

ORIGINAL RESEARCH

**SERUM 25(OH) VITAMIN D LEVEL AND ITS RELATION TO
DIABETIC PERIPHERAL NEUROPATHY IN TYPE 2
DIABETIC PATIENTS**

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ABSTRACT

Background: The present study was undertaken for evaluating serum vitamin D levels and its relation to diabetic peripheral neuropathy in type 2 diabetic patients.

Materials & methods: A total of 100 type 2 diabetic patients were enrolled in the present study. Complete demographic and clinical details of all the patients was obtained. Clinical examination was carried out in all the patients and data was recorded. assessment of peripheral neuropathy was done by neuropathy disability score (NDS) and nerve conduction studies. The NDS was established by bilateral examination of the pin-prick sensation, temperature sensation, vibration test, and Achilles tendon reflex. Serum levels were obtained and vitamin D levels were evaluated using auto-analyser. Correlation of vitamin D levels was done using auto-analyser. All the results were recorded and analysed using SPSS software.

Results: DPN was present in 56 percent of the patients. Mean vitamin D levels among the patients with and without DPN was 19.12 ng/ml and 32.95 ng/ml respectively. While analysing and comparing statistically, significant results were obtained.

Conclusion: Significant correlation exists between DPN and serum vitamin D levels among type 2 diabetic patients.

Key words: Vitamin D, Neuropathy, Diabetic

INTRODUCTION

Diabetes mellitus (DM), a world significant health concern, is a metabolic disease caused by the defection of insulin secretion or the obstacle of insulin function. The number of people with diabetes will rise up to 366 million in 2030 which is estimated by the World Health Organization (WHO), and these diabetes epidemics will continue.¹⁻³

Vitamin D deficiency is a common public health problem all over the world. Vitamin D deficiency contributes significantly to the pathogenesis of the two types of diabetes by impairing insulin secretion from pancreatic beta-cells and increasing insulin resistance. Clinical studies reported that vitamin D deficiency is more common in patients with diabetes and plays an important role in pathogenesis of diabetic neuropathies.⁴⁻⁷ Studies also have shown impaired insulin synthesis and secretion in animal models with vitamin D deficiency; diabetes onset can be delayed with 1–25-OH vitamin D intake, and some specific studies have reported that vitamin D deficiency contributes to the etiology and progression of type 2 diabetes and development of diabetes complications especially micro-vascular complications. The relationship between vitamin D and DPN was suggested in several studies.⁸⁻¹⁰ Hence; under the light of above-mentioned data, the present study was undertaken for evaluating serum vitamin D levels and its relation to diabetic peripheral neuropathy in type 2 diabetic patients.

MATERIALS & METHODS

The present study was undertaken for evaluating serum vitamin D levels and its relation to diabetic peripheral neuropathy in type 2 diabetic patients. A total of 100 type 2 diabetic patients were enrolled in the present study. Complete demographic and clinical details of all the patients was obtained. Clinical examination was carried out in all the patients and data was recorded. assessment of peripheral neuropathy was done by neuropathy disability score (NDS) and nerve conduction studies. The NDS was established by bilateral examination of the pin-prick sensation, temperature sensation, vibration test, and Achilles tendon reflex.¹⁰ Serum levels were obtained and vitamin D levels were evaluated using auto-analyser. Correlation of vitamin D levels was done using auto-analyser. All the results were recorded and analysed using SPSS software.

RESULTS

Mean age of the type 2 diabetic patients was 49.2 years. Majority proportion of the patients were males. Mean serum vitamin D levels were found to be 26.3 ng/ml. Out of 100 type 2 diabetic patients, DPN was present in 56 percent of the patients. Mean vitamin D levels among the patients with and without DPN was 19.12 ng/ml and 32.95 ng/ml respectively. While analysing and comparing statistically, significant results were obtained.

