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Original Research

Serum 25 (OH) vitamin D level and its relation to diabetic peripheral neuropathy

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ABSTRACT:

Background: To assess the correlation between serum 25 (OH) vitamin d and diabetic peripheral neuropathy. **Materials & methods:** A total of 50 patients were enrolled. All the patients included in this study were subjected to full history taking. Anthropometric measurements were calculated. Subjects with DPN were classified into painful and painless DPN patients. **Results:** T2DM patients group had lower serum level of 25(OH) vitamin D. A chi-square test showed significant differences according to sex and neurological symptoms (p- value0.001). The mean serum level of 25(OH) vitamin D in patients with DPN (group I) (20.12) was highly statistically significant lower than patients without DPN (group II) (32.02) with p value = 0.001. **Conclusion:** 25 (OH) Vitamin D has a significant role in diabetic peripheral neuropathy.

Keywords: Serum 25 (OH), Vitamin D, diabetic peripheral neuropathy.

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INTRODUCTION

Diabetes, a major lifestyle disease, has become a global burden. In developing countries, the prevalence of diabetes is rising rapidly. In many developing countries, China is the biggest contributor to diabetes, followed by India.[(1)] Type 2 diabetes (T2DM) has become a major global healthcare issue, and its incidence is reported to be an alarming increase. [(2)] Diabetes mellitus (DM) is a group of clinical syndromes characterized by glucose metabolism disorders, with the long-term hyperglycemia causing chronic complications in multiple organs. In type 2 diabetes mellitus (T2DM), the main microvascular complications include diabetic retinopathy (DR), diabetic nephropathy (DN), and diabetic peripheral neuropathy (DPN). DR, DN, and DPN all have profound adverse impact on the patients' quality of life and lead to disability or mortality. [(3,4)]

Vitamin D3 is a lipid-soluble hormone that has well-established classical physiological function in maintaining calcium and phosphate homeostasis and promoting bone mineralization [(5)]. However, vitamin D3 is a pleiotropic signaling molecule, which plays numerous physiological roles ranging from regulating cellular proliferation and intracellular metabolism, and modulating innate and adaptive immune responses. [(6,7)] In addition to its role in regulating calcium and phosphorus metabolism, vitamin D was reported to inhibit inflammation and autoimmune response, alleviate insulin resistance, and promote insulin synthesis and secretion.[(8)] In relation to this, vitamin D deficiency was found to be associated with diabetic microvascular complications. [(9)]

Neuropathy is the most common chronic complication of diabetes; about 50% of diabetic patients have various types of neuropathies. [(10)] Approximately 50% of patients with diabetic neuropathy (DN) experience some degree of neuropathic pain. [(11)] Diabetic peripheral neuropathy (DPN) is an important cause of non-traumatic foot ulcers and amputations, and also contributes to recurrent hospitalizations, injuries, and decreased quality of life.

MATERIALS & METHODS

A total of 50 patients were enrolled. All the patients included in this study were subjected to full history taking. Anthropometric measurements were calculated. Subjects with DPN were classified into painful and painless DPN patients. Laboratory investigations were done for the patients.Measurement of 25(OH) vitamin D serum levels were done by enzyme immunoassays using

EDI. VDI was defined as a serum circulating 25-(OH) D level of<28ng/ml.Data was collected and analysed using SPSS software. P- value < 0.05 was considered significant. P- value < 0.001 was considered as highly significant. P- value > 0.05 was considered insignificant.

RESULTS

This study has been carried out on 50 patients who were known to have T2 DM, (20 males and 30 females) with mean age 44.5 years as patient groups. T2DM patients group had lower serum level of 25(OH) vitamin D. A chi-square test showed significant differences according to sex and neurological symptoms (p- value0.001).

Table: 1 Group variable and type II DM Group I with DPN and group II without DPN

Group variable	Type II dm group1 (n= 30)	Type II dm group II (n= 20)	P-value
Age(years)	46.3	43.6	0.003
HBA1C %	8.2	6.67	0.001

Table: 2 Correlation between 25(OH) vitamin D with DPN group 1 and without DPN group II

	DPN group I (n= 30)	Without DPN group II (n=20)	P-value
	24 (80%)	11 (55%)	<0.001
25 (OH) vitamin D levels	20.12 ng/mL	32.02 ng/mL	<0.001

In the current study, the mean serum level of 25(OH) vitamin D in patients with DPN (group I) (20.12) was highly statistically significant lower than patients without DPN (group II) (32.02) with p value = 0.001. Also, we found that 80% of patients with DPN had vitamin D deficiency (25(OH)D ≤ 28 ng/ml) and 20% of them had sufficient serum level of vitamin D (25(OH)D > 28ng/ml compared to patients without DPN. There were 55% with sufficient serum level of vitamin D and 45% had vitamin D deficiency (25(OH)D ≤ 28 ng/ml with statistical significant difference (P = 0.001).

DISCUSSION

The definition of vitamin D deficiency has been controversial, in part owing to the interpretation of surrogates associated with vitamin D status. Vitamin D deficiency has been historically defined and recently recommended by the Institute of Medicine (IOM) as a 25(OH)D below 20 ng/ml, vitamin D insufficiency as a 25(OH)D of 21–29 ng/ml, and sufficient vitamin D level as a 25(OH)D > 30 ng/ml. [12] Clinical studies reported a significant relation between vitamin D deficiency and diabetic neuropathy. Other studies found that the serum vitamin D level was significantly inversely correlated with the intensity of nerve conduction velocities impairment (p = 0.001). [13] In this study, T2DM patients group had lower serum level of 25(OH) vitamin D. A chi-square test showed significant differences according to sex and neurological symptoms (p- value0.001).

Vitamin D deficiency was found in 73.3% of T2DM groups and in 35% of control subjects with statistical significant differences (p < 0.005), and serum level of 25(OH) vitamin D in patients with DPN (21.09 ± 8.38) was less statistically significant than that in patients without DPN (31.12 ± 14.85) (p = 0.001). Mean serum level of 25(OH) vitamin D in patients with painless DPN (10.047 ± 8.12) was less significant than that in patients with painful DPN (18.14 ± 3.85), (p < 0.05). Regression analysis revealed that vitamin D deficiency is one of the independent risk factors of DPN, (OD, 0.914), (p = 0.007). Vitamin D deficiency has a significant role in the development and severity of DPN in Egyptian patients with T2DM. [14]

In the vitamin D insufficiency group (<30 ng/mL 25-(OH) D), patients with neurological symptoms had higher serum 25-(OH) D levels than those without neurological symptoms (24.65±3.42 ng/mL vs 23.61±4.54 ng/mL, p≤0.001). The risk of numbness and pain increased by 0.5-fold for every 6 ng/mL increase in 25-(OH) D. In the vitamin D sufficiency group (≥30 ng/mL 25-(OH) D), patients with neurological symptoms had lower serum 25-(OH) D levels than those without neurological symptoms (32.96±3.18 ng/mL vs 33.45±4.27 ng/mL, p<0.01). For every 4 ng/mL decrease in 25-(OH) D, the risk of numbness and pain increased by 0.2-fold. [15] In the current study, the mean serum level of 25(OH) vitamin D in patients with DPN (group I) (20.12) was highly statistically significant lower than patients without DPN (group II) (32.02) with p value = 0.001.

CONCLUSION

25 (OH) Vitamin D has a significant role in diabetic peripheral neuropathy.

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