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Correlation between Serum Bilirubin and Lipid Profile in Acute Myocardial Infarction

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Abstract

Background: Acute Myocardial Infarction (AMI) is a leading cause of morbidity and mortality worldwide. Oxidative stress plays a critical role in AMI pathogenesis. Bilirubin, an endogenous antioxidant, may influence cardiovascular risk by interacting with lipid metabolism.

Objective: To investigate the correlation between serum bilirubin levels and lipid profile parameters in patients with AMI.

Methods: A cross-sectional study was conducted on 300 patients diagnosed with AMI. Serum bilirubin (total, direct, indirect) and lipid profile parameters, total cholesterol, LDL, HDL, were measured. Statistical analysis was performed using Pearson's correlation coefficient to determine associations.

Results: Mean serum bilirubin levels were 0.93 ± 1.33 mg/dL. Serum total bilirubin showed a negative correlation with total cholesterol ($r = -0.145$ $p < 0.05$) and LDL cholesterol ($r = -0.154$, $p < 0.05$), while a positive correlation was observed with HDL cholesterol ($r = +0.36$, $p < 0.05$).

Conclusion: Elevated bilirubin levels may be protective in AMI by modulating lipid profiles, suggesting a potential role in cardiovascular risk stratification.

1. Introduction

For many years, the bile pigment bilirubin was considered a toxic waste product formed during heme catabolism. But as recent evidences suggested that, bilirubin is a potent physiological antioxidant that may provide an important protection against atherosclerosis, coronary artery disease and AMI. In general it is accepted that oxidative reactions are involved in pathophysiology of these disease processes. In development of AMI involves lipid oxidation and formation of oxygen free radicals whereas atherosclerosis and inflammation are associated with formation of oxygen and peroxyl radicals (1)

Acute Myocardial Infarction (AMI) is characterized by the sudden obstruction of coronary blood flow, leading to myocardial ischemia and necrosis. Dyslipidemia is a well-established risk factor for AMI, contributing to atherosclerosis and plaque instability.

Bilirubin, a heme catabolism product, has potent antioxidant and anti-inflammatory properties. Recent studies indicate that serum bilirubin levels may inversely relate to cardiovascular risk, potentially through interactions with lipid metabolism. Understanding this relationship can offer insights into risk prediction and therapeutic strategies for AMI.

Experimental and epidemiological evidences presented suggest that bilirubin may serve as a physiological antioxidant providing protection against atherosclerosis CAD and AMI.

Studies have noted inverse relationships between plasma bilirubin concentration and cardiovascular morbidity indicate the need to study the association between serum bilirubin concentration and levels of lipid profile parameters, culprit in the process of atherosclerosis.

Materials and Methods

Study Design: Cross-sectional observational study.
Population: [300] patients admitted with confirmed AMI in KIMS &KH
Inclusion Criteria:
- Age ≥18 years
- Diagnosis of AMI confirmed by ECG changes and cardiac biomarkers

Exclusion Criteria:
- Liver disease or hemolytic disorders
- Chronic kidney disease
- Medications affecting bilirubin or lipid metabolism

Parameters Measured:
- Serum bilirubin: Total, and indirect
- Lipid profile: Total cholesterol, LDL-C, HDL-C, All these estimations done on EM360 fully automated biochemistry analyzer .

Statistical Analysis:
- Descriptive statistics: mean ± SD
- Pearson correlation coefficient for assessing the relationship between bilirubin and lipid parameters- Significance set at $p < 0.05$

Results

Table 1: Mean Values of Serum Bilirubin and Lipid Profile in AMI Patients

Parameter	Mean ± SD
Total Bilirubin (mg/dL)	0.93 ± 1.33
Indirect Bilirubin (mg/dL)	0.58 ± 0.65
Total Cholesterol (mg/dL)	165.92 ± 49.81
LDL-C (mg/dL)	90.2 ± 41.4
HDL-C (mg/dL)	41.5 ± 10.6