Table 1: Prevalence of DPN

DPN	Number	Percentage
Present	56	56
Absent	44	44
Total	100	100

Table 2: Correlation of DPN and vitamin D

DPN	Vitamin D levels	p- value
Present	19.12	0.000 (Significant)
Absent	32.95	

DISCUSSION

Peripheral nervous system can be affected by diabetes disease in various ways, and the prevalence of neuropathy in patients with diabetes is approximately 30%, and up to 50% will eventually develop neuropathy during the course of their disease. Diabetic peripheral neuropathy (DPN), a common complication of diabetes mellitus, is found in 50% patients living with diabetes mellitus.^{6- 8} Clinical observational studies demonstrated a significant association among patients with vitamin D deficiency, and neuropathic pain symptoms, neurological deficits, autonomic dysfunction, and electrophysiological studies in diabetic patients.^{8- 10} Hence; the present study was undertaken for evaluating serum vitamin D levels and its relation to diabetic peripheral neuropathy in type 2 diabetic patients.

Mean age of the type 2 diabetic patients was 49.2 years. Majority proportion of the patients were males. Mean serum vitamin D levels were found to be 26.3 ng/ml. Out of 100 type 2 diabetic patients, DPN was present in 56 percent of the patients. Mean vitamin D levels among the patients with and without DPN was 19.12 ng/ml and 32.95 ng/ml respectively. Our results were in concordance with the results obtained by previous authors who also reported similar findings. Abdelsadek et al reported that vitamin D deficiency had a significant role in the development and severity of DPN in patients with type 2 diabetes mellitus (T2DM). DPN was categorized as painful or painless. The mean (SD) serum 25(OH)D level was significantly less in patients with DPN than in those without. The mean serum 25(OH)D level was decreased in patients with painless DPN compared to that in those with painful DPN. On regression analysis, vitamin D deficiency was an independent risk factor for DPN.¹⁰ Another study, conducted in France by Skalli et al., evaluated serum vitamin D concentration in patients with T2DM with and without DPN. Patients with DPN were older and had a longer duration of diabetes, as well as a lesser vitamin D concentration. In addition, the percentage of patients with vitamin D deficiency (<20 ng/mL) was notably greater in the subgroup with DPN.¹¹

In the present study, while analysing and comparing the vitamin D levels among patients with and without DPN statistically, significant results were obtained. Diabetic patients are at high risk of micro vascular complications including DPN, which has bad impact on the quality of life, and it is associated with high mortality. The role of vitamin D in pathophysiology of DPN, some animal studies demonstrated the associations between vitamin D deficiency and low levels of nerve growth factors (neurotrophins) which are required for the development and survival of both sympathetic and sensory neurons, and cause defective neuronal calcium homeostasis. Decrease in neurotrophins and defective calcium homeostasis increase nerve damage by toxins including hyperglycemia, also vitamin D receptor modulates neuronal cells differentiation and function. So, vitamin D deficiency impairs nociceptor function, worsens nerve damage, and lowers the pain threshold.^{12, 13}

In animal studies, Vitamin D deficiency has been shown to associate with low levels of neurotrophins (especially nerve growth factor) and defective neuronal calcium homeostasis. Vitamin D through its receptor modulates neuronal differentiation as well as neuronal growth and functions. In addition, vitamin D deficiency has been linked to a lower pain threshold which increases when vitamin D deficiency is corrected. Vitamin D deficiency is common in diabetic patients, and low concentrations are associated with the presence and the severity of sensory neuropathy in diabetes.^{13- 15} Zoppini and colleagues' study found that higher serum 25(OH) D levels were independently associated with a reduced risk of prevalent microvascular complications. Also, clinical studies were done on patients with T2DM by Soderstrom and colleagues. They concluded that vitamin D is an independent risk factor for development of DN. So, neuropathic pain can be relieved by replenish vitamin D deficiency, which reduces the use of medication for neuropathic pain like tricyclic antidepressant, antiepileptic, and narcotics with their often severe side effects. Also, the neuroprotective effects of vitamin D may reverse the neuronal damage and prevent the progression of DPN.¹⁵⁻¹⁷

CONCLUSION

Significant correlation exists between DPN and serum vitamin D levels among type 2 diabetic patients.

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