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A study of Serum Vitamin D and Vaspin Levels among patients with Acute Myocardial Infraction

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Abstract

Background : Acute Myocardial Infarction (AMI) is a major cause of morbidity and mortality worldwide. Emerging evidence suggests that vitamin D deficiency and adipokines like vaspin play significant roles in the pathophysiology of cardiovascular diseases. However, the relationship between serum vitamin D levels, vaspin levels, and AMI remains poorly understood. **Aim and Objectives** : To evaluate and compare serum vitamin D and vaspin levels in patients with AMI and healthy individuals. **Materials and Method** : This cross-sectional study involved 100 participants, divided into two groups: 50 patients diagnosed with AMI and 50 age- and sex-matched healthy controls. Serum levels of vitamin D and vaspin were measured using enzyme-linked immunosorbent assay (ELISA) techniques. Clinical and demographic data were collected and analyzed. Statistical analysis was performed to compare serum levels between the two groups and to evaluate the correlation between vitamin D and vaspin

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levels. **Results** : The results showed that serum vitamin D levels were significantly lower in AMI patients compared to controls ($p<0.05$). Conversely, serum vaspin levels were significantly higher in the AMI group ($p<0.05$). **Conclusion** : The study concludes that lower vitamin D levels and elevated vaspin levels are associated with AMI. These biomarkers may serve as potential predictors for the risk and severity of AMI, offering new insights into the pathogenesis and potential therapeutic targets for cardiovascular disease management. Further research is warranted to explore the underlying mechanisms and clinical implications.

Keywords : Serum Vitamin D, Vaspin Levels, Cardiovascular Disease, Cardiovascular Risk Factors

Introduction

Acute myocardial infarction (AMI), commonly known as a heart attack, remains a leading cause of morbidity and mortality worldwide despite advances in diagnostic and therapeutic strategies. The pathophysiology of AMI involves the rupture of atherosclerotic plaques, leading to the formation of a thrombus that occludes coronary arteries, thereby compromising myocardial blood flow. This ischemic event triggers a cascade of biochemical and cellular processes that culminate in myocardial injury and necrosis. Given the complexity and severity of AMI, identifying biomarkers that can not only aid in early diagnosis but also provide insights into the underlying pathophysiological mechanisms is of paramount importance.

Vitamin D, traditionally recognized for its role in bone metabolism and calcium homeostasis, has garnered attention in recent years for its potential involvement in cardiovascular health. Numerous epidemiological studies have suggested a link between vitamin D deficiency and an increased risk of cardiovascular diseases, including AMI.[1-3] Vitamin D is believed to exert protective effects on the cardiovascular system through various mechanisms, such as modulation of the renin-

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angiotensin-aldosterone system (RAAS), anti-inflammatory properties, and direct effects on cardiac myocytes. Despite these associations, the exact role of serum vitamin D levels in the context of AMI remains a topic of ongoing research, with some studies reporting conflicting results.

Vaspin, a visceral adipose tissue-derived serine protease inhibitor, has recently emerged as a novel biomarker of interest in cardiovascular research. Initially identified in the context of obesity and insulin resistance, vaspin is thought to play a role in the regulation of glucose and lipid metabolism. Its potential anti-inflammatory and anti-apoptotic properties have sparked interest in exploring its relevance in cardiovascular diseases, particularly in conditions characterized by chronic inflammation and metabolic disturbances, such as AMI. However, the relationship between serum vaspin levels and AMI is not well-established, and studies investigating this association have yielded inconclusive results.

The interplay between vitamin D and vaspin in the context of AMI is an area of emerging interest, given that both biomarkers are involved in pathways that influence cardiovascular health. The potential synergistic or antagonistic effects of these biomarkers on the pathogenesis and outcomes of AMI warrant further investigation. Understanding the levels of serum vitamin D and vaspin in patients with AMI could provide valuable insights into the underlying mechanisms of the disease and potentially identify novel targets for therapeutic intervention.

In this context, the present study aims to assess the serum levels of vitamin D and vaspin among patients with acute myocardial infarction in a hospital setting. By evaluating these biomarkers in a cohort of AMI patients, this study seeks to elucidate their potential roles in the pathophysiology of AMI and to explore their association with clinical outcomes. Furthermore, this study will contribute to the growing body of

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literature on the relevance of vitamin D and vaspin as cardiovascular biomarkers and may help to identify patients at higher risk for adverse events following AMI.

