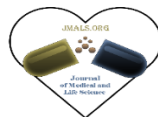




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The Correlations of Vitamin D and Zinc Deficiency with Neck Pain, Fatigue, and Tremors of Muscle: A Case Report and Review of Article

Zainab Zamil Gataa Allami ^{1,*}, Firas Khalid ALkhalidi ², Maytham A. Dragh¹

¹ Department of Biology, College of Science, University of Misan, Maysan, Iraq

² Maysan Health Directorate, Alzahrawi Surgical Hospital, Maysan, Iraq

*Corresponding author: Zainab Zamil Gataa Allami

Email: zainabzamil@uomisan.edu.iq

DOI:10.21608/jmals.2024.390104

Abstract:

Background: Vitamin D (Vit D) can be defined as a fat-soluble vitamin that comes from supplements, dietary intake, and dermal synthesis. In terms of public health, zinc (Zn) is one of the most crucial nutrients. Vit D and Zn deficiency are often associated with bone pain, fatigue, hair loss, sleep disorder, neck pain, and muscle disorders of which combined muscle tremors are a common manifestation.

Case Summary Chief Complaint: The present case report describes a woman 33 years old with bone pain, fatigue, hair loss, sleep disorder, neck pain, and muscle disorders that combine with muscle tremors, muscle weakness, and muscle spasms. **Diagnosis:** The case displayed D3 and Zn levels that were considered low at (3 ng/ml, and 35.18 ug/dl, respectively) with a typical symptomatology clinical symptom. Vit D supplements were given at a dose of 5000 IU per day, Dexday supplement at a dose of 50mg per day, Citro D3 at a dosage of 300000 IU per week, Zn supplement at a dose of 50mg per day, and ELLEZEN supplement at a dose of 40,000 IU per day, in addition to dietary supplements, sun exposure, and some exercises.

Result: The woman responded well to treatment, showing significant improvement. Vit D3 and Zn supplementation led to the disappearance of symptoms. The main conclusion from this case is the importance of diagnosing and effectively managing Vit D and Zn deficiency for overall quality of life in young women. This approach can greatly improve patient outcomes and prevent the development of potentially serious complications later in life.

Keywords: Vitamin D, Zinc, Neck Pain, Tremors, Muscle disorder

1. Case Report

Mrs. A. was a 33-year-old woman who came for treatment of her left-hand tremor. She complained of pain in her left knee, and neck and muscle spasms. She noticed that she was gaining weight despite diet and exercise and that her hair was falling out. She complained of bone, neck, and joint pain, fatigue, feeling sleepy, and spasms and tremors in the muscles of the left side of the body, which were

characterized by muscle weakness, her weight was 70.55 Kg, her height was 1.60 m, her body weight mass (BMI) was 27.558. She had no previous medical. She had not been exposed to much sunlight and had taken no previous medications. She had no health problems. She was born in Iraq and lived in southern. When asked to extend her hands and spread her fingers. The examination has been conducted. Tremors at this age are considered very

