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Aya Abdelgaber Abozeid
Rheumatology, Rehabilitation
& Physical Medicine
Department, Faculty of
Medicine, Tanta University,
Tanta, Egypt

Heba Ahmed Almokadem
Rheumatology, Rehabilitation
& Physical Medicine
Department, Faculty of
Medicine, Tanta University,
Tanta, Egypt

Dina Ibrahim Abdelhai
Rheumatology, Rehabilitation
& Physical Medicine
Department, Faculty of
Medicine, Tanta University,
Tanta, Egypt

Doaa Shawky Alashkar
Rheumatology, Rehabilitation
& Physical Medicine
Department, Faculty of
Medicine, Tanta University,
Tanta, Egypt

Hanan Mohammed El-Sadany
Rheumatology, Rehabilitation
& Physical Medicine
Department, Faculty of
Medicine, Tanta University,
Tanta, Egypt

Corresponding Author:
Aya Abdelgaber Abozeid
Rheumatology, Rehabilitation
& Physical Medicine
Department, Faculty of
Medicine, Tanta University,
Tanta, Egypt

Serum vitamin D in rheumatoid arthritis patients: Its relation to disease activity and neuropathic pain

Aya Abdelgaber Abozeid, Heba Ahmed Almokadem, Dina Ibrahim Abdelhai, Doaa Shawky Alashkar and Hanan Mohammed El-Sadany

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Abstract

Vitamin D is involved in regulating the immune system through various processes, thereby indicating that a vitamin D deficiency contributes to the development and progression of rheumatoid arthritis. People with a vitamin D deficiency frequently experience heightened pain sensitivity, a condition linked to hyperinnervation and hypersensitivity in nerve fibres. The trial's primary goals were to measure the levels of vitamin D in rheumatoid arthritis patients' blood and look for any connections between the vitamin and the severity of the condition. Using nerve conduction study (NCS) as a marker, the trial also aimed to determine a relationship between vitamin D levels and neuropathic pain in RA patients.

Keywords: Serum vitamin D, rheumatoid arthritis, disease activity, neuropathic pain

Introduction

Rheumatoid arthritis is a long-term inflammatory condition marked by inflammation of multiple joints on both sides of the body, where joint damage, deformities, and impaired function often occur. The RA joints affected by inflammation display an increase in the number of cells lining the intimal layer and an increased cellularity of the synovial lining. The primary cell types participating in synovial inflammation are T-cells, monocytes, macrophages, and neutrophils. Cellularity is heightened when cells exhibit greater expression of adhesion molecules that regulate cell movement and of pro-inflammatory compounds like cytokines and chemokines [1].

The cause of RA remains unclear, however genetic and environmental elements play a significant role in its progression [2]. Additionally, lifestyle factors that contribute to this risk include low vitamin D intake and levels, which can heighten the likelihood of clinical manifestations [3].

Rheumatoid arthritis primarily impacts both small and large joints. It also manifests in various ways beyond the joints, such as peripheral neuropathy. Rheumatoid arthritis patients face a roughly 50% risk of acquiring peripheral neuropathy [4]. Carpal tunnel syndrome (CTS), vasculitis neuropathy in the form of mononeuritis multiplex, sensorimotor neuropathy, pure sensory neuropathy, and pure motor neuropathy are all examples of peripheral nerve involvement [5].

Chronic pain is a significant concern for individuals with rheumatoid arthritis and negatively impacts their overall well-being. Although medical treatment can help slow the progression of this disease, it remains a leading cause of disability if left unmanaged [6]; however, adequate medical control can still achieve this.

Musculoskeletal discomfort, myopathy, and bone demineralisation associated with vitamin D insufficiency are all associated with persistent pain. The immune system, hormone control, neuronal alterations, and the cortex of the brain may all be impacted by vitamin D levels [7].

Neural growth factor (NGF), neurotrophin 3 (NT3), and glial cell line-derived neurotrophic factor (GDNF) are examples of neurotrophins that vitamin D increases the synthesis of while decreasing the production of neurotrophin 4 (NT4). This system may affect the lifespan, maintenance, and development of neurons. NGF is a well-known inflammatory mediator.

The direct impact of this condition causes heightened sensitivity in the sensory nerve endings, intensifies sensory input signals, and increases blood flow to injured tissue [8].

According to research, vitamin D may also have neuroprotective effects by controlling calcium ion levels in neurones and reducing the effects of glucocorticoids [9]. Hypovitaminosis D may influence changes in peripheral nerves' experience of pain [10].

The many immunomodulatory characteristics of vitamin D may be linked to the possible relationship between blood vitamin D levels and the severity, activity, and development of RA [11].

The most compelling evidence regarding the connection between vitamin D and RA pertains to its impact on the progression of the disease. Research conducted in 2015 found that individuals with low vitamin D levels upon diagnosis of early rheumatoid arthritis experienced decreased rates of remission, increased disease activity, and a less positive response to treatment compared to patients with sufficient vitamin D levels (above 20 ng/ml or 50 nM) [12].

In addition, several studies have highlighted the common issue of vitamin D insufficiency and have identified a correlation between low levels of 25(OH)D in the blood and reduced physical capabilities, along with heightened disease activity in individuals with RA [13].

Besides the typical measures of RA disease activity and physical disability, research has discovered a link between serum 25(OH)D levels and other inflammatory markers. Studies have directly connected serum 25(OH)D levels with bone loss associated with rheumatoid arthritis [14].

Conclusions

The LANSS (Leeds Assessment of Neuropathic Symptoms and Signs) showed a strong negative correlation with vitamin D insufficiency, which was more common in individuals with rheumatoid arthritis and neuropathic pain. High DAS28 scores were associated with a vitamin D deficit, and the two were significantly correlated negatively. In patients with RA, peripheral nerve involvement is a well-documented phenomenon, with the majority of cases being entrapment neuropathy, particularly carpal tunnel syndrome (CTS) at 65%, followed by polyneuropathy at 50%, primarily manifesting as a sensorimotor variant.

Conflict of Interest

Not available

Financial Support

Not available

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