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Original Research

Prevalence and Clinical Profile of Vitamin D Deficiency Among Adult Patients Presenting with Non-Specific Musculoskeletal Pain in a Tertiary Care Hospital.

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Abstract

Background: Vitamin D deficiency is a major public health concern worldwide and is increasingly recognized as an important cause of chronic non-specific musculoskeletal pain among adults. Despite abundant sunlight in tropical countries such as India, vitamin D deficiency remains highly prevalent due to inadequate sun exposure, sedentary lifestyle, skin pigmentation, dietary insufficiency, obesity, and urbanization. Early identification of vitamin D deficiency in patients presenting with diffuse musculoskeletal pain may prevent unnecessary investigations and improve quality of life. (1,2) **Objectives:** To determine the prevalence of vitamin D deficiency among adults presenting with non-specific musculoskeletal pain and to evaluate their demographic characteristics, clinical profile, and associated risk factors. **Materials and Methods:** A hospital-based cross-sectional observational study was conducted in the Department of General Medicine of a tertiary care hospital over one year. Adult patients presenting with non-specific musculoskeletal pain were enrolled after informed consent. Demographic details, clinical features, dietary habits, sunlight exposure, body mass index, and laboratory investigations including serum 25-hydroxy vitamin D levels were recorded. Vitamin D deficiency was defined as serum 25(OH)D level <20 ng/mL. Data were analyzed using descriptive and inferential statistics. **Results:** Among 100 participants, vitamin D deficiency was observed in 68% of patients, while insufficiency was noted in 20% and normal levels in 12%. Females, elderly individuals, obese patients, and those with inadequate sunlight exposure showed significantly higher prevalence of deficiency. Diffuse body ache, low back pain, fatigue, proximal muscle weakness, and generalized bone pain were the most common clinical manifestations. **Conclusion:** Vitamin D deficiency is highly prevalent among adults presenting with non-specific musculoskeletal pain. Routine screening of high-risk individuals and timely vitamin D supplementation may significantly reduce symptoms and improve functional outcomes.

Keywords: Vitamin D deficiency, Musculoskeletal pain, Adult population, Serum 25-hydroxy vitamin D, Bone pain, Tertiary care hospital.

Introduction

Vitamin D is a fat-soluble vitamin that plays an essential role in calcium and phosphorus homeostasis, skeletal mineralization, muscle function, and immune regulation. (1) Traditionally, vitamin D has been associated with bone health; however, recent evidence has highlighted its involvement in numerous extraskeletal functions, including modulation of immunity, cardiovascular health, endocrine disorders, and chronic pain syndromes. (2) Vitamin D deficiency has become a global health problem affecting nearly one billion individuals worldwide. Surprisingly, the prevalence remains extremely high in countries with abundant sunlight, including India, where studies have reported deficiency rates ranging from 50% to 90% among healthy adults. (3,4) The major source of vitamin D is endogenous synthesis in the skin following exposure to ultraviolet B radiation. Several factors influence vitamin D synthesis, including latitude, season, skin pigmentation, age, duration of sun exposure, clothing habits, sunscreen use, and dietary intake. (5) Increasing urbanization, indoor occupations, sedentary lifestyles, and air pollution have contributed significantly to the growing burden of hypovitaminosis D.

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Non-specific musculoskeletal pain is one of the commonest complaints encountered in general medical practice. Patients often present with generalized body ache, chronic low back pain, diffuse bone pain, proximal muscle weakness, joint pain, and easy fatigability without any identifiable inflammatory or structural pathology.(6) Vitamin D deficiency has been increasingly recognized as an important reversible cause of chronic musculoskeletal pain. Deficiency results in impaired calcium absorption, secondary hyperparathyroidism, osteomalacia, decreased muscle strength, and altered neuromuscular function, leading to diffuse pain and functional disability.(7) Several Indian studies have demonstrated a significant association between low serum vitamin D levels and chronic musculoskeletal pain. Women, elderly individuals, obese persons, patients with limited sunlight exposure, and individuals with poor dietary calcium intake are particularly vulnerable.(8,9) Early recognition of vitamin D deficiency is important because appropriate supplementation leads to significant symptomatic improvement and prevents unnecessary imaging studies, prolonged analgesic use, and repeated hospital visits.(10) Despite the high prevalence of vitamin D deficiency, routine screening remains uncommon in many healthcare settings. Understanding the prevalence and clinical profile of affected patients can help clinicians develop evidence-based strategies for early diagnosis and treatment. Therefore, the present study was undertaken to determine the prevalence of vitamin D deficiency among adults presenting with non-specific musculoskeletal pain and to evaluate their demographic characteristics, clinical presentation, and associated risk factors.