abnormal. She was asked questions when she arrived at the clinic and stated that she had symptoms of a Zn and Vit D deficiency. Therefore, the advice was to do several tests before prescribing the treatment, the most important of which is a Vit D test, a thyroid hormone test, calcium and magnesium levels, and others. Serum Vit D was low at 3 ng/ml. Serum Vitamin B-12 Vitamin B9, and Serum Ferritin were normal at (238 pg/ml, 7.897 ng/ml, 68.5 mg/dl, respectively). Serum Sodium, Serum Magnesium, and Serum Phosphorus (Po4) were normal (140.4 mg/dl, 2.00 mg/dl, and 4.23 mg/dl, respectively). Serum Potassium and Serum Calcium were normal (3.71 mm/L, and 1.19 mm/L, respectively), and Serum Chloride was normal (103 mEq/L). Serum Zn was low (35.18 ug/dl). Serum Blood sugar was normal at (93 mg/dl). Serum T3 free, T4 free, TSH, and IPTH were normal (4.3 μ IU/mL, 15.0 ng/dl, 1.8 μ IU/ml, 49.47pg/ml, respectively). Vit D and Zn deficiency were shown to be probable causes of tremors, muscle weakness, disorders, spasms, neck discomfort, joint pain, weariness, and sleep disturbances after the authors evaluated the literature. Vit D supplements at a dose of 5000 IU per day, Zn supplements at a dose of 50.0 mg per day, Citro D3 at a dose of 300000 IU per week, ELLEZEN at a dose of 40,000 IU per day, and Dexday at a dose of 50 mg per day were all recommended to her. The patient was described dietary rich vitamins and elements, exposure to sunlight, and then some exercises for muscle strengthening. The patient has improved symptoms since Vit D and Zn supplements were introduced. On her next visit to the clinic to follow up on her health condition, her tremors, muscle spasms and weakness, hair loss, fatigue, neck pain, and joint pain were completely gone. In this visit, the serum Vit D was normal at 46.2 ng/ml, and serum Zn was normal at 70 ug/dl. This example demonstrates how Vit D and Zn relate to symptoms like exhaustion, sleep disturbance, neck and joint discomfort, tremors,

muscle weakness, and spasms. It also shows how these conditions may be treated.

2. Introduction:

Vit D can be defined as a fat-soluble vitamin that comes from supplements, dietary intake, and dermal synthesis. Dairy products, eggs, fatty fish, and fortified drinks are among its limited food sources (1,2). When exposed to sunlight, the skin's 7-dehydrocholesterol absorbs UV B rays and transforms to pre-Vit D3, which then isomerizes to Vit D3. As illustrated in fig (1), pre-Vit D3 as well as Vit D3 absorb UV B radiation and are transformed into a range of photoproducts, a few of which have special biologic qualities (3). For healthy bones, vitamin D is crucial. To maintain strong bones, it is necessary to absorb phosphorus and calcium into the body and control their transport into and out of the skeleton (4). A member of the steroid hormone receptor family, the Vit D receptor (VDR) stimulates a series of cell signaling events to maintain healthy levels of Ca^{2+} , which in turn control several biological processes (5-7). According to Priya *et al.* (8), the serum Vit D levels were determined using the chemiluminescence test and were categorized as follows: insufficiency 21-29 ng/ml, deficiency < 20 ng/ml, toxic >150 ng/ml, and sufficiency >30 ng/ml. Numerous factors, including lack of exposure to sunlight, cultural practices (for example, wearing long garments), low Vit D dietary intake, skin pigmentation, use of skin sun blockers, prolonged lactation periods, obesity, and tobacco smoking, were linked to women with Vit D deficiency (9,10). In terms of clinical manifestations, vitamin D3 deficiency does not show any symptoms until its plasma levels drop extremely low. Vit D3 deficiency manifests clinically as hyperparathyroidism, bone discomfort, muscle weakness, and fractures. These days, there is evidence connecting Vit D3 deficiency to diabetes, migraines, coronary artery disease, cancer, and other conditions (11,12).

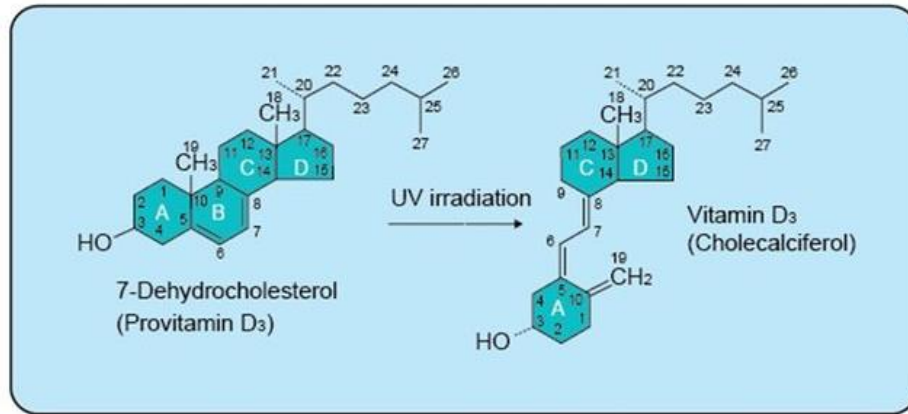


Figure 1. Vit D3 structure (Sirajuden *et al.*, 2019) [11].

