Section: General Medicine

Original Research Article

STUDY OF THE ASSOCIATION OF LIPID PROFILE MARKERS BETWEEN CARDIAC AND NON-CARDIAC INDIVIDUALS

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Received : 02/08/2023
Received in revised form : 08/09/2023
Accepted : 19/09/2023

Keywords:
Lipoproteins; HDL-C; Triglycerides; Acute coronary syndrome

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DOI: 10.47009/jamp.2023.5.5.152

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2023; 5 (5); 775-778

Abstract

Background: Increased risk of cardiovascular disease is associated with high levels of low-density lipoprotein cholesterol, lipoproteins {Lp(a)}, Apolipoprotein B, and triglycerides and low levels of high-density lipoprotein cholesterol (HDL-C) and lipoproteins (Apolipoprotein A1). We will identify other lipid profile markers that pose a higher risk attributable to myocardial ischemia. It helps provide preventive strategies for non-cardiac patients with no other risk factors like cardiac patients (Diabetes, Hypertension, Smoking, Alcoholism, etc.). As a result, the current study examined the correlation between lipid profile markers in cardiac and non-cardiac people. **Materials and Methods:** In the present prospective cross-sectional study, 60 patients from Sree Balaji Medical College and Hospital - various departments, including the outpatient department ward, intensive care unit and emergency department were included. The patients were divided into cardiac and non-cardiac, each comprising 30 subjects. Semi-structured, self-administered questionnaires were used to collect data from all study participants, and the lipid profile was collected from both groups of patients. **Result:** Both groups showed a male predominance, and the mean age was similar. However, a higher incidence of diabetes mellitus, hypertension, smoking, and alcohol use was noted in cardiac group patients. In the mean levels of triglycerides, low-density lipoprotein, apolipoprotein A1, and apolipoprotein B, as well as high-density lipoprotein (mg/dL), total cholesterol (mg/dL) apolipoprotein A1 and lipoprotein, statistically significant differences were found. **Conclusion:** High-density lipoprotein, apolipoprotein B, lipoprotein (a), and triglyceride levels in acute coronary syndrome (ACS) patients were shown to be considerably higher than those in patients without cardiovascular disease.

INTRODUCTION

Cardiovascular diseases (CVD) result in deaths of 17.9 million lives every year, accounting for 31% of deaths globally. The Indian population are much more prone to the mortality of CVD (282 deaths/100,000 [264-293]) when compared with the global level of mortality (233 deaths/100,00 [229-236]).[1] To establish an early and critical marker for cardiovascular disease (CVD), lipoprotein indicators, HDL, LDL, and triglycerides are compared to identify risk factors to recognise and prevent death.[2] It has been discovered that lipoprotein elevates the risks of developing aortic valve stenosis/calcification and cerebrovascular illness, independent of LDL-lowering medication.[3,4]

Triglyceride level analysis for cardiovascular disease outcomes has shown conflicting results in previous studies. Multivariate statistical analyses have shown that the significance of triglycerides is eliminated by HDL, which was found to be significant in univariate tests.[5] Aortic atherosclerotic plaques have been found to include triglyceride-rich lipoproteins, a family of lipoproteins with high triglyceride content but normal LDL and HDL cholesterol contents and evidence of early atherosclerosis.[6] Triglycerides (TG) can increase women's risk of coronary artery disease (CAD). Although some patient subsets (those with atherogenic dyslipidemia, metabolic syndrome, and possibly diabetes) did appear to benefit from TG-lowering medications in conjunction with statins, this has not been conclusively demonstrated.[7,8]

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Atherosclerosis, myocardial infarction, and stroke have all been linked to high plasma lipoprotein levels in Caucasians and Orientals in several cross-sectional studies.[9,10] However, in other groups, the function of lipoprotein as a predictive factor for atherosclerosis is more questionable.[11] Therefore, the goal of the current study was to examine the association between lipoproteins {lipoprotein (a), Apolipoprotein A1, Apolipoprotein B}, HDL-C, and triglyceride levels along with other lipid profile markers in both cardiac and non-cardiac patients, so that additional markers can be identified in non-cardiac patients to stratify the risk.

MATERIALS AND METHODS

This prospective cross-sectional study was conducted in the Department of General Medicine at Sree Balaji Medical College and Hospital between February 2022 and March 2023. Sixty patients were enrolled for the study and divided into two groups, namely cardiac (CA) and non-cardiac (NCA), each with 30 subjects. Institutional ethical committee approval and written consent were obtained.

