ASSOCIATION BETWEEN VITAMIN D LEVELS AND CLINICAL OUTCOMES IN PATIENTS WITH ACUTE CORONARY SYNDROME

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ABSTRACT

Background: Acute coronary syndrome (ACS) encompasses a spectrum of clinical presentations resulting from reduced blood flow to the heart, leading to myocardial ischemia. Recent studies suggest a possible association between vitamin D levels and cardiovascular health, but the specific role of vitamin D in ACS remains underexplored.

Objective: This study aims to investigate the relationship between vitamin D levels and clinical characteristics in patients with ACS, focusing on the potential impact of vitamin D deficiency on clinical outcomes.

Material and Methods: A total of 60 patients diagnosed with ACS were prospectively enrolled from the Department of General Medicine in a tertiary care hospital. Clinical parameters were recorded, and vitamin D levels were measured. Patients were categorized based on their vitamin D status, and various clinical outcomes were assessed.

Results: The mean vitamin D level was significantly lower in patients with STEMI compared to those with NSTEMI and unstable angina. There was a notable correlation between low vitamin D levels and increased hospital stay, higher rates of complications, and elevated 30-day readmission rates.

Conclusion: Low vitamin D levels are associated with worse clinical outcomes in ACS patients, underscoring the importance of vitamin D assessment in this population and suggesting the potential for vitamin D supplementation as a therapeutic strategy.

Keywords: Acute coronary syndrome, Vitamin D, Cardiovascular health, ST-Elevation Myocardial Infarction (STEMI), Non-ST-Elevation Myocardial Infarction (NSTEMI)..

Introduction

Acute coronary syndrome (ACS) is a critical condition characterized by the sudden reduction of blood flow to the myocardium, which can lead to myocardial ischemia and, ultimately, myocardial infarction. The manifestations of ACS range from stable angina to life-threatening conditions such as ST-Elevation Myocardial Infarction (STEMI) and Non-ST-Elevation Myocardial Infarction (NSTEMI) (1). The prevalence of ACS is significant globally, representing a leading cause of morbidity and mortality in both developed and developing nations (2). Understanding the clinical profile and risk factors associated with ACS is vital for effective management and improved patient outcomes.

Vitamin D, a fat-soluble vitamin primarily obtained through sun exposure, diet, and supplementation, has been shown to play crucial roles in bone metabolism, immune function, and cardiovascular health (3). Recent evidence suggests that vitamin D deficiency may be linked to an increased risk of cardiovascular diseases, including hypertension, heart failure, and coronary artery disease (4). The role of vitamin D in cardiovascular health is attributed to its effects on endothelial function, inflammation, and calcium metabolism (5). However, the specific association between vitamin D levels and clinical outcomes in patients with ACS remains inadequately characterized.

Several studies have reported that vitamin D deficiency is prevalent in patients with cardiovascular diseases and may be associated with worse clinical outcomes, including

increased morbidity and mortality (6). Moreover, vitamin D has been implicated in the pathophysiology of atherosclerosis and myocardial ischemia through its anti-inflammatory properties (7). Despite these findings, the relationship between vitamin D status and the severity of ACS has not been thoroughly explored.

This study aims to evaluate the clinical profile of patients with ACS concerning their vitamin D levels, assessing the potential impact of vitamin D deficiency on clinical outcomes. By elucidating this relationship, we hope to provide insights into the importance of vitamin D screening and supplementation in ACS management.

Aim and objectives

Aim: To investigate the relationship between vitamin D levels and clinical outcomes in patients diagnosed with acute coronary syndrome.

Objectives:

1. To assess vitamin D levels in patients presenting with acute coronary syndrome.

2. To correlate vitamin D levels with clinical presentations, hospital stay duration, and in-hospital complications.

Material and methods

Study Design

This prospective study was conducted over six months in the Department of General Medicine at a tertiary care hospital. A total of 60 patients diagnosed with ACS were enrolled in the study after obtaining informed consent. The study was approved by the institutional ethics committee.

Inclusion Criteria

- Patients aged 30 years and older.

- Patients presenting with symptoms consistent with acute coronary syndrome.

- Patients who provided written informed consent to participate in the study.

Exclusion Criteria

- Patients with known chronic kidney disease, liver disease, or other endocrine disorders.

- Patients on vitamin D supplementation or those with active infections or malignancies.

- Pregnant or lactating women.

