Original Article

Prevalence of Vitamin D Deficiency in Iraqi Female at Reproductive Age

Hayder A. Hantoosh, Mayyadah H. Mahdi, Ban W. Imran, Ansam A. Yahya[1]

Departments of Obstetrics and Gynecology and [1]Pharmacy, AL Emam Al Sadiq Hospital, Babylon Health Directorate, Babylon, Iraq

Abstract

Background: Vitamin D, a fat-soluble vitamin that now is recognized as a prohormone that recently has an important role in the reproductive health. Vitamin D deficiency (VDD) had high prevalence worldwide and was estimated to affect about 50% of the population worldwide. Hypovitaminosis D related to several health problems in women such as infertility, polycystic ovarian syndrome endometriosis, and pregnancy-related complications such as preeclampsia and caesarian section. **Objective:** The aim of the study is to evaluate the serum level of Vitamin D in sample of Al-Hilla women at reproductive age. **Materials and Methods:** The total number included in the study was 500 patients. They were companions of patients visiting specialist gynecologic and obstetric private clinics in Hilla City from first of October 2017 to end of March 2018 the patients were grouped into three groups according to their age: Group 1: Patients aged (15–30) years. Group 2: Patients aged 31–40 years. Group 3: Patients aged more than 40 years and premenopausal. The data were collected which were then analyzed statistically and registered. **Results:** Whole sample mean serum Vitamin D level 15.85 ± 7.69 and the percentage of deficiency over all the sample was 76%. Regarding the result in each group, Group 1 include 350 patients, mean age (23.8 ± 3.96), and mean serum Vitamin D level (16.16 ± 7.69), *t*-test was statistically significant $P < 0.05$. Group 2 include 119 patients, mean age (35.2 ± 2.9), and mean serum Vitamin D level (15.14 ± 7.42), *t*-test was statistically significant $P < 0.05$. Group 3 include 31 patients, mean age (42.81 ± 1.45), and mean serum Vitamin D level (14.82 ± 7.77), *t*-test was statistically significant $P < 0.05$. **Conclusion:** Results of our study revealed a widespread, severe VDD in women at reproductive age with aproportion of deficiency in the whole sample of 76% and proportion of insufficiency 18% while only 7% had sufficient Vitamin D Serum level.

Keywords: Hypovitaminosis, reproductive age, Vitamin D, Vitamin D deficiency

Introduction

Vitamin D is a fat-soluble vitamin that now is recognized as a prohormone because it can be synthesized in the body from its precursor (7-dehydrocholesterol) when exposed to ultraviolet (UV) light at a wavelength between 290 and 315 nm. Maintaining adequate circulating 25-hydroxy Vitamin D concentrations is important for the functioning of the metabolic, immune, muscular, skeletal, cutaneous, and respiratory systems of men and women of all ages.[1] The source of vitamin was from the diet and by the action of sunlight on the skin. First, when skin exposed to the UV rays of sunlight this will induce the photolytic conversion of 7-dehydrocholesterol to previtamin D3 followed by thermal isomerization to Vitamin D3. Regarding diet source, only few natural food sources contain significant amounts of Vitamins D2 and D3 such as fatty fish (salmon and tuna), also cod liver oil, milk, and its products.[2] The importance of Vitamin D for the reproductive biology was supported by many rodent studies; while in human, a recognition that Vitamin D signaling may be pertinent for reproductive health was relatively recent.[3] There was some evidence about hypovitaminosis D and its effects on fertility through an indirect effect that Vitamin D deficiency (VDD) usually leads to hypocalcemia and hypophosphatemia. Without Vitamin D, the body absorbs up to 30% less calcium and 20% less phosphorus. When the hypocalcemia and hypophosphatemia were corrected in the female mice and rat studies, their fertility returned. These results suggest that VDD may affect infertility indirectly

Address for correspondence: Dr. Mayyadah H. Mahdi, Al-Emam Al-Sadiq Hospital, Babylon Health Directorate, Babylon, Iraq.
E-mail: mayyadah2004@gmail.com

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because of the disruption of Vitamin D function in maintaining calcium/phosphorus homeostasis.