Inclusion Criteria

Patients with acute coronary syndrome, elevated lipid profiles, comorbidities, and risk factors (Smoking, Alcohol consumption, etc.) and known cardiac patients taking regular medications, patients over 30 with high BMI were willing to participate were included.

Exclusion Criteria

Pregnant and lactating mothers, patients over 18 years old who were unwilling to cooperate with the study, and dying patients were excluded.

Data collection instruments (Data questionnaire, Tools, Equipment): Informed consent was taken from the participants, and a semi-structured, self-administered Questionnaire was used to collect from the study participants after getting permission from the ethical committee. Materials for drawing blood {Disposable sterile lancet (or 24-gauge needle/ syringe), Alcohol, Dry gauze, Tubes} and ECG machine.

Statistical Analysis

The acquired data was imported into Microsoft Excel (Windows 10) and analysed using the SPSS-19 statistical software for social sciences. Pearson chi-square test was used to determine the relationship between two categorical variables. A P value <0.05 is considered to be statistically significant.

RESULTS

Sixty patients were enrolled for the study and divided into two groups, namely cardiac (CA) and non-cardiac (NCA), each with 30 subjects. Male predominance was reported in both groups (CA: 76.67%; NCA: 90%). In both groups, the mean age was similar (CA: 50.17 ± 4.98; NCA: 52.9 ± 5.73). The patients with diabetes mellitus, hypertension, smoking, and alcohol were reported more in the cardiac group [Table 1].

Between study groups, there was a statistically significant difference in the mean values of Total cholesterol (mg/dL), High-density lipoprotein (mg/dL), Triglycerides, Low-density lipoprotein, Lipoprotein, Apo lipoprotein A1, and Apo lipoprotein B (p-value<0.05) [Table 2].

Table 1: Observation of demographic parameters and comorbidity among patients of both groups

Parameters	Observations		P-value
	Cardiac (CR) (n=30)	Non-Cardiac (NCR) (n=30)	
Gender			
Male	23 (76.67%)	27 (90%)	0.166
Female	7 (23.33%)	3 (10%)	
Age, years (mean ± SD)	50.17 ± 4.98	52.9 ± 5.73	0.053
Non-diabetic	14 (46.67%)	20 (66.67%)	0.118
Diabetic	16 (53.33%)	10 (33.33%)	
Non-hypertensive	19 (63.33%)	22 (73.33%)	0.405
Hypertensive	11 (36.67%)	8 (26.67%)	
Non-smoker	16 (53.33%)	22 (73.33%)	0.108
Smoker	14 (46.67%)	8 (26.67%)	
Non-alcoholic	16 (53.33%)	21 (70%)	0.184
Alcoholic	14 (46.67%)	9 (30%)	

Table 2: Observation of different lipid markers in both group patients

Parameter	Cardiac (N=30)	Non-cardiac (N=30)	P-value
Total cholesterol (mg/dL)	173.33±36.48	125.87±30.8	<0.001
High-density lipoprotein (mg/dL)	31.47±5.22	42.47±7.41	<0.001
Triglycerides (mg/dL)	134.33±75.94	101.67±30.12	0.033
Low-density lipoprotein (mg/dL)	115±40.9	63.07±34.65	<0.001
Lipoprotein (a) (mg/dL)	35.28±27.01	13.29±10.3	<0.001
Apo-lipoprotein A1	89.97±33.73	109.13±29.95	0.023
Apolipoprotein B	102.79±9.66	92.32±4.59	<0.001

ISSN (O): 2687-5365; ISSN (P): 2753-6556

DISCUSSION

Over time, coronary artery disease and atherosclerosis have been linked increasingly to metabolic deviations in plasma triglycerides. It was initially established that high triglyceride levels increased cardiovascular disease risk.[12,13] Numerous investigations have validated the link between triglyceride levels and illness risk, and a finding was initially made 40 years ago due to a univariate relation. High levels of high-density lipoprotein (HDL) cholesterol, a significant and important risk indicator for cardiovascular disease, are one metabolic disturbance linked to raised plasma triglyceride levels.[14,15]

Some patient subgroups (those with atherogenic dyslipidaemia, metabolic syndrome, and maybe diabetes) did seem to benefit from statins and TG-lowering drugs. Still, no link exists between these treatments and better CV outcomes. These seemingly incompatible results have materialised.[13] So, determining the epidemiology of acute coronary syndrome was the main objective of the current study. We aimed to compare the levels of lipoprotein markers {Lipoprotein(a), Apolipoprotein A1, Apolipoprotein B}, high-density lipoprotein (HDL-C), and triglycerides between patients diagnosed with acute coronary syndrome (ACS) and healthy controls.[10,14]

