b>		
Mild (10-20)	20.83 (10)	32.29 (31)
Moderate (5-10)	33.33 (16)	7.29 (7)
Severe <5	22.91 (11)	2.08 (2)

**Table 2: Vitamin D profile in the study subjects**

Thyroid status	Cases % (n=48)	Controls % (n=96)	p-value
<b>Laboratory assessment</b>			
T3	0.72±0.55	0.93±0.26	<0.01
T4	5.2±3.54	6.41±2.06	<0.01
TSH	6.42±4.02	3.66±1.04	<0.01
<b>Thyroid profile</b>			
Euthyroidism	41	-	
Hypothyroidism	9	-	
Hyperthyroidism	50	-	

**Table 3: Thyroid profile in the study subjects**