Observation of vitamin D levels in newly diagnosed multiple sclerosis patients: A case series

Y Huynh Thi Nhu ✉, Dieu Nguyen Xuan, Luong Nguyen Ngoc, Nghia Hoang Tien Trong
Department of Neurology, Military Hospital 175

Correspondence to
Y Thi Huynh Nhu
Department of Neurology,
Military Hospital 175
Email: hynhthinhuy4995@gmail.com

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ABSTRACT

Background: Many environmental factors have been reported to be associated with the risk of developing multiple sclerosis (MS), such as lack of exposure to sunlight, vitamin D deficiency, obesity, smoking, and infectious mononucleosis. Vitamin D deficiency has been shown to play a role in immune system function and may increase the risk of developing MS, although there are many confounding factors and inconsistent results.

Objective: In this report, we evaluated vitamin D levels in newly diagnosed MS patients to determine the need for vitamin D supplementation.

Methods: We observed vitamin D levels in newly diagnosed MS patients who had not previously used corticosteroids and vitamin D. We measured serum 25-hydroxyvitamin D (25 OH vitamin D) levels when patients with suspected MS were hospitalized. All patients were evaluated for kidney function, and normal function was ensured.

Results: We recorded six patients (5 females, 1 male), aged from 17 to 66 years old, newly diagnosed with MS from January 2024 to July 2024, and 4 patients had positive oligoclonal bands. 25 OH vitamin D levels were low in 5 patients and normal in 1 patient. The patient with normal 25 OH vitamin D levels was the youngest with a serum level of 83.95 ng/ml. In the remaining patients, deficient 25 OH vitamin D levels were recorded in 1 patient (15.91 ng/ml) and insufficient levels in 4 patients (ranging from 20.46 to 28.4 ng/ml). Patients with low 25 OH vitamin D levels were then supplemented with vitamin D2 or D3.

Conclusion: Most MS patients have low 25 OH vitamin D levels, so vitamin D supplementation in MS treatment is necessary. However, further observations with larger sample sizes and comparisons with healthy individuals or non-MS patients are needed.

Keywords: multiple sclerosis, MS, vitamin D level, 25-hydroxyvitamin D, 25 OH vitamin D, deficiency, insufficient, vitamin D supplementation.

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I. INTRODUCTION

Multiple sclerosis (MS) is a complex autoimmune disease in which the interaction between genetic and environmental factors causes a cascade of events, including activation of the adaptive and innate immune system, central nervous system demyelination, and axonal and neuronal damage. There is a lot of evidence for the association of Epstein-Barr virus infection, obesity, smoking, and especially vitamin D deficiency with increased risk of MS.

Vitamin D plays an important role in the regulation of both the innate and adaptive immune system by the presence of vitamin D receptor (VDR) expression in almost all cells of the immune system. Systemic 1,25(OH)2VD3 affects several immune cell types, including macrophages, dendritic cells (DCs), and T and B cells as Figure 1.

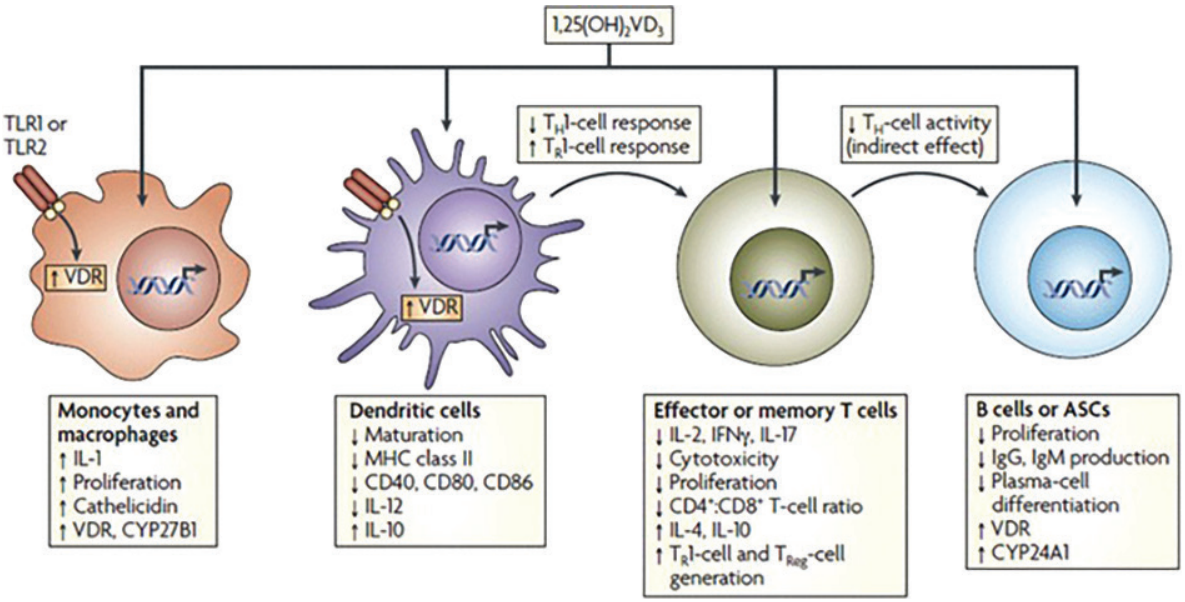

***Figure 1**. Mechanisms of vitamin D immunomodulation*

From: "Vitamin effects on the immune system: vitamins A and D take centre stage",

by J. Rodrigo Mora, 2008, Nature Reviews Immunology.