Furthermore, there was evidence that a reduction in Vitamin D levels directly affects infertility through physiological changes. Vitamin D was also involved in the regulation of several body hormones including the anti Müllerian hormone, follicle stimulating hormone, estradiol (a type of estrogen), and progesterone, all having role in fertility.[4,5] Recently, several studies had been done about the role of Vitamin D and its metabolites in overall health and specifically in a reproductive disorder of women. Vitamin D receptors, mRNA, and protein were detected in the human breast endometrium, myometrium, cervical and ovarian tissues.[6,7] VDD was hypothesized to have a role in the pathophysiology of a variety of gynecological disorders, that polycystic ovary syndrome (PCOS) appears the most well studied. Vitamin D receptors are expressed in human ovarian tissue and placenta.[8,9]

A recent retrospective cohort study document that PCOS infertile women with adequate 25 (OH) Vitamin D levels (>30 ng/ml) were more likely to achieve ovulation compared to those with 25 (OH) Vitamin D levels <20 ng/ml. VDD, defined as serum 25-hydroxyvitamin D levels of <20 ng/ml, was estimated to affect about 50% of the population worldwide.[10] It has been estimated that about 1 billion people worldwide suffer from VDD.[11] The data collected by the National Health and Nutrition Examination Surveys (NHANES) within North America record a 4-fold increase in the prevalence of VDD over the past 10–15 years with as much as 36% of the USA population being affected.[3]

The aim of the study is to evaluate the serum level of Vitamin D in a sample of women in Al-Hilla province at reproductive age.

Materials and Methods

The total sample included 523 participants (all are with in reproductive age of 15–47 years). Twelve patients were excluded because of the use of Vitamin D supplement and 11 patients excluded because of being postmenopausal, so the total number included in the study was 500 participants. They were companions of patients visiting specialist gynecologic and obstetric private clinics in Hilla City from first of October 2017 to end of March 2018 when the study was ended.

Full history and physical examination were done to all participants, then they were sent for investigations such as serum level of Vitamin D that made by chemoimmunoassay method (maglumi instrument), and also other investigation depend on their presentation state and compliance for visiting clinic which mostly aimed for pregnancy, repeated abortion, and other gynecologic cause.

The patients were grouped into three groups according to their age:

- Group 1: Include 350 patients aged (15–30) years
- Group 2: Include 119 patients aged (31–40) years
- Group 3: Include 31 patients aged more than 40 years and premenopausal.

Statistical analysis frequencies, percentages, and one-sample *t*-test were used to analyze the significance of Vitamin D deficiencies in the group of the study.

The analysis was performed by IBM SPSS Software Statistic Version 21 (Chicago, USA). A significance level of 0.05 was considered for *t*-test.

Results

A total of 500 patients, the mean age of the whole sample 27.76 ± 7.15 was included in this study divided into three groups.

Discussion

The status of Vitamin D is determined by measuring the level of 25 (OH) Vitamin D in serum. Many classifications for Vitamin D range in blood that according to the American College of Cardiology classifies levels of Vitamin D into: Severe deficiency ,deficiency, mild to moderate deficiency, sufficient and ideal as shown in Table 1.[12] Therefore, higher prevalence of VDD in Al-Hilla women at reproductive age in our study is shown in Table 1. In our study Table 2 show the age distribution in the whole sample .The result of the serum level of 25 –hydroxy vit D included in Table 3 for group 1,

Table 1: Serum 25-hydroxy vitamin D (ng/ml)[12]

Serum 25-hydroxy vitamin D (ng/ml)	Vitamin D status
≤10	Sever deficiency
10-20	Deficiency
20-30	Mild-moderate deficiency
≥30	Sufficient
40-50	Ideal
50-150	Indeterminate
>150	Toxicity

Table 2: Age distribution in the whole sample *t*-test was significant *P*<0.05

Groups	Mean age±SD	Number of patients	Mean serum vitamin D level	*P*
Group 1	23.87±3.96	350	16.16±7.69	<0.05
Group 2	35.2±2.9	119	15.14±7.42	<0.05
Group 3	42.81±1.45	31	14.82±7.77	<0.05

SD: Standard deviation

Table 3: The results of the serum level of vitamin 25-hydroxy vitamin D in Group 1

State level of vitamin 25(OH)D (ng/ml)	Number of patients (%)
Sever deficiency <10 ng/ml	55 (15.71)
Deficiency 10-20 ng/ml	210 (60)
Suboptimal (Insufficient) 20-30 ng/ml	58 (16.57)
Optimal (sufficient)	22 (18.49)

25(OH)D: 25-hydroxy vitamin D

Table 4: The results of the serum level of vitamin 25-hydroxy vitamin D in Group 2

State level of vitamin 25(OH)D (ng/ml)	Number of patients (%)
Sever deficiency <10 ng/ml	25 (21)
Deficiency 10-20 ng/ml	66 (55.46)
Suboptimal (insufficient) 20-30 ng/ml	22 (18.49)
Optimal (sufficient)	6 (5.04)