2.1. Vitamin D And Muscle Function:

According to Kuroda *et al.* (14), skeletal muscle is an exceptionally plastic tissue that can respond to stress and injury with robust adaptation and regeneration. Severe Vit D deficiency is characterized by muscle weakness (15). For a long time, it was known that a Vit D deficiency is characterized by muscle weakness. The precise biomolecular effects of Vit D on skeletal muscle have not been well understood up until recently (16,17). Vit D's function on muscle tissue is mediated through a receptor found in muscle cells, which could have both non-genomic and genomic effects. The binding of 1,25-dihydroxy Vit D [1,25(OH)₂D] to its nuclear receptor initiates the genomic effects, causing modifications in mRNA transcription and consequent protein synthesis. Vit D non-genomic effects happen quickly and are mediated by a cell surface receptor (18). Muscle

injury and regeneration are influenced by Vit D levels. Vit D deficiency causes oxidative damage, muscular atrophy, increased production of reactive oxygen species (ROS), reduced adenosine triphosphate (ATP) generation, and mitochondrial dysfunction. These deficiency symptoms may worsen comparable symptoms that usually accompany muscle damage (left panel). Hydroxylated, activated Vit D [1,25(OH)₂D] promotes an increase in the number of Vit D receptors (VDRs) in satellite cells as well as central myonuclei during muscle regeneration (right panel). As seen in Fig (2), such variations in VDR abundance are associated with both stimulation and inhibition of satellite cell growth (19). It was demonstrated in certain research that Vit D supplementation increases muscle strength, especially in those who are Vit D deficient (20).

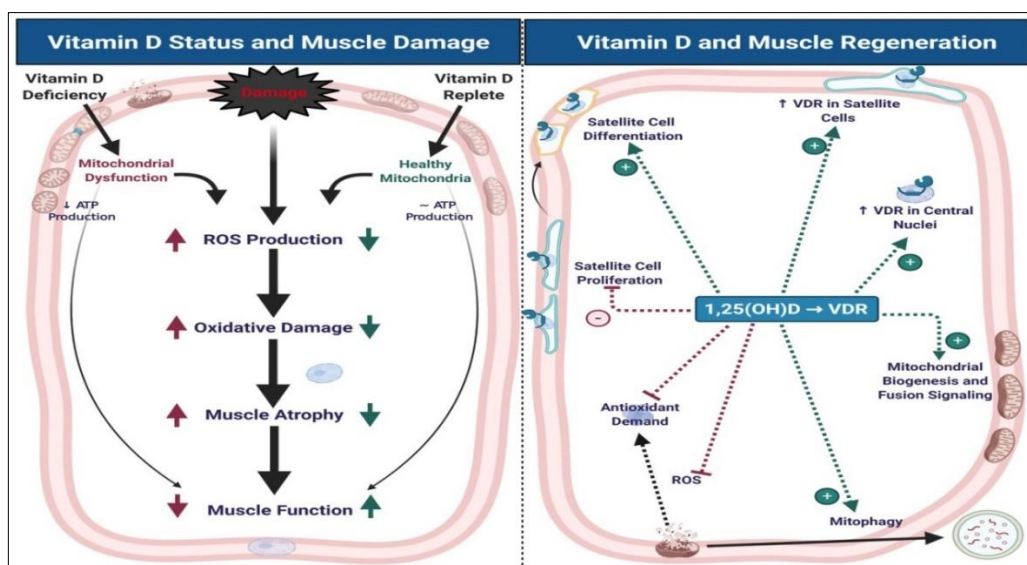


Figure (2) Vit D status contributes to the damage and regeneration of the muscles (19).