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The correlation between vitamin D and MS was demonstrated by numerous epidemiologic studies. Several Mendelian randomization studies found that a genetically lowered 25-hydroxyvitamin D (25 OH vitamin D) level is strongly associated with increased susceptibility to MS [1,2]. Furthermore, some studies looking at both vitamin D levels during pregnancy and vitamin D levels in childhood have shown that low levels may increase the risk of developing MS [3,4]. However, we still don't know whether vitamin D levels are different in people with MS compared with the general population, and if taking vitamin D supplements could be used as a treatment to manage MS.

In this report, we evaluated vitamin D levels in newly diagnosed MS patients to determine the need for vitamin D supplementation.

II. METHOD

We conducted an observation of serum

vitamin D levels in newly diagnosed MS patients from January 2024. We measured serum 25 OH vitamin D levels when patients with suspected MS were hospitalized. The serum samples were taken before we used corticosteroids and vitamin D. We collected data from patients who then met the McDonald 2017 criteria for MS. All patients were evaluated for kidney function, and normal function was ensured.

III. RESULTS

We recorded six patients with five females, aged from 17 to 66 years old, newly diagnosed with MS from January 2024 to July 2024. Characteristics of the patients are demonstrated by the following **Table 1**.

***Table 1**. Characteristics of participants with the diagnosis of MS*

	Male (M)/ Female (F)	Age (y/o)	Oligoclonal bands status	Phenotype of MS
Patient 1	F	17	Negative	RRMS
Patient 2	F	66	Negative	PRMS
Patient 3	F	26	Positive	RRMS
Patient 4	F	27	Positive	RRMS
Patient 5	F	40	Positive	RRMS
Patient 6	M	19	Positive	RRMS

***Comments**:* We observed that 25 OH vitamin D levels were low in 5 patients and normal in 1 patient. The patient with normal 25 OH vitamin D levels was the youngest with a serum level of 83.95 ng/ml. In the remaining patients, deficient 25 OH vitamin D levels were recorded in 1 patient (15.91 ng/ml) and insufficient levels in 4 patients (ranging from 20.46 to 28.4 ng/ml) **(Table 2).**

***Table 2**. 25 OH vitamin D level in six MS patients*

	25 OH vitamin D level (ng/ml)	Vitamin D status
Patient 1	83.95	Normal
Patient 2	21.1	Insufficient
Patient 3	28.4	Insufficient
Patient 4	15.91	Deficient
Patient 5	20.46	Insufficient
Patient 6	21.22	Insufficient

***Comments**:* Patients with low 25 OH vitamin D levels were then supplemented with vitamin D2 or D3.

IV. DISCUSSION

In our study, we observed that 25 OH vitamin D levels were low in 5 of 6 MS patients. A large limitation of our study is the absence of a control group consisting of non-MS individuals. Without this comparison, it is challenging to establish a causal relationship between low vitamin D levels and the onset of MS. However, a study about the prevalence of vitamin D deficiency in northern Vietnam published in 2012 showed that the rate of vitamin D deficiency in the Vietnamese population was 23,8% [5]. In this study, more than 80% of the women and 60% of the men had 25 OH vitamin D values below 30ng/mL that classified as vitamin D insufficient. This means that vitamin D levels in Vietnamese people are relatively low, so it is difficult to conclude that the results seen in MS patients are significant. The high prevalence of low vitamin D levels could be explained by low exposure to sunlight according to this report.

The next question is whether vitamin D supplements are needed for patients with MS. Some studies reported that lower levels of vitamin D are associated with higher relapse rates in MS. In a prospective longitudinal study from the

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Netherlands, relapse risk was significantly reduced in those with medium (20–40 ng/mL) and high (> 40 ng/mL) serum vitamin D levels compared to those with low levels [6]. Additionally, lower vitamin D levels were strongly associated with development of new T2 lesions and with contrast-enhancing lesions on brain MRI. On the other hand, studies suggest that vitamin D supplementation may be beneficial for patients with MS including the number of active lesions decrease, annualized relapse rate lower, and cognitive improvement [7-9]. However, some evidence conflicts with that. In 2023, a new trial in the United States found no difference in the number of relapse attacks when comparing the low and high doses of vitamin D intake [10]. They also reported no difference in the number of lesions or cortical atrophy on MRI scans between the two groups. These results suggest that prescribing higher doses of vitamin D for purposes of modifying the RRMS course may not be beneficial.

Therefore, considering the documented vitamin D deficiencies in the patients reported in this study, it would be valuable to implement a targeted vitamin D supplementation intervention. The clinical progression of these patients could then be closely monitored and compared to their baseline status prior to supplementation. This approach could provide further insights into the potential therapeutic benefits of vitamin D in managing MS, helping to clarify whether supplementation leads to measurable improvements in clinical outcomes such as relapse rates, disability progression, and overall quality of life. Such findings could significantly contribute to optimizing MS treatment protocols and offer evidence-based guidance on the use of vitamin D as a supportive therapy.

V. CONCLUSION

Serum vitamin D level is most likely low in patients with MS diagnosis. However, further observations with larger sample sizes and comparisons with healthy individuals or non-MS patients are needed. Besides, we also need further research to prove the benefit of vitamin D supplementation.

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