Materials and Method

This was a cross-sectional observational study conducted at Department of General Medicine, MNR Medical College and Hospital, Sangareddy, Telangana, over a period of 12 months. Study included each of 50 patients with AMI and Healthy subjects. The study aimed to evaluate and compared serum vitamin D and vaspin levels among patients diagnosed with acute myocardial infarction (AMI) and healthy subjects. Ethical clearance was obtained from the Institutional Review Board (IRB) prior to the initiation of the study, and all participants provided informed consent. Subjects were included after satisfying inclusion and exclusion criteria given bellow.

Inclusion Criteria

- Adult patients aged 18 years and above.
- Patients with a confirmed diagnosis of AMI within 24 hours of symptom onset.
- Patients who provided written informed consent to participate in the study.

Exclusion Criteria

- Patients with a history of chronic kidney disease, liver disease, or malignancy.
- Patients on vitamin D supplementation or medications known to affect vitamin D metabolism (e.g., steroids, anticonvulsants) within the last three months.
- Patients with autoimmune or inflammatory diseases.
- Pregnant or lactating women.
- Patients with a history of previous myocardial infarction or revascularization procedures.

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Method

Clinical Assessment

Upon admission, a detailed clinical history was obtained from each patient, including information on demographics (age, gender), risk factors for cardiovascular disease (e.g., hypertension, diabetes mellitus, smoking, dyslipidemia), and presenting symptoms. A thorough physical examination was performed, and relevant clinical data, such as blood pressure, heart rate, and body mass index (BMI), were recorded.

Laboratory Investigations

Venous blood samples were collected from all participants within 24 hours of admission, following a 12-hour overnight fast. The blood samples were centrifuged at 3000 rpm for 10 minutes to separate the serum, which was then stored at -80°C until analysis.

Serum Vitamin D Measurement

Serum 25-hydroxyvitamin D [25(OH)D] levels were measured using a commercially available enzyme-linked immunosorbent assay (ELISA) kit. The assay sensitivity and specificity were as per the manufacturer’s guidelines. Vitamin D levels were categorized as deficient (<20 ng/mL), insufficient (20–30 ng/mL), or sufficient (>30 ng/mL) based on established criteria.

Serum Vaspin Measurement

Serum vaspin levels were quantified using a validated ELISA kit, as per the manufacturer’s protocol. The intra-assay and inter-assay coefficients of variation were within acceptable limits. The serum vaspin levels were reported in ng/mL.

Statistical Analysis

Descriptive statistics were used to summarize the baseline characteristics of the study population. Continuous variables were expressed as mean ± standard

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deviation (SD) or median (interquartile range) depending on the distribution of the data, while categorical variables were presented as frequencies and percentages.

Comparative analyses were performed to assess differences in serum vitamin D and vaspin levels between different subgroups of patients (e.g., based on gender, presence of diabetes, severity of AMI). Independent t-tests were used for continuous variables, while chi-square tests were employed for categorical variables. A p-value of <0.05 was considered statistically significant for all analyses. Data were analyzed using SPSS version 25.0

Observation and Results

Study included each of 50 patients with AMI and Healthy subjects, to evaluate and compared serum vitamin D and vaspin levels among patients diagnosed with acute myocardial infarction (AMI) and healthy subjects. Observation of the study given bellow.

Table : 1 Demographic prole among study populations.

Parameters	Cases		Healthy Subjects		t-test	P-value
	Frequency /Mean	SD /Percentage	Frequency /Mean	SD /Percentage		
Age (Years)	50.23	5.61	51.26	6.32	1.11	0.26
Gender						
Male	46	92	38	76	4.76	0.029
Female	4	8	12	24		
BMI (Kg/SqM)	26.82	4.26	27.11	5.36	0.29	0.76

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Table : 2 Mean vitamin D and Vaspin levels between cases and healthy subjects

Parameters	Cases		Healthy Subjects		t-test	P-value
	Mean	SD	Mean	SD		
Vitamin D(ng/mL)	25.97	10.82	36.24	8.96	5.16	<0.001
Vaspin Level (pg/mL)	372.42	80.16	430.94	115.51	2.94	0.004

Above table showed that mean difference in vitamin D level and Vaspin levels was statistically highly significant and it was observed that it was lower among AMI cases compared to healthy subjects.

