



# Vitamin D status and its relationship with age in type 2 diabetic patients

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## Abstract

**Introduction:** Type 2 diabetes has become a chronic worldwide epidemic with advancing complications and has caused many premature deaths. Its global prevalence is about 9.7%, with 92.4 million suffering from the disease. Vitamin D level has been recently considered as an adjustable risk factor of cardiovascular diseases in individuals with type 2 diabetes.

**Objectives:** The aim of the current study is to investigate the frequency of vitamin D deficiency and the relationship between vitamin D serum levels and age in type 2 diabetes patients.

**Patients and Methods:** In this descriptive-analytic study, 101 type 2 diabetes patients of Imam Ali clinic in Shahrekord were investigated. Serum vitamin D levels of the participants were measured by DRG (USA) Elisa kits. The results were analyzed using SPSS software with a 95% confidence level.

**Results:** Of 101 studied patients, 32 were male and 69 were female. The average age of the subjects was  $61.25 \pm 11.75$  years. The average age of the males was  $63.09 \pm 11.15$  years and the average age of the females was  $60.39 \pm 12$  years. Around 72 subjects were vitamin D deficient. No significant difference of vitamin D levels between males and females ( $P=0.985$ ) was detected. Serum vitamin D levels of type 2 diabetes patients were significantly positive correlated with their ages ( $r=0.282$ ,  $P=0.004$ ).

**Conclusion:** In the present study the prevalence of vitamin D deficiency in type 2 diabetes patients was 71.3%. We found a positive significant relationship between the vitamin D level and age. It is possible that ageing process is not one of the causes of vitamin D deficiency.

**Keywords:** Vitamin D, Type 2 diabetes, Age

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## Introduction

Vitamin D deficiency, considered as a main popular health problem in the world, has developed into an epidemic in each country (1). Vitamin D deficiency has considerable effects on skeletal muscles and evidence shows that, those suffering from vitamin D inadequacy are at the risk of heart complications and death (2,3). In the past decade, researchers have addressed that vitamin D plays a role in the pathogenesis of various chronic diseases like diabetes, hypertension, infections, autoimmune diseases, cancer and obesity (4). Various investigations detected that the expression of skeletal muscles vitamin D receptors significantly reduced with increasing age (5). Recent human studies have focused on the age-related changes in bones and metabolism during menopause, due to its deep impact on the equilibrium of minerals existed in bones, especially in those suffering from osteoporosis (4-6).

Type 2 diabetes has become a chronic worldwide epidemic with advancing complications and has caused many premature deaths. Its global prevalence is about 9.7%,

with 92.4 million suffering from the disease (7). Vitamin D level has been recently considered as an adjustable risk factor of cardiovascular diseases, in individuals with type 2 diabetes (8,9). Changes in vitamin D3 and its circulating metabolites such as decrease in 1 $\alpha$ -hydroxylase activity and increase in the activity of kidney 25-hydroxylase have been demonstrated in animal and human studies in cases that suffering from type 2 diabetes (10). The correlation between low serum levels of vitamin D and decrease in insulin sensitivity has been reported in recent cross-sectional investigations (11-13). Several epidemiological and cross-sectional investigations have detected that low levels of 25 (OH) D in circulation are related to increase of fasting blood sugar, insulin and higher prevalence of diabetes (14,15).

## Objectives

The aim of this study is to consider the relationship of vitamin D levels and ages of type 2 diabetes individuals. Additionally we sought to consider the prevalence of

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**■ Implication for health policy/practice/research/medical education**

Type 2 diabetes has become a chronic worldwide epidemic with advancing complications and has caused many premature deaths. Vitamin D level has been recently considered as an adjustable risk factor of cardiovascular diseases, in individuals with type 2 diabetes. Several epidemiological and cross-sectional investigations have detected that low levels of 25 (OH) D in circulation are related to increase of fasting blood sugar, insulin and higher prevalence of diabetes and expression of skeletal muscles vitamin D receptors significantly reduced with increasing age.

vitamin D deficiency in type 2 diabetes patients.

**Patients and Methods**

In this descriptive-analytic study, 101 type 2 diabetes patients of Imam-Ali clinic in Shahrekord were included. The diagnostic criterion for diabetes was according to American Diabetes Association (ADA) (16). Diabetes patients who were undergoing dialysis or were receiving kidney transplant and mentally disabled patients that could not consciously agree to terms of the experiment were exempted from the study. Serum vitamin D levels of the participants were measured by DRG (USA) Elisa kits (17).

**Ethical issues**

The research adhered to the principles of the Declaration of Helsinki. The purpose and design of study were explained for all subjects and they completed an informed consent form. Ethical committee of Shahrekord University of Medical Science approved the protocol (#IR.SKUMS.REC 1394.165).

**Statistical analysis**

To determine the association between the gender variable and vitamin D levels, the non-parametric Mann-Whitney U test was applied and to determine the relationship between vitamin D levels and sex Spearman's correlation coefficient was used. The results obtained, upon being organized and corrected, were analyzed using SPSS (version 19.0, SPSS Inc., Chicago, Illinois, USA) software with a 95% confidence level. In the current study, a patient is considered as suffering from vitamin D deficiency, if individual has a vitamin D serum level of less than 25 nmol/L. A P value of below 0.05 was considered significant.