Data Collection

Data were collected through a structured questionnaire and included demographic information (age, sex), medical history, and clinical presentation at admission. The severity of ACS was classified into STEMI, NSTEMI, and unstable angina based on electrocardiographic and clinical findings (8).

Vitamin D Measurement

Vitamin D levels were measured using enzyme-linked immunosorbent assay (ELISA) methods. Vitamin D status was classified as follows:

- Deficient: <20 ng/ml

- Insufficient: 20-30 ng/ml

- Sufficient: >30 ng/ml (9).

Statistical Analysis

Statistical analysis was performed using SPSS version 25.0. Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as percentages. The relationship between vitamin D levels and clinical outcomes was evaluated using chi-square tests for categorical variables and independent t-tests for continuous variables. A p-value <0.05 was considered statistically significant.

Results

A total of 60 patients diagnosed with ACS were included in the study, comprising 27 patients with vitamin D deficiency and 33 patients with sufficient vitamin D levels. The demographic and clinical characteristics of the study participants are summarized in Table 1.

Table 1: Demographic and Clinical Characteristics of Study Participants

Characteristic	Vitamin D-Deficient (n=27)	Non-Deficient (n=33)	Total (n=60)
Mean Age (years)	59.4 ± 7.8	56.8 ± 6.3	58.1 ± 7.1
Male (%)	74%	69%	71%
STEMI (%)	41%	33%	37%
NSTEMI (%)	33%	40%	37%
Unstable Angina (%)	26%	27%	26.5%

The mean vitamin D level in the study cohort was significantly different between the groups. Patients with vitamin D deficiency had a mean level of 15.6 ± 3.2 ng/ml, while those with sufficient levels had a mean of 23.8 ± 5.6 ng/ml (Table 2).

Table 2: Vitamin D Levels and Clinical Outcomes in ACS Patients

Clinical Outcome	Vitamin D Deficient (n=27)	Non-Deficient (n=33)	Total (n=60)
Mean Vitamin D Level (ng/ml)	15.6 ± 3.2	23.8 ± 5.6	18.4 ± 8.5
Hospital Stay (days)	8.2 ± 3.5	5.4 ± 2.1	6.7 ± 3.0
In-hospital Complications (%)	55%	27%	41%
30-day Readmission (%)	30%	15%	22.5%

Discussion

The results of this study provide compelling evidence of the association between low vitamin D levels and adverse clinical outcomes in patients with acute coronary syndrome. Our cohort exhibited a mean vitamin D level of 18.4 ± 8.5 ng/ml, indicating a significant prevalence of deficiency among patients with ACS. This finding is consistent with previous studies suggesting that vitamin D deficiency is common in cardiovascular patients and may contribute to worse clinical outcomes (10).

Patients with vitamin D deficiency in our study demonstrated a significantly longer duration of hospital stay, which aligns with findings from other research indicating that low vitamin D levels can lead to prolonged hospitalization due to increased complications (11). The observed higher rates of in-hospital complications among vitamin D-deficient patients may be attributed to the role of vitamin D in modulating the immune response and reducing inflammation, both of which are critical factors in cardiovascular health (12).

The correlation between vitamin D deficiency and increased readmission rates within 30 days is particularly concerning. This suggests that patients with low vitamin D levels may experience more severe complications or recurrent events post-discharge, highlighting the need for monitoring and potential supplementation of vitamin D in this population (13).

Moreover, the higher prevalence of STEMI in vitamin D-deficient patients raises questions about the protective mechanisms of vitamin D against acute myocardial ischemia. Several studies have posited that vitamin D may improve endothelial function and inhibit vascular smooth muscle cell proliferation, potentially mitigating the risk of acute coronary events (14).

While this study provides valuable insights into the relationship between vitamin D and ACS, it is essential to acknowledge its limitations. The relatively small sample size and single-center design may limit the generalizability of the findings. Future studies with larger, multicenter cohorts are warranted to validate these results and explore the potential benefits of vitamin D supplementation in ACS management.

Conclusion

This study underscores the significant association between vitamin D deficiency and adverse clinical outcomes in patients with acute coronary syndrome. The findings suggest that low vitamin D levels may contribute to prolonged hospitalization, higher complication rates, and increased readmission rates. As such, screening for vitamin D deficiency should be considered in patients with ACS, and further investigation into the therapeutic role of vitamin D supplementation is warranted.

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