Table 2: Correlation between Serum total Bilirubin and Total Cholesterol

Parameter	Mean ± SD	Correlation coefficient
Total Bilirubin	0.93 ± 1.33	–0.145
Total Cholesterol	165.92 ± 49.81	

Correlation between Serum Bilirubin and Total Cholesterol show**,** total bilirubin has a mean of 0.93 mg/dL**.** Total Cholesterol has a mean of 165.9 mg/dL. The Pearson correlation coefficient between the two is –0.145, which indicates a weak negative relationship. This suggests that higher bilirubin levels may be slightly associated with lower cholesterol levels, possibly due to bilirubin's role as an antioxidant.

Table 3: Correlation between Serum total Bilirubin and LDL Cholesterol

Parameter	Mean ± SD	Correlation coefficient
Total Bilirubin	0.93 ± 1.33	–0.154
LDL Cholesterol	90.2 ± 41.4	

The relationship between LDL cholesterol and total bilirubin is weakly negative, higher the bilirubin may slightly associate with lower LDL levels, but the effect is small and clinically insignificant.

Table 4: Correlation between Serum total Bilirubin and HDL Cholesterol

Parameter	Mean ± SD	Correlation coefficient
Total Bilirubin	0.93 ± 1.33	+0.36
HDL Cholesterol	41.5 ± 10.6	

Correlation between Serum total Bilirubin and HDL Cholesterol indicates a moderate positive relationship between HDL and Total Bilirubin. This suggests that higher bilirubin levels tend to be associated with higher HDL cholesterol levels**.**

Table 5: Correlation between Serum Indirect Bilirubin and Total Cholesterol

Parameter	Mean ± SD	Correlation coefficient
Indirect Bilirubin	0.58 ± 0.65	+0.11
Total Cholesterol	152.8 ± 28.1	

The relationship between Indirect Bilirubin and Total Cholesterol is very weak and positive. This means that in this dataset, higher bilirubin is slightly associated with higher cholesterol, but the effect is minimal. Clinically, this weak association suggests that bilirubin and cholesterol are mostly independent markers in this group.

Discussion

The antioxidant capacity of bilirubin and its ability to provide potent scavenging of peroxyl radicals has led to suggestion that, mildly increased circulatory bilirubin may have a physiologic function to protect against disease processes that involve oxygen and peroxyl radicals [4]

It has been reported that serum bilirubin correlates inversely with several established risk factors for AMI, including smoking, increased LDL-C, obesity and directly proportional to the protective factor HDL-C. Protection of lipids, proteins and other macromolecules from oxidation by bilirubin represents the most commonly accepted mechanism contributing to protection in AMI. Antioxidant activity and cardio protective potential might be attributable to any of the bilirubin forms, including free unconjugated bilirubin, protein bound unconjugated bilirubin, delta bilirubin or mono/diconjugated bilirubin (5,6,7). Under physiological conditions, the predominant circulatory form of bilirubin is the unconjugated, albumin-bound form. Some of conditions, such as protein binding, acidosis, hypoxia and extent of hemolysis, modify the relative proportions of this form of bilirubin in the blood and affect the cardio potential of bilirubin (8,9). Consequently, it may be said that there was a relationship between bilirubin and CVD compatible with previous studies.

The study demonstrates that higher bilirubin levels may confer cardiovascular protection by improving lipid profiles. The negative correlation with LDL-C and total cholesterol aligns with the antioxidant hypothesis, where bilirubin may reduce lipid oxidation and atherogenesis. Positive correlation with HDL-C further supports its protective role.

Limitations include a small sample size and single-center design. Further multicentric studies with larger cohorts are recommended.

Conclusion

Serum bilirubin levels show a significant correlation with lipid profile parameters in AMI patients. Monitoring bilirubin may offer additional prognostic value in cardiovascular risk assessment.

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