25(OH)D: 25-hydroxy vitamin D

Table 5: The results of the serum level of vitamin 25-hydroxy vitamin D in Group 3

State level of vitamin 25(OH)D (ng/ml)	Number of patients (%)
Sever deficiency <10 ng/ml	7 (22.58)
Deficiency 10-20 ng/ml	17 (54.84)
Suboptimal (insufficient) 20-30 ng/ml	6 (19.35)
Optimal (sufficient)	1 (3.22)

25(OH)D: 25-hydroxy vitamin D

Table 6: Comparison of means in different groups of the sample

Mean serum level of vitamin 25(OH)D	Group
16.6	Group 1
15.18	Group 2
14.85	Group 3
15.85	Mean of the total sample

Table 7: Percentages of vitamin D deficiency within different groups of the study

Percentage of deficiency	Number of individuals with vitamin D deficiency	Group
75.7	265	Group 1 (*n*=350)
76.46	91	Group 2 (*n*=119)
78	24	Group 3 (*n*=31)

Table 4 for group 2 and Table 5 for group 3. Also we made a comparison of the means and the percentages of the vit. Levels in different groups of the sample and we found that the least level was in group 3 as shown in Table 6 and Table 7. This study when compared with previous studies in Iraq and neighboring countries that also show VDD in women of childbearing age, in Iraqi studies that were carried out in 2015–2016 on many Iraqi samples including childbearing-age women show that in other parts of the world as in the United States, high prevalence of VDD among perinatal women of childbearing age has been reported too. The third NHANES (1988–1994) found that 4% of white and 42% of black women of childbearing age residing in the USA had serum 25 (OH) Vitamin D levels <10 ng/mL (25 nmol/L), which is consistent with a diagnosis of severe vitamin deficiency.[13]

Hypovitaminosis D occur in more than (65%) of women of child-bearing age.[14] which is consistent with our study, while in neighboring countries such as in Iran where the largest studies about the prevalence of VDD was done, several studies show that Iranian women have VDD.[15-18] also agree with our study. Studies in Saudi Arabia of childbearing-aged women also showed the widespread prevalence of severe line with our result in the study.

In other parts of the world as in the United States, high prevalence of VDD among perinatal women of childbearing age has been reported too.

Age is an essential factor that affects Vitamin D levels such as obesity, gender, and diseases. In general, elder people are susceptible to VDD due to many risk factors, not only due to reduced skin production of Vitamin D with age but also due to decreased sunlight exposure, decreased dietary intake, reduced skin thickness, impaired intestinal absorption, and diminished hydroxylation in the liver and kidney.[19,20] This was come in line with our result when comparing of the mean serum vitamin level between groups found that the least mean level was in Group 3 which include the older women while the highest mean level was in group 1 which include the younger women. Because of several factors influence the Vitamin D serum level, as well as the fact that its deficiency causes multiple diseases and complications,[21,22] especially in women, that could affect fertility and may correlate with many gestational complications. Therefore, VDD is a very important health problem that should be considered as one of the priorities outlined in the health policies, especially in woman health. Taking our study result that shows significant epidemic of VDD in women at reproductive age whom mostly visit gynecologic clinic for either infertility or recurrent abortions or other gynecologic abnormalities in addition to other studies from the region into consideration we found that this serious deficiency will not only affect the health status of the women themselves but also have remarkable consequences on the health of their children and future generations to come. Because it is easily, safely, and cheaply corrected VDD through adequate supplementation for a healthy pregnancy and optimal health of both the mother and the baby. There are some limitations in our study that we did not collect information regarding dietary Vitamin D intake, UVB exposure, or measures of obesity (body mass index), also a great benefit would be if the study had involved the estimation of parathyroid hormone (PTH) which would give further information about the relationship between Vitamin D level and PTH, but its high cost and unavailability in most laboratories were the limitations of the study.

Conclusion

Our study reveals severe VDD in women at reproductive age that should be considered in relation to many gynecologic abnormalities that about 76% of childbearing-aged women that visit gynecologic clinic mostly for infertility, recurrent abortion, and other gynecologic problem had VDD with their serum level <20 ng/ml.

