



The Predictive Role of Vitamin D Deficiency in Urinary Tract Infection at Reproductive Age in Women

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Abstract

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BACKGROUND: Urinary tract infections (UTIs) are common health infections in pregnant women with high complications. Many of the worldwide population suffer from vitamin D deficiency (VDD) due to insufficient exposure to sunlight. The relationship between VDD and UTI and giving vitamin D supplementation contributes to preventing UTI.

AIM: The present study aims to find the effect of VDD and UTIs in women of reproductive age as risk factors during pregnancy.

METHODS: The samples were collected from May 2020 to February 2021 from gynecology clinic outpatients and private clinics in Basrah city. A 104 sample was collected from females of reproductive age between 15 and 45 years divided into three age groups suffering recurrent UTI and VDD.

RESULTS: Of 104 women who followed up with UTIs during the study period, the deficiency of vitamin D levels in women was 62.5%. The levels of deficiency were significantly higher in the age group 25-34y is 71.1%, followed by 15-24y is 63.2%, and 35-45 y is 50% with mean 24 ± 6.8 years. In addition, the results showed the vitamin D levels at an insufficient level (30.8%) higher in the age group 35-45 y is 42.9% with a mean of 10 ± 1.2. Furthermore, the results showed that the vitamin D levels at an insufficient level (30.8%) higher in the age group 35-45 years are 42.9% with a mean of 10 ± 1.2.

CONCLUSION: Our current study revealed that there is a clear correlation between women who suffer from VDD and UTIs, whether severe or frequent infection at reproductive age and this affects their fertility and pregnancy. In addition, the study concluded that adolescent girls and young women are the most vulnerable to VDD and UTIs.

Introduction

Urinary tract infections (UTIs) are common health infections in pregnant women with high complications. UTIs are the third infection after respiratory tract and gastrointestinal infections. It occurs as a self-limiting infection but has tended to be recurrent, and their infections threaten health, because it is related to antibiotic resistance [1], [2]. In general, urinary tract infections occur at different ages in women of reproductive age, and about 11% at the age of 18–24 years among women in the United States suffer from a urinary tract infection each year [3]. UTIs are risks for women during pregnancy, which may cause pre-term birth, affect the intrauterine growth of the fetus, as well as preeclampsia [4]. UTIs appear in three forms: cystitis, acute pyelonephritis, and asymptomatic bacteriuria. Acute pyelonephritis is the most severe form of UTI [5]. Some researchers believe that a relationship between vitamin D deficiency (VDD) and urinary tract infection and giving vitamin D supplementation contributes to preventing UTI, but the association between its deficiency and urinary tract infection has not been known [5]. Vitamin D is a group

of fat-soluble secosteroids that are produced in the skin after exposure to ultraviolet radiation [6], [7]. Many of the worldwide population suffer from VDD due to insufficient exposure to sunlight [8]. Almost 80% of people in Africa and Asia are vitamin D deficient [9], [10]. Recent studies have indicated that vitamin D has an important role in protecting against autoimmune diseases and other infections [11], [12]. VDD is associated with many diseases, including osteoporosis [13]. Pre-eclampsia, infections as well as autoimmune diseases, cancers, cardiovascular disease, and respiratory and urinary tract infections caused by bacterial infections [14], [15].

The present study aims to find the effect of VDD and UTIs in women of reproductive age as risk factors during pregnancy.

Methods

Collection of samples

The samples were collected from May 2020 to February 2021 from gynecology clinic outpatients

and private clinics in Basrah city. Written consent was obtained from all the patients participating involved in the study. A 104 sample was collected from females of reproductive age between 15 and 45 years divided into three age groups suffering recurrent UTI and VDD. All women had not taken vitamin D or other supplements and excluded those who used the supplements. The urine was examined to diagnose urinary tract infections by taking clean catch mid-stream urine into 20 mL sterile screw-capped container for each patient and then was centrifuged at $450 \times g$ for 5 min by centrifuge, the supernatant was rid and the pellet suspended in urine. The supernatant rid, and the pellet suspended in urine. A 10 μ l of the pellet was transferred on a glass slide and covered with a coverslip and examined at 40 \times magnification under a microscope to detect the presence of leucocytes (>10 leucocytes per high power field).

Detection of Vitamin D level

A 5 mL of the venous blood samples were obtained to determine the vitamin D3 test in gel tube and separate by centrifugation at $1500 \times g$ at 4°C by centrifuge. Sampled was tested by the Cobas e411 analyzer that is an automated analyzer. It is designed for quantitative and qualitative *in vitro* assay determinations for a broad range of applications to determine vitamin D levels according to the manufacturer's instructions.