2.2 . The Associations of Tremors, Neck Pain, and Fatigue with Vitamin D Deficiency:

2.2.1. The Associations of Tremors with Vitamin D Deficiency:

As the most prevalent movement disorders observed in clinical practice, tremors are frequently encountered. It is characterized as an involuntary, rhythmic oscillation of a body component around one or more joints. Tremor often manifests as moderate in most people. Since their etiology varies, correctly defining them aids in determining the root cause [21]. Resting tremor, which is a type of tremor involving muscles at rest, is most frequently associated with Parkinson's disease. Postural tremor, which is most frequently observed in essential tremor, is a type of tremor involving muscles during isometric contraction. Kinetic tremor, which is defined as a tremor affecting muscles during planned movements (isotonic contraction), is most frequently observed in the event of a cerebellar efferent pathway injury (22). Every normal person experiences physiological tremor, which is not clinically significant. Strong motion, physical weariness, hypoglycemia, heavy metal poisoning, hyperthyroidism, alcohol withdrawal, stimulants, and fever can all cause it, albeit it is rarely visible to the naked eye (23). According to Homann *et al.* (24), up to 89% of the hyperkinetic movement disorders (HKMDs)—like RLS, essential tremor, and Huntington's disease—have a Vit D deficiency, with the latter also being linked to a decrease in bone mineral density.

2.2.2. The Associations of Vitamin D Deficiency with Neck Pain:

With an age-standardized incidence rate of 27 per 1,000 people in the year 2019, neck pain is one of the most prevalent musculoskeletal illnesses (25). According to Mehri *et al.* (26), women are more likely to experience neck pain, which could be related to their weaker muscles. According to Cai (27), deficiency or insufficiency in Vit D might result in or exacerbate back, neck, and muscle pain.

The strength of the back, neck, and waist muscles declines in those who lack Vit D.

2.2.3. Associations of Vitamin D Deficiency with Sleep Disorder and Fatigue:

There is no one definition of fatigue. An abundance of medical literature defines fatigue as a state of weakness, weariness, and low energy. According to its length, nature, and underlying causes, fatigue can be divided into a number of different varieties (28). In otherwise healthy people with Vit D deficiency, Vit D treatment dramatically reduced weariness (29). Vit D deficiency was associated with an increased risk of sleep disturbances (30).

2.3. The Correlation Between the Role of Zinc and Vitamin D:

A crucial association exists between Zn and Vit D. Zn is an essential mineral. Research has indicated that while Zn supplementation raised Vit D levels in postmenopausal women, lower blood Zn levels might indicate Vit D deficiency in postmenopausal girls. Inadequate amounts of Vit D and Zn support the health of the musculoskeletal system and other body systems, but a deficiency in any of such nutrients might lead to some diseases that affect almost every system in the body (31). Future health initiatives must take food fortification or mineral supplementation into consideration, as Shams *et al.* (32) revealed significant connections between low 25(OH) D and Zn serum concentrations.

2.4. The Associations of Zinc Deficiency with Fatigue, Muscle weakness, and sleep disorder:

One of the most crucial nutrients with significant implications for public health is Zn. It has a wide range of biological applications and is necessary for the synthesis of collagen as well as proteins (33). The distribution of Zn in the body is normally found in the following areas: 20% in bone, 60% in muscle, 5% in the kidney, 5% in skin, heart, and pancreas, 0.1% in blood plasma, and 1.5% in the brain (34). Zn is one of the most significant critical