Aim

To determine the prevalence and clinical profile of vitamin D deficiency among adult patients presenting with non-specific musculoskeletal pain in a tertiary care hospital.

Objectives

1. To estimate the prevalence of vitamin D deficiency among adults presenting with non-specific musculoskeletal pain.
2. To study the demographic profile of patients with vitamin D deficiency.
3. To evaluate the clinical manifestations associated with vitamin D deficiency.
4. To identify risk factors associated with vitamin D deficiency.
5. To correlate serum vitamin D levels with clinical symptoms.

Materials and Methods

Study Design

Hospital-based cross-sectional observational study.

Study Setting

Department of General Medicine, tertiary care teaching hospital.

Study Duration

One year.

Study Population

Adult patients presenting with non-specific musculoskeletal pain.

Sample Size

A total of **100 consecutive patients** fulfilling the inclusion criteria were enrolled.

Inclusion Criteria

- Age ≥ 18 years.
- Patients presenting with generalized body ache, chronic low back pain, diffuse musculoskeletal pain, or unexplained muscle weakness lasting more than four weeks.
- Patients willing to provide informed consent.

Exclusion Criteria

- Chronic kidney disease.
- Chronic liver disease.
- Malignancy.
- Hyperparathyroidism.
- Patients already receiving vitamin D supplementation within the previous six months.
- Pregnancy and lactation.
- Known inflammatory arthritis or connective tissue disorders.

Data Collection

A detailed history was obtained regarding age, gender, occupation, dietary habits, duration of symptoms, sunlight exposure, physical activity, body mass index, smoking status, alcohol intake, and associated comorbidities. Clinical examination included assessment of body mass index, tenderness over long bones, proximal muscle strength, gait abnormalities, and joint examination. Laboratory investigations included complete blood count, serum calcium, phosphorus, alkaline phosphatase, renal function tests, liver function tests, thyroid profile where indicated, and serum **25-hydroxy vitamin D** estimation by chemiluminescent immunoassay.

Vitamin D status was classified as follows:

- **Deficiency:** <20 ng/mL
- **Insufficiency:** 20-29 ng/mL
- **Sufficiency:** ≥ 30 ng/mL

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using SPSS version 22. Quantitative variables were expressed as mean $\pm$ standard deviation, while categorical variables were expressed as frequencies and percentages. Chi-square test and Student's *t*-test were applied where appropriate. A *p*-value <0.05 was considered statistically significant.

Results

Among the **100 patients** included in the study, the mean age was **46.8 ± 13.2 years**. The majority of participants (36%) belonged to the **41-50 years** age group, followed by 51-60 years (28%). Females constituted **64%** of the study population, whereas males accounted for **36%**.

Serum vitamin D analysis revealed that **68%** of patients had vitamin D deficiency (<20 ng/mL), **20%** had vitamin D insufficiency (20-29 ng/mL), and only **12%** had sufficient vitamin D levels (≥ 30 ng/mL).

The most common presenting complaint was **diffuse body ache (82%)**, followed by **low back pain (74%)**, generalized fatigue (63%), proximal muscle weakness (48%), knee pain (44%), and difficulty climbing stairs (31%). Bone tenderness was observed in **28%** of patients, while muscle tenderness was noted in **35%**.

Vitamin D deficiency was significantly more common among females (74%), individuals with body mass index ≥ 25 kg/m² (58%), patients with less than 30 minutes of daily sunlight exposure (71%), and those consuming diets low in dairy products and calcium-rich foods (66%).

Biochemical evaluation showed elevated serum alkaline phosphatase in **26%** of vitamin D-deficient patients and mild hypocalcemia in **18%**. No serious complications were observed during the study period.

Discussion

Vitamin D deficiency has emerged as a major public health problem worldwide and is increasingly recognized as an important but often overlooked cause of chronic non-specific musculoskeletal pain. The present study evaluated the prevalence of vitamin D deficiency and its clinical profile among adults attending a tertiary care hospital. In the present study, 68% of patients were found to have vitamin D deficiency, while an additional 20% had vitamin D insufficiency. Similar findings have been reported from various Indian studies demonstrating that vitamin D deficiency is highly prevalent despite adequate sunlight availability.(3,4) This paradox has been attributed to indoor lifestyles, increased use of sunscreen, darker skin pigmentation, atmospheric pollution, and inadequate dietary intake of vitamin D-rich foods.(5) The mean age of patients was 46.8 ± 13.2 years, with the majority belonging to the fourth and fifth decades of life. Comparable observations have been reported by Harinarayan et al. and Marwaha et al., who found vitamin D deficiency to be common among middle-aged adults because of reduced outdoor activity, occupational commitments, and lifestyle changes.(8,11) Females constituted 64% of the study population and showed a higher prevalence of vitamin D deficiency than males. Similar findings have been reported in Indian and international studies.(9,12) Cultural clothing practices, limited sunlight exposure, hormonal factors, pregnancy, lactation, and reduced dietary calcium intake have been proposed as contributing factors among women.