The prospective registry data was collected from high-risk adults over 30 years old and free of cardiovascular disease from 2008-2012. A total of 51,462 subjects were included, with a mean age of 62.6 years for an average follow-up of 3.2 years. A total of 919 fatalities, 1666 instances of hospitalisation due to coronary heart disease, and 1510 hospitalisations related to stroke were documented. The variables indicating an elevated risk for overall mortality, coronary heart disease hospitalisations, and stroke hospitalisations were identified as follows: low levels of HDL-Cholesterol with adjusted Relative Risk (aRR) values of 1.25, 1.29, and 1.23, respectively; high Total/HDL-Cholesterol ratios with aRR values of 1.22, 1.38, and 1.25, respectively; and high Triglycerides/HDL-Cholesterol ratios with aRR values of 1.21, 1.30, and 1.09, respectively.

Furthermore, the factors demonstrating the greatest proportion of population attributable risk (%) were as follows: low HDL-Cholesterol with values of 7.70, 11.42, and 8.40, respectively; high Total/HDL-Cholesterol ratios with values of 6.55, 12.47, and 8.73, respectively; and high Triglycerides/HDL-Cholesterol ratios with values of 8.94, 15.09, and 6.92, respectively.[16] The prevalence of ACS risk at these mean levels is estimated to be between 30 and 40 percent among Asian Indians. Adult treatment panel III of the National Cholesterol Education Program recognises Lp (a) as a novel risk factor.[17] An increased risk of ACS is seen in those with high Lp levels (a). In Asian Indians, elevated Lp (a) levels are linked to a higher risk of early coronary atherosclerosis, myocardial infarction, and recurrent myocardial infarction.[17-21]

Increased ratios of triglycerides to HDL, HDL to triglycerides, and apolipoprotein B to apolipoprotein A1 are all characteristic of Asian Indians. Myocardial infarction in Asian Indians was positively linked with these ratios.[19] In our research, TC (mg/dL), HDL (mg/dL), TGL, LDL, LP(a), Apo lipoprotein A1, and Apo lipoprotein B (mg/dL) mean values were all significantly different ($p > 0.05$) between the Cardiac and non-cardiac groups.

Contrary to earlier research, the prevalence of diabetes, hypertension, smoking, and alcohol consumption in the study group between the cardiac and non-cardiac populations did not differ statistically (p-value > 0.05).[5,20]

A restricted cubic spline (RCS) regression analysis revealed a linear association of TG with ischemic stroke, non-HDL-C, apoB, and TC/HDL-C ratio with all-cause mortality. A significant non-linear association of apoB was associated with ischemic stroke and CVD. The study also reported that elevated risks of CVD were linked to deviations from optimal levels of total TC, with either lower or higher TC levels being implicated, as well as higher levels of apolipoprotein AI (ApoAI) and lower levels of apolipoprotein B (ApoB). Conversely, a decrease in TG levels was associated with an increased risk of all-cause mortality. To mitigate these risks, maintaining optimal lipid levels emerges as a crucial strategy in preventing CVD and reducing mortality rates.[22]

Limitations

This study has flaws, and there aren't many participants in it, and care is warranted when extrapolating the study's findings. Patients in the single tertiary care hospital used in the study may not be representative of the population as a whole. Further research with a sizable sample size is required to verify the results of our study.

CONCLUSION

Patients with acute coronary syndrome had significantly higher levels of Apo lipoprotein B, Lipoprotein (a), high-density lipoprotein, and triglycerides than those without cardiac disease. The study suggests assessing Apo-lipoprotein B, Lipoprotein (a), and HDL in non-cardiac patients to reduce cardiovascular morbidity and mortality. Further research is recommended on these factors, such as atherosclerotic risk factors and their influence on other systems.

More attention should be paid to serum lipids and other modifiable risk factors to prevent acute coronary syndrome. With greater total cholesterol, lower HDL, and higher triglyceride levels than the older age group, the non-cardiac group had a less ideal lipid profile.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Acknowledgement

We want to express our sincere gratitude to the patients who participated in this study. Their contribution was invaluable in generating the data and insights presented in this research paper. We also extend our appreciation to the head of the department, as well as the medical staff, for their support and dedication throughout the study.

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ISSN (O): 2687-5365; ISSN (P): 2753-6556