trace elements, present in over 300 human enzymes, and studies have indicated that the likelihood of developing a Zn deficiency rises with age. Elderly health issues are similar to symptoms of Zn deficiency, which include delayed wound healing, weakened muscles, and compromised immune system (35). Because of its impacts on muscle cell activation, differentiation, and proliferation, Zn was particularly identified to alter myogenesis as well as muscle regeneration in skeletal muscle (36). According to Ravasi *et al.* (37), the strength of the back and hand-bending muscles was considerably impacted by the Zn and Zn with the magnesium supplements. According to Cwynar (38), Zn deficiency is most associated with dermatitis, fatigue, impaired immunity, poor wound healing, and hair loss. Zn supplementation is beneficial in treating sleep disturbances in multiple clinical trials (39).

3. Discussion:

The findings observed in such case report of bone pain, fatigue, joint pain, neck pain, hair loss, feeling drowsy, and muscle disorders that combined muscle weakness, muscle spasms, and muscle tremors clinic provide evidence regarding an association between Zn deficiency and Vit D. Neonatal tremors or shivering in two patients' case reports were most possibly caused by a Vit D deficiency (40). Only one case study Calarge *et al.* (41) characterizes tremor as a likely, perhaps even suggestive, sign of a Vit D deficiency in children. According to Cai (27), deficiency or insufficiency in Vit D could aggravate or cause back, neck, and muscle pain. Since it is easily preventable and treated, treating Vit D insufficiency and deficiency plays a significant role in treating individuals with concurrent Vit D insufficiency and deficiency for persistent back and neck pain as well as muscle spasms. According to Eloqayli *et al.* (42), patients with neck discomfort have significantly reduced serum levels of Vit D and Ferritin (p-value less than 0.05). Skeletal muscular fatigue and myopathy have been linked to

severe Vit D deficiency (43). According to Beckmann *et al.* (44), 90% of the 149 patients had low Vit D levels. Health-related quality of life and fatigue levels dramatically improved following Vit D administration. At the conclusion of the study, there was a direct correlation between the lack of fatigue and Vit D level and health-related quality of life. According to Mirzaei-Azandaryani *et al.* (45), those who received Vit D had far better sleep than those in the control group. It is advised that older adults use Zn supplements to help them feel less fatigued (46). Magnesium, Zn, and Zn + magnesium dietary supplements have been shown to positively affect the strength of upper body muscles in physically active women [37]. Van Schoor (47) reported on the use of Zn supplementation as a novel therapeutic strategy to enhance older individuals' quality of sleep. The B vitamins, iron, vitamin C, Zn, magnesium, and omega-3 fatty acids are important nutrients. Supplements might assist in addressing dietary deficits and reducing fatigue. Zn supplementation has been mentioned by Afzali *et al.* (48) as a novel therapeutic strategy for enhancing older individuals' sleep quality.

Conclusion:

According to this case study, Vit D and Zn deficiency play significant roles in joint pain, bone pain, weariness, neck discomfort, hair loss, drowsiness, and muscular disorders that include weakness, muscle spasms, and tremors in the musculoskeletal system. In this instance, symptoms are improved by treatment for Vit D and Zn deficiency.

Acknowledgements:

The authors thank their patients for agreeing to this publication and thus enhancing medical knowledge. Thanks to **Dr. Firas Khalid Clinic** (Orthopaedic Surgeon/ Maysan Province/Iraq) for diagnosing medical cases and prescribing treatment for patients.

Ethics Approval and Consent to Participate:

Consent was obtained directly from the patient.

Consent For Publication:

Before the study's publication, the patient provided written informed consent.

Funding: None.

Author contributions:

Z.Z.G: Writing, editing, reviews. **F.K.A:** Critical reviews, diagnosing medical cases, and prescribing treatment for patients. **M.A.D:** Critical reviews. The conduct of this study and the approval of the final version were jointly done by all the authors. They have reviewed and given their approval to the manuscript's final draft.

Conflict of interest:

The research has been conducted without any commercial or financial relations which can be seen as a conflict of interest, as declared by the authors.

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