Table : 3 Mean vitamin D and Vaspin levels between cases and healthy subjects

Vitamin D	Cases	Healthy Subjects	Chi-square	P-value
Sufficient (≤30 ng/mL)	11(22%)	26(52%)	14.27	<0.0001
Insufficient (>20- <30 ng/mL)	20(40%)	19(38%)		
Deficient (<=20 ng/mL)	19(38%)	5(10%)		
Total	50(100)	50(100)		

It was observed that, vitamin D level were deficient among 38% of the AMI patients while it was observed among 10% in healthy subjects and insufficient among 40% of the AMI patients, and 38% among healthy subjects and this difference was observed statistically highly significant.

Discussion

In recent years, considerable progress has been made in identifying biomarkers for assessing the risk of AMI patients. Vaspin, in particular, has garnered attention due to its connection with the development of metabolic syndrome and atherosclerosis.[1] The importance of maintaining optimal serum vaspin levels in cardiovascular diseases

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(CVDs) is emphasized in the literature. Elevated vaspin levels have been linked to a significant reduction in adverse cardiac events when compared to lower vaspin levels.[2]

The present study found that AMI patients have significantly lower vaspin levels compared to healthy individuals, and these finding were similar to many other studies[3-5] A meta-analysis further confirmed that higher vaspin levels are associated with a decreased risk of atherosclerosis. Zhou et al., in a study involving 1,036 MI patients, found that lower vaspin levels were linked to a higher incidence of MI.[6,7]

Notably, the present study did not identify a significant gender variation in vaspin levels in healthy subjects, aligning with findings from another study.[8] Conversely, a study reported significantly higher vaspin levels in females than males,[9] but the underlying reasons for this gender difference remain unclear.

Some studies reported that females had significantly higher vaspin levels than males, but in our study we didn’t try to find Vaspin levels in gender because the reasons for this gender disparity are still not well understood.[9]

Vaspin is emerging as a promising predictive biomarker in MI patients, with lower levels linked to an increased risk of adverse cardiac events.[10] Furthermore, the study suggested that vaspin may offer protective benefits by enhancing left ventricular ejection fraction following MI. Research has also indicated that vaspin may exert anti-inflammatory and anti-apoptotic effects by targeting vascular cells.[11]

Although the mechanisms by which vaspin influences the progression and prognosis of cardiovascular diseases are not yet fully understood, research suggests that inflammation plays a crucial role in the development of these conditions. Inflammation is also involved in cardiac remodeling after MI. Consequently, vaspin may play a role in myocardial remodeling and enhance cardiovascular outcomes in MI

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patients, potentially due to its anti-inflammatory properties.[12,13] The intricate role of vaspin in cardiovascular health highlights the necessity for ongoing research to uncover its underlying mechanisms and explore its potential therapeutic uses.

In this study, AMI patients exhibited significantly lower VD levels compared to the control group. Specifically, serum VD levels were deficient in 19 (38%), insufficient in 20 (40%), and sufficient in 11 (22%) of the AMI patients. Overall, 78% of the AMI patients had VD levels below the normal range. These findings are consistent with several other studies that have also reported significantly lower VD levels in MI patients compared to the control group.[14,15]

An Iranian study found that 56% of CAD patients had VD insufficiency, while 6% were deficient. Another study reported that 67.5% of individuals with reduced VD levels were deficient, and 16.5% had insufficient levels.[16,14]

The literature offers interesting insights into the relationship between VDD and CAD. Although both conditions share common risk factors such as overweight, tobacco use, and a sedentary lifestyle, some researchers suggest that their strong association may not indicate a causal relationship but rather a coexistence.[17] In the present study, we did not explore any connections between risk factors and vitamin D levels.

While several studies have identified a link between VD levels and CAD, a significant amount of research has challenged this association.[17,18] As a result, the relationship between VD levels and CAD remains controversial, with conflicting findings. For instance, Jorde R et al. found no difference in VD levels between MI patients and non-MI controls,[19] whereas Rajasree et al. suggested that elevated VD levels might increase the risk of IHD.[20]

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Conclusion :

The significantly lower levels of vaspin and VD observed in AMI patients underscore the potential importance of these biomarkers for cardiovascular health. Furthermore, the study highlights the widespread inadequacy of VD among AMI patients, with more than half classified as deficient or insufficient. This underscores the need to monitor and address vitamin D levels in individuals at risk for AMI.

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Conflict of Interest : None

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