Statistical analysis

All data were analyzed using SPSS software. Calculation of mean values and standard deviation (SD) made for characterization of the study population. We tested the relationship between hypovitaminosis D and UTIs by Chi-square and the t-test. $p < 0.05$ considered statistically significant.

Results

A total of 104 females suffer from UTIs during the study period divided into three age groups with a mean age of all patients 38 ± 5.8 , the first group 15–24 years ($n = 38$), the second group 25–34 years ($n = 38$), and the third group 35–45 years ($n = 28$). No females in this study group were using vitamin D supplements. The present study found a strong correlation between the high prevalence of UTIs and VDD among women, all women had UTIs with a prevalence rate of UTIs which were 100% at reproductive age.

The deficiency of vitamin D levels in women was 62.5%., where the deficiency levels were significantly higher in the age group 25-34 years is 71.1%, followed

by 15-24 years is 63.2%, then 35-45 years is 50.0% with mean 24 ± 6.8 with significant deficiency ($P < 0.000$) at three groups. Furthermore, The results showed that the vitamin D levels at an insufficient level (30.8%) higher in the age group 35–45 years are 42.9% with a mean of 10 ± 1.2 (Table 1).

Table 1: Prevalence of vitamin D deficiency in women according to age groups

Age groups (Years)	Female		Vitamin D level		
	No.	%	Deficiency (<15) %	Insufficient (15-30) %	Normal (>30) %
15–24	38	36.54	63.2	26.3	10.5
25–34	38	36.54	71.1	26.3	2.6
35–45	28	26.92	50.0	42.9	7.1
Total	104	100	62.5	30.8	6.7
Mean \pm SD	38 ± 5.8		24 ± 6.8	10 ± 1.2	2 ± 1.5
p-value	0.0001				

*SD: Standard deviation.

Discussion

Many women have a problem with UTIs than men due to many factors including anatomical readiness, proximity to the urethra and vagina, and sexually active life during reproductive age [15]. The study found UTIs in all women who had VDD through the presence of many pus cells in urine samples, this shows the effectiveness and role of the kidneys by making vitamin D important to the body, as previous studies have found that the level of the vitamin D is lower in patients with chronic kidney disease because the infection makes the kidneys unable to convert vitamin D to its active form [16].

VDD is a health problem for women that need great attention. VDD is known as deficiency mineralization defect or demineralization of the skeleton that leads to osteomalacia, osteoporosis, and hyperparathyroidism. There are many classifications for the level of vitamin D range in blood, but according to the American College of Cardiology, vitamin D is classified into severe deficiency, deficiency, mild-to-moderate, and sufficient level [17]. Our study showed a clear relationship between vitamin D deficiency and UTI among females of reproductive age with 62.5%. This almost identical to the results made by Al-Hilali, 2016, and this was identical to previous studies conducted in the United States, Iran, Turkey, and Saudi Arabia [18], [19], [20], [21]. The present results indicated that the age groups 15–34 years are the most vulnerable to VDD than the older women with age group 35–45 years; these explain that age has a role in affecting vitamin D levels and skin production for vitamin D decreases with age and skin thickness [22]. Furthermore, adolescent and young women tend to consume large quantities of fast food and soft drinks that lack vitamins, especially vitamin D and less consumption of healthy foods and even those that contain reasonable amounts of the vitamin D, such as dairy products, seafood, and fatty foods rich in the vitamin D and therefore low dietary intake of the vitamin D in their foods [23], [24]. Although

Iraq is characterized by abundant sunshine during most of the year, the reason may be due to the lack of exposure to sunlight, as some women avoid exposure to the sun due to the hot climate, which may reduce their activities during the daytimes for esthetic reasons in addition to their use of sun blockers [25], [26], [27].

The mechanism that explains this association is unknown; it suggests the reason for the presence of many immune factors in the host that react to a UTI such as lipocalin and lactoferrin, which confers a portion of the protection against infection. Vitamin D serum deficiency level may be associated with many factors that may lead to many diseases and complications, including its effect on female fertility and pregnancy [28]. The role of vitamin D is associated with innate and acquired immune defenses to protect the host from bacterial infection, improve the immune system performance, and respond by activating the role of phagocytic activity and neutrophil motility and its role as a potent stimulator of antimicrobial peptides [13], [29], [30]. In addition, vitamin D is necessary to stimulate WBCs and remove infected cells through interleukins and cytokines [9].

Conclusion

Our current study revealed that there is a clear correlation between women who suffer from VDD and UTIs, whether severe or frequent infection at reproductive age and this affects their fertility and pregnancy. In addition, the study concluded that adolescent girls and young women are the most vulnerable to VDD and UTIs.

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