



Comparative Investigation of Serum Vitamin D Level in Women with Unexplained and Male Factor Infertility

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Received 2019 December 02; Revised 2020 March 10; Accepted 2020 April 25.

Abstract

Background: A high prevalence of vitamin D deficiency exists in Iranian people. Vitamin D plays a significant role in the pathogenesis of infertility.

Objectives: This study aimed to compare the serum levels of vitamin D in women with unexplained and male factor infertility admitted to the Infertility Center of the Ali ibn-e Abitaleb Hospital, Zahedan, Iran, in 2018.

Methods: This case-control study was performed on 155 women in two groups: a case group consisting of 105 women with unexplained infertility and a control group consisting of 50 women with male factor infertility admitted to the Ali ibn-e Abitaleb Hospital. Blood samples were taken from all the subjects and sent to the laboratory to determine the vitamin D level. Descriptive statistics, including frequency, percentage, mean, and standard deviation were used to describe the data. Also, the mean serum vitamin D level was determined using an independent *t*-test and the Mann-Whitney U test, and the rate of $P < 0.05$ was considered significant.

Results: The results showed that vitamin D levels were significantly lower in the case group than in the control group ($P < 0.001$). The mean vitamin D level was 23.68 ± 6.88 in the case group and 10.90 ± 11.11 in the control group.

Conclusions: The vitamin D level was lower in women with unexplained infertility than in women with male factor infertility. Therefore, measures need to be taken to prescribe vitamin D supplementation to infertile women.

Keywords: Serum Vitamin D Level, Unexplained Infertility, Male Factor Infertility

1. Background

Infertility is defined as lack of pregnancy after one year of sexual intercourse without contraception. Infertility is one of the common problems of human societies, with 60 to 80 million couples suffering from it worldwide, according to WHO estimates (1). Various studies in different societies have examined the incidence of infertility and have reported different outcomes; the rate of infertility is 35% in Sheffield, 35% in China, 12.5% in Tehran, 2.3% in Isfahan Province, 6.8% in Hormozgan and 2.2% in Kerman. The relative prevalence of infertility etiologies is between 25 - 40% for male factor, 40 - 55% for women factors, about 10% for both men and women (Mixed), and about 10% for unexplained infertility. The approximate prevalence of infertility causes in women is 40 - 30% of ovulatory disorder, 30 - 40% of peritoneal or tubular factors, 10 - 15% unexplained, and in 10 - 15% are mixed (2, 3).

Vitamin D is a fat-soluble vitamin that plays a dual

role as vitamin and hormone (4). Vitamin D deficiency has been reported in many countries, including developing countries. Recently, vitamin D deficiency has also been addressed as a health problem in developed countries. Studies conducted by the Endocrine Research Center of the Tehran University of Medical Sciences showed that vitamin D deficiency was 40% to 80% prevalent in Iran (5). Recent studies over the past two decades have shown the importance of vitamin D in reducing the risk of cancer, cardiovascular disease, multiple sclerosis, rheumatoid arthritis, and type 1 diabetes. The vitamin D receptor is found in most body tissues, including vascular endothelium, myocardium, macrophages, monocytes, B and T cells, and dendritic cells (6, 7). Vitamin D deficiency is one of the causes of metabolic bone diseases, such as rickets, osteomalacia, and osteoporosis, and, ultimately, weakness and muscle mass loss. However, new information has shown the role of vitamin D deficiency in immunosuppression, especially pneumonia in children, reduced fertility,

increased menarche age, decreased insulin resistance to glucose, decreased cardiac contractility, increased blood pressure, and infertility (8). Many physiological actions of vitamin D are carried out in target organs by binding the active metabolite (1.25 (OH)₂ D3) to the vitamin D receptor. The vitamin D receptor and metabolizing enzymes are expressed in germs cells, spermatozoa, leydig cells, and the male reproductive pathway's epithelial cells, showing direct effects of vitamin D on spermatogenesis, sex hormone production, and sperm maturation (9, 10). In women, vitamin D deficiency may also cause the pathogenesis of infertility, disorder, and menstrual cycle abnormalities. Vitamin D receptors are present in various female reproductive tissues, including the uterus and ovary, suggesting this vitamin's effect on these organs (10-14). Due to the high prevalence of vitamin D deficiency in Iran, the importance of infertility, the possible role of vitamin D in the pathogenesis of infertility, the uncertainty of previous studies' results, and the lack of prior research on vitamin D deficiency in Zahedan.

2. Objectives

This study aimed to compare serum vitamin D levels in women with unexplained infertility and male factor infertility admitted to the Infertility Center of the Ali ibn-e Abitalib Hospital, Zahedan, in 2017.

3. Methods

This case-control study was performed on two groups of infertile women. The case group included all women with primary unexplained infertility, and the control group included women with male factor infertility admitted to the Infertility Center of Ali ibn-e Abitalib Hospital, Zahedan, in 2017. The control group underwent a complete ultrasound examination, hysterosalpingography and other hormonal evaluations that have been associated with infertility due to male factor. In the case group, semen analysis was normal. Exclusion criteria also included: PCOS (polycystic ovarian syndrome), the use of vitamin supplements in the last three months hormonal disorders and uterine structural disorders. The size of sample was considered 155 patients based on similar studies. The sampling method was also easy and available. For data collection, the checklist and Para clinical results were used for each couple, the researcher referred to Ali ibn-e Abitalib Hospital with an informational form containing demographic characteristics of the patients. After clarifying the study conditions for the patients and obtaining informed consent, they were included in the study. Laboratory scientists took 2 cc blood samples from all the subjects

and sent the samples to the hospital laboratory to determine the vitamin D level.