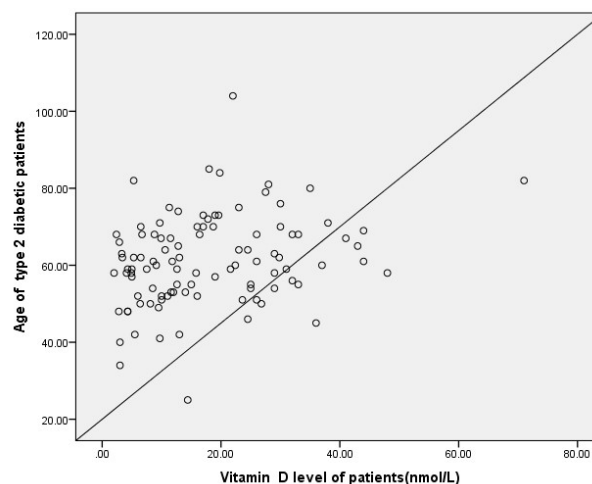
**Results**

Of 101 studied patients, 32 patients were male while 69 patients were female. The average age of the subjects was  $61.25 \pm 11.75$  years, the average age of the males was  $63.09 \pm 11.15$  years and the average age of the females was  $60.39 \pm 12$  years. As shown in Table 1, no significant difference was observed between the vitamin D levels and sex ( $P=0.985$ ).

Of 101 diabetic patients, 72 individuals suffered vitamin D deficiency which is equivalent to 71.3% of these people.

**Table 1.** Serum levels of vitamin D in terms of gender

Variable	Proportion	Vitamin D status (nmol/L)	P value
Gender			0.985
Men	32	18.13±2.45	
Women	69	17.85±1.48	
Total	101	17.97±1.24	



**Figure 1.** Serum vitamin D levels of type 2 diabetes patients were significantly correlated with their ages ( $r = 0.282, P = 0.004$ ).

The average serum levels of vitamin D in patients were  $17.94 \pm 12.16$  nmol/L. We found that serum vitamin D levels of type 2 diabetes patients were significantly correlated with their ages ( $r=0.282, P=0.004$ ; Figure 1). Vitamin D levels in diabetic men and women had no significant difference ( $P>0.5$ ).

**Discussion**

In the present study the prevalence of vitamin D deficiency in type 2 diabetes patients have been 71.3 %. Furthermore, vitamin D levels in diabetic men and women had no significant difference ( $P>0.5$ ). We found a positive significant relationship between the vitamin D level and age.

In the study conducted by Sadiya et al, on type 2 diabetes patients and obese individuals, 83.2% of individuals were vitamin D deficient and only 4.5% of them had normal levels of vitamin D (18). In their study the prevalence of vitamin D deficiency was higher among women. By contrast, in current study no significant difference of vitamin D between females and the males was detected. The results of their study showed a positive relationship between serum 25(OH) D serum level and age of diabetes patients, a finding that was observed in our study too. Accordingly, the study by Kafshani et al detected no positive significant relationship between serum vitamin D values of diabetes patients with their age and gender. However, in the present study we found a significant relationship between healthy individuals' ages and their vitamin D levels (19). In other studies carried out in the Middle East, the positive relationship between the

participants' vitamin D levels and their ages was observed too (20,21). A recent study by Alfawaz et al, in Saudi Arabia, referred to a positive relationship of serum vitamin D levels of the individuals, with their age (21). Previously in the study of Iranian healthy adults, by Baradaran et al, no significant correlation of gender and their vitamin D levels was detected. However, a positive correlation of age serum vitamin D levels was seen (22). In another study on diabetes patients in China, vitamin D levels of women were lower than those of men (23). Moreover, in the study by Sherman et al, as in our study, no difference between the level of 25(OH)D in circulation in men and women was seen (24).

Vitamin D and its metabolites have important impact on insulin biosynthesis and its secretion. Additionally, vitamin D had a significant influence on subsiding of inflammatory process in type 2 diabetes (25). As recent investigations have detected, a severe deficiency of vitamin D suppresses pancreas secretion and insulin circulation which leads to low insulin levels and glucose toleration disorder (26,27). As in the current studies, low vitamin D serum values are associated independently to abdominal obesity and hyperglycemia (28). There also has been shown that the skeletal muscle tissue contains vitamin D receptors and to reach its highest functionality, muscles require an adequate vitamin D status (29).

Furthermore, it has been observed that vitamin D receptors presented in skeletal muscles and decreased with aging process (5,30).

### Conclusion

In the present study the prevalence of vitamin D deficiency in type 2 diabetes patients was 71.3%. We found a positive significant relationship between the vitamin D level and age. It is possible that ageing process is not one of the causes of vitamin D deficiency. This finding requires to re-check in larger and multi-centric investigations.

### Limitations of the study

Low proportion of patients is a limitation of our study. We suggest larger investigation on this aspect of diabetic disease.

### Authors' contribution

All authors participated to design of the study. LM managed the research. MS performed the investigation. SBR analyzed the data. MRT and SBR prepared the manuscript. All authors read, revised and approved the manuscript.

### Conflicts of interest

The authors declare that they have no competing interests.

### Ethical considerations

Ethical issues (including plagiarism, data fabrication, double publication) have been completely observed by the authors.

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