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Original research article

A cross-sectional study assessing association of homocysteine and lipoprotein (a) with ischemic heart disease

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Abstract

Background: Elevated levels of lipoprotein (a) [Lp(a)] and homocysteine have been proved to be associated with increased cardiovascular risk, yet they are often neglected in younger populations presenting with myocardial infarction (MI).

Methods: This cross-sectional study investigates the roles of lipoprotein (a) [Lp(a)] and homocysteine as risk factors for acute myocardial infarction (MI) in young patients under 40 years of age without conventional cardiovascular risk factors.

Results: A cohort of 30 patients was evaluated, revealing that 10 had elevated homocysteine levels and 7 had high Lp(a) levels, with statistical analysis indicating significant associations.

Conclusion: These findings suggest that Lp(a) and homocysteine should be considered in clinical assessments for young individuals presenting with MI, as they may serve as critical indicators for cardiovascular risk management and prevention strategies.

Keywords: Lp(a), homocysteine, MI

Introduction

Ischemic heart disease (IHD) is a major public health problem in India [1]. It remains one of the leading causes of morbidity and mortality worldwide, necessitating a deeper understanding of its risk factors. Among these, homocysteine-a sulfur-containing amino acid-has gained attention for its potential role in cardiovascular health. Elevated homocysteine levels, or hyperhomocysteinemia, have been linked to endothelial dysfunction, promoting atherosclerosis and thrombotic events [2]. Moreover, lipid profile parameters, including low-density lipoprotein (LDL) cholesterol, high-density lipoprotein (HDL) cholesterol, and triglycerides, are well-established risk factors for IHD [3].

Moderately elevated levels of homocysteine in serum or plasma have been well-established as a significant and independent risk factor for occlusive arterial disease and venous thrombosis [4, 5]. Research indicates that up to 50% of patients with stroke and other atherothrombotic conditions exhibit high homocysteine levels (exceeding 15 μmol/L) [6].

Research indicates that high homocysteine levels may correlate with adverse lipid profiles, particularly

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elevated LDL and reduced HDL, thus compounding the risk of cardiovascular events [7]. Understanding the interplay between homocysteine and lipid parameters could enhance our knowledge of IHD pathophysiology and inform clinical strategies for prevention and management. This article aims to explore the correlation between homocysteine levels and lipoprotein (a) [Lp(a)] with IHD, highlighting the clinical implications of these associations.

Methodology

This cross-sectional study is conducted at SN Medical college hospital in the cardiology department over a period of one year to assess young patients under 40 years of age who experienced acute myocardial infarction (MI) without conventional cardiovascular risk factors. The study focused on a cohort of 30 patients who were non-diabetic, non-smokers, and had lipid profiles within the normal range.

Participants

- **Sample size:** 30 young patients aged less than 40 years who had acute MI.

Inclusion criteria

- Patients with acute ST elevation MI as per the universal definition.
- Aged less than 40 years.
- Non-diabetic and non-smokers,non-hypertensive

Exclusion criteria

- Patient more than 40 years of age
- Individuals with diabetes mellitus.
- Smokers or former smokers.

Data Collection

After obtaining informed consent, detailed clinical histories were taken from all participants. Each patient underwent a thorough clinical examination, focusing on cardiovascular health.

Laboratory Investigations

The following laboratory tests were performed for each patient:

- **Lipoprotein (a) [Lp(a)] Levels:** Measured to assess the potential role of Lp(a) in acute MI.
- **Homocysteine Levels:** Quantified to evaluate any associations with the incidence of acute MI in the absence of traditional risk factors.

Definitions

- **Normal Lipid Profile:** Total cholesterol <200 mg/dL, triglycerides <150 mg/dL, HDL cholesterol ≥40 mg/dL in males and ≥50 mg/dL in females, LDL cholesterol <100 mg/dL.
- **Acute Myocardial Infarction:** Diagnosed based on clinical presentation and supported by relevant biomarkers and imaging studies.

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Descriptive statistics were used to summarize demographic and clinical characteristics. Data were analyzed using appropriate statistical software, with p-values <0.05 considered significant. The relationships between homocysteine and Lp(a) levels and the occurrence of acute MI in this young cohort were evaluated.

Results

Out of 30 patients, 16 (53.3%) were males and 14 (46.7%) were females. 12 patients (40%) belonged to 18-30 years of age and 18 patients (60%) belonged to 31-40 years of age.

Table 1: Demographic details

Varaiables		Number	%
Gender	Males	16	53.3%
	Females	14	46.7%
Age (In years)	18-30	12	40%
	31-40	18	60%

Out of 30 patients, 20 patients (66.7%) had homocysteine level ≤15 mcmol/L and 10 patients (33.3%) had levels >15 mcmol/L. Additionally, 7 (23.3%) patients exhibited high Lp(a) levels. The remaining 13 patients (43.3%) had all parameters within normal ranges.

Table 2: Homocystein levels

Varaiables		Number	%
Homocystein levels	≤15 mcmol/L	20	66.7%
	>15 mcmol/L	10	33.3%

Statistical analysis revealed a significant association between elevated homocysteine and Lp(a) levels with the occurrence of acute MI, with a p-value of <0.05. These findings suggest that a considerable proportion of young patients presenting with acute MI in this cohort had abnormal values for either homocysteine or Lp(a), highlighting their potential role as risk factors in this demographic.

Discussion

This cross-sectional study aimed to explore the relationship between elevated homocysteine and lipoprotein (a) levels in young patients under 40 years of age who experienced acute myocardial infarction (MI) without conventional cardiovascular risk factors. The results indicate that a significant proportion of these patients exhibited abnormal levels of either homocysteine or Lp(a), which may provide insight into their roles as potential contributors to acute MI in this unique population.

In our study, 10 out of 30 patients had elevated homocysteine levels. Elevated homocysteine has been widely recognized as a risk factor for cardiovascular diseases, including MI, due to its association with endothelial dysfunction and atherosclerosis [8]. It has been suggested that high homocysteine levels can promote thrombosis and arterial plaque formation, even in the absence of traditional risk factors [9]. Our findings corroborate existing literature, which highlights that hyperhomocysteinemia can occur in

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younger populations and may contribute to acute cardiovascular events [10].

Additionally, 7 patients in our cohort displayed high levels of Lp(a). Lp(a) is a genetically determined lipoprotein that has been implicated in atherogenesis and thrombosis [11]. Elevated Lp(a) levels have been associated with an increased risk of MI, particularly in individuals with a family history of cardiovascular disease [12]. Our results align with previous studies that have identified elevated Lp(a) as a significant risk factor in young patients with acute coronary events, even in the absence of traditional risk factors [13].

The presence of high homocysteine and Lp(a) levels in our cohort suggests that these biomarkers may serve as valuable tools for identifying young individuals at risk for acute MI. Clinicians should consider screening for these parameters in younger patients presenting with acute MI, particularly when conventional risk factors are absent. Early identification and management of elevated homocysteine and Lp(a) may provide opportunities for intervention and prevention of future cardiovascular events.

Conclusion

In conclusion, lipoprotein (a) [Lp(a)] and homocysteine are significant but often overlooked risk factors for myocardial infarction in young individuals. Addressing these markers in clinical assessments is crucial for early identification and effective risk management, ultimately improving cardiovascular health outcomes in this population.

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