The vitamin D level was measured with the ELISA Test Kit of 25 OH Vitamin D (Pishgaman). Vitamin D deficiency (less than 15 ng/mL), insufficiency (15-30 ng/mL), and adequacy (30-100 ng/mL) were considered. The obtained data and the vitamin D level were entered into the information form and analyzed using SPSS software. Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to describe the data. Also, to compare mean serum vitamin D levels, an independent t-test was used; otherwise, the Mann-Whitney U test was used. The value of $P < 0.05$ was considered significant. Sampling from both groups was done in the same seasons to eliminate the season's effect as a confounding factor. Also, the studied groups were homogenized in terms of age and the body mass index (BMI).

4. Results

In this study, 155 infertile women with unexplained infertility and male factor were evaluated. The mean age of the women in the case group (Unexplained infertility) was 27.87 ± 5.40 years old, and the control group (male factor) was 27.73 ± 4.79 years old, and BMI in the case group was 22.3 ± 4.22 and in the control group were 26.6 ± 3.47 . In the case group, the average vitamin D level was 10.90 ± 11.11 . In the control group, the mean vitamin D level was 23.68 ± 6.88 . The mean serum vitamin D levels in infertile women with unexplained infertility and male factors were compared using an independent t-test. The results showed that vitamin D levels were significantly lower in the case group than in the control group <0.001 (Table 1).

5. Discussion

This study, 105 infertile women with unexplained cause and 50 male factor were examined. According to the results in the case group (unexplained infertility), the mean level of vitamin D was 10.90 ± 7.11 ng / mL, that indicates a deficiency of vitamin D among women with infertility due to unexplained cause. In fact, this level of vitamin D could lead to disorders such as a mother's immune deficiency and other problems for mother or her child (15). Therefore, it appears to be necessary to take vitamin D supplements. Behbahani et al. (15) reported that 52.78% of infertile women were diagnosed with vitamin D deficiency. In the studies of Garbedian et al. (11) and Rudick et al. (16), the vitamin D deficiency rate was 54.9% and 58% in females, respectively, which is consistent with our research. Our study also found that the mean vitamin D level was 23.66 ± 6.88 ng/ml in the control group (male factor infertility).

Table 1. The Mean Vitamin D Level in Infertile Women with Unexplained Infertility and Male Factor

Group	Number	The Mean Vitamin D Level	Standard Deviation	P-Value
Case (unexplained)	105	10.90	7.11	<0.001
Control (male factor)	50	23.60	6.88	

The vitamin D level is higher in women with male factor infertility than in women with unexplained infertility. However, the amount of vitamin D still shows vitamin D deficiency in these women. In their research, Irani and colleagues (17) stated that vitamin D deficiency, which was considered serum levels below 20 ng/mL, was common in reproductive age and reproductive functions, such as inappropriate sperm parameters. In the failure of in vitro fertilization, it is recommended to use vitamin D supplementation to treat infertile men and women. Yang et al. (18) concluded in their study that infertile men with semen analysis disorders (such as oligoasthenoteratospermia) or infertile normospermia men had lower testosterone and serum vitamin D levels than the healthy men. Therefore, in addition to recommending vitamin D to infertile women, they should have the same recommendation on their spouses, especially in cases with male factor infertility. Concerning the study's primary goal, the results showed that the vitamin D level was significantly lower in the case group than in the control group. It means that vitamin D levels are lower in women with unexplained infertility than in women with male factor infertility. Pagliardini et al. (19) observed no significant correlation between vitamin D deficiency and infertility in women with male factor infertility. However, vitamin D's role in male fertility has been proven in Sollis's systematic review study (20). Therefore, it appears that studies should be conducted on the administration of vitamin D supplementation to women with unexplained infertility and their effect on these women's fertility. Our study found that the vitamin D level was very low in the unexplained infertility group, but higher in the male infertility group, including healthy women, although still inadequate. However, it is impossible to prove the relationship between infertility and vitamin D deficiency. It is suggested to perform a study on the administration of vitamin D to infertile women and its effect on these women's fertility. It is also suggested to consider anthropometric indices in infertile people, as the association of these indices with vitamin D and nutrient deficiency can cause infertility in individuals. Finally, it is suggested to carry out screening programs for men and women of reproductive age in Sistan and Baluchestan province.

Acknowledgments

We would like to thank all the distinguished professors, colleagues, and patients who collaborated to implement this project.

Footnotes

Authors' Contribution: FF and MR conceived the presented idea, developed the theory, and performed the examination; MR verified the analytical methods and supervised the study findings; and FF wrote the article. All the authors discussed the results and contributed to the final manuscript.

Conflict of Interests: The authors declare no conflicts of interest regarding the publication of this paper.

Ethical Approval: The Ethics Committee of the Zahedan University of Medical Sciences approved this study as part of a dissertation with the code IR.ZAUMS.REC.1396.87.

Funding/Support: The authors declare that the current research has been performed with no support from any organizations and/or universities.

Informed Consent: Informed consent was obtained from the participants.

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