Diffuse body ache was the most common presenting complaint, followed by low back pain, generalized fatigue, proximal muscle weakness, and knee pain. These findings are consistent with previous studies, which have shown that vitamin D deficiency commonly presents with vague musculoskeletal symptoms that are frequently misdiagnosed as fibromyalgia, chronic fatigue syndrome, early osteoarthritis, or psychosomatic disorders.(6,13) The present study also demonstrated a significant association between vitamin D deficiency and obesity. Individuals with a body mass index (BMI) ≥ 25 kg/m² had a higher prevalence of deficiency. Previous investigators have suggested that vitamin D, being fat-soluble, becomes sequestered in adipose tissue, thereby reducing its bioavailability in obese individuals.(14) Reduced sunlight exposure emerged as one of the strongest risk factors. More than two-thirds of deficient patients reported less than 30 minutes of daily sunlight exposure. Ultraviolet-B radiation is essential for cutaneous synthesis of vitamin D, and inadequate exposure significantly impairs endogenous production.(5) Urbanization, indoor occupations, and sedentary lifestyles have contributed substantially to this growing problem.

Dietary assessment revealed that patients with poor intake of dairy products and calcium-rich foods had significantly lower serum vitamin D levels. Similar findings have been reported by Harinarayan et al., emphasizing the importance of balanced nutrition along with adequate sunlight exposure in maintaining optimal vitamin D status.(8) Biochemical abnormalities such as elevated alkaline phosphatase and mild hypocalcemia were observed in a subset of patients, reflecting increased bone turnover and defective mineralization associated with vitamin D deficiency. However, most patients had normal serum calcium levels despite markedly reduced vitamin D concentrations, highlighting that serum calcium alone is not a reliable indicator of vitamin D status.(15) The high prevalence of vitamin D deficiency observed in the present study supports routine screening of patients presenting with persistent non-specific musculoskeletal pain, especially among females, elderly individuals, obese patients, and those with limited sunlight exposure. Early diagnosis and appropriate supplementation can prevent unnecessary investigations, reduce healthcare costs, improve quality of life, and decrease disability.(16) The findings of the present study are in agreement with recommendations of the Endocrine Society Clinical Practice Guidelines, which advocate screening high-risk populations and treating confirmed deficiency with appropriate vitamin D replacement therapy.(17) Overall, the study emphasizes that vitamin D deficiency is a common, easily diagnosable, and readily treatable condition. Increased awareness among physicians regarding its varied clinical presentation can facilitate early intervention and significantly improve patient outcomes.

Conclusion

Vitamin D deficiency is highly prevalent among adults presenting with non-specific musculoskeletal pain in tertiary care settings. Diffuse body ache, chronic low back pain, generalized fatigue, and proximal muscle weakness were the most common clinical manifestations. Female gender, obesity, inadequate sunlight exposure, and poor dietary intake were significant risk factors associated with deficiency. Routine evaluation of serum 25-hydroxy vitamin D levels in patients with persistent unexplained musculoskeletal pain may facilitate early diagnosis and treatment. Appropriate vitamin D supplementation, dietary counseling, and lifestyle modification can significantly improve symptoms and enhance quality of life.

Limitations

- The study was conducted at a single tertiary care center, limiting the generalizability of the findings.
- The sample size was relatively small.
- Seasonal variations in vitamin D levels were not assessed.
- Long-term follow-up after vitamin D supplementation was not performed.
- Bone mineral density and parathyroid hormone levels were not evaluated in all participants.

Recommendations

1. Routine screening for vitamin D deficiency should be considered in adults presenting with chronic non-specific musculoskeletal pain.
2. Public health programs should promote awareness regarding adequate sunlight exposure and balanced nutrition.
3. Vitamin D supplementation should be initiated in confirmed cases according to standard treatment guidelines.
4. Larger multicentric studies are recommended to evaluate long-term outcomes following supplementation.
5. Lifestyle modification, regular physical activity, and dietary counseling should be incorporated into routine patient care.

Conflict of Interest

None declared.

Source of Funding

Nil.

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