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Conflicts of interest

There are no conflicts of interest

References

1. Tiwari P, Sharma N. Role of Vitamin D in various illnesses: A review. J Pharm Care Health Syst 2017;4:3.
2. Dusso AS, Brown AJ, Slatopolsky E. Vitamin D. Am J Physiol Renal Physiol 2005;289:F8-28.
3. Luk J, Torrealday S, Neal Perry G, Pal L. Relevance of Vitamin D in reproduction. Hum Reprod 2012;27:3015-27.
4. Firouzabadi RD, Rahmani E, Rahsepar M, Firouzabadi MM. Value of follicular fluid Vitamin D in predicting the pregnancy rate in an IVF program. Arch Gynecol Obstet 2014;289:201-6.
5. Irani M, Merhi Z. Role of Vitamin D in ovarian physiology and its implication in reproduction: A systematic review. Fertil Steril 2014;102:460-8.e3.
6. Friedrich M, Rafi L, Mitschele T, Tilgen W, Schmidt W, Reichrath J, *et al.* Analysis of the Vitamin D system in cervical carcinomas, breast cancer and ovarian cancer. Recent Results Cancer Res 2003;164:239-46.
7. Vienonen A, Miettinen S, Bläuer M, Martikainen PM, Tomás E, Heinonen PK, *et al.* Expression of nuclear receptors and cofactors in human endometrium and myometrium. J Soc Gynecol Investig 2004;11:104-12.
8. Parikh G, Varadinova M, Suwandhi P, Araki T, Rosenwaks Z, Poretsky L, *et al.* Vitamin D regulates steroidogenesis and insulin-like growth factor binding protein-1 (IGFBP-1) production in human ovarian cells. Horm Metab Res 2010;42:754-7.
9. Avila E, Díaz L, Halhali A, Larrea F. Regulation of 25-hydroxyvitamin D3 1alpha-hydroxylase, 1,25-dihydroxyvitamin D3 24-hydroxylase and Vitamin D receptor gene expression by 8-bromo cyclic AMP in cultured human syncytiotrophoblast cells. J Steroid Biochem Mol Biol 2004;89-90:115-9.
10. Holick MF. Vitamin D deficiency. N Engl J Med 2007;357:266-81.
11. Singh P, Mehlawat U, Pande S. Vitamin D deficiency and its association with non-communicable diseases. IPP 2014;2:336-46.
12. American College of Cardiology. Serum 25-hydroxy Vitamin D in Ng/ml accepted. American college of cardiology 2011;58:1547-56.
13. Nesby-O'Dell S, Scanlon KS, Cogswell ME, Gillespie C, Hollis BW, Looker AC, *et al.* Hypovitaminosis D prevalence and determinants among African American and white women of reproductive age: Third national health and nutrition examination survey, 1988-1994. Am J Clin Nutr 2002;76:187-92.
14. Al-Hilali KA. Prevalence of Hypovitaminosis D in Adult Iraqi People Including Postmenopausal Women. Scientific Research Journal (SCIRJ), Volume IV, Issue IX, 2016. p. 53.
15. Diamond TH, Levy S, Smith A, Day P. High bone turnover in Muslim women with Vitamin D deficiency. Med J Aust 2002;177:139-41.
16. Alagöl F, Shihadeh Y, Boztepe H, Tanakol R, Yarman S, Azizlerli H, *et al.* Sunlight exposure and Vitamin D deficiency in Turkish women. J Endocrinol Invest 2000;23:173-7.
17. Salek M, Hashemipour M, Aminorroaya A, Gheiratmand A, Kelishadi R, Ardestani PM, *et al.* Vitamin D deficiency among pregnant women and their newborns in Isfahan, Iran. Exp Clin Endocrinol Diabetes 2008;116:352-6.
18. Emdadi R, Chaichian S, Mahboubi M, Moradi Y, Akhlaghdoust M, Basharkhah A. Prevalence of Vitamin D deficiency among women of reproductive age: A multi centric study in Tehran. Shiraz E Med J 2016;17:e40745.
19. Al-Horani H, Dayyih WA, Mallah E, Hamad M, Mima M, Awad R, *et al.* Nationality, Gender, Age, and Body Mass Index Influences on Vitamin D Concentration among Elderly Patients and Young Iraqi and Jordanian in Jordan Biochemistry Research International 2016;(2):1-8. Doi: http://dx.doi.org/10.1155/2016/8920503.
20. Al-Mogbel ES. Vitamin D status among adult Saudi females visiting primary health care clinics. Int J Health Sci (Qassim) 2012;6:116-26.
21. Fouda MA, Turkistani IZ, Angkaya-Bagayawa FF, Krishnaswamy S, Al-Daghri N. Vitamin D deficiency in young women of childbearing age the elephant in the room. Int J Clin Exp Med 2016;9:4615-9.
22. Fry CM, Sanders TA. Vitamin D and risk of CVD: A review of the evidence. Proc Nutr Soc 2015;74:245-57.