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Original Article

Apolipoprotein B and Lipid Profile among Patients Diagnosed with Acute Myocardial Infarction

Bilal Mustafa[1*], Masroor Anwar[2], Muhammad Nazim[3], Aamna Khokhar[4]

[1]Akbar Niazi Teaching Hospital, Islamabad, Pakistan
[2]Khyber Teaching Hospital, Peshawar, Pakistan
[3]Wazirabad Institute of Cardiology, Wazirabad, Pakistan
[4]Islamabad Medical and Dental College, Islamabad, Pakistan

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***Corresponding Author:**
Bilal Mustafa
Akbar Niazi Teaching Hospital, Islamabad, Pakistan
bilalmustafa_83@yahoo.com

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ABSTRACT

Highest mortality rates are associated with acute myocardial infraction. It is recognized as leading cause of deaths globally. It is sequelae to the atherosclerosis cardiovascular disease (ASCVD). There is a close relationship between the Apo lipoprotein B abundance and atherosclerosis. **Objectives:** To estimate the ApoB blood levels and its usefulness and to analyze the total cholesterol TC, non-HDL cholesterol, triglycerides, high density lipoprotein cholesterol (HDL-C), LDL/HDL and low density lipoprotein cholesterol (LDL-C) ratios in AMI patients. **Methods:** It was a comparative cross-sectional study with statistical approach, conducted at Akbar Niazi Teaching Hospital, Islamabad and Khyber Teaching Hospital, Peshawar. The study was conducted on the 53 males and 28 female attended the cardiovascular center of the hospital. The duration of the study was from December 2021 to May 2022. The convenient sampling technique was used for the sampling of the enrolled patients. The healthy patients were included in the control group. The tubidimetric method was laboratory analysis and for lipid profiling the Apolipoprotein B and enzymatic method was used. The SPSS version 21.0 was used for the statistical analysis. **Results:** The ratio of males to females was 1.8:1. The Myocardial infarction range of the patients was selected from more than 31 years to 84 years. The 55± 10 was the average age of the patients included in the study. However, 61 years of age was the median and the interquartile limit was 46 to 61 years for male patients, and for female patients was 49 to 68 years. Of 93 patients (6.5 %) the sufferers were of age lower than 40 years, 46 patients were smokers in the experimental group and in the control group, only 15 people were smokers. The 99 ± 17.8 was the mean level and SD of the experimental group. The moderate correlation was observed in the ApoB, non-HDL cholesterol and HDL-cholesterol. **Conclusions:** The moderate correlation between Apo B and non HDL-C and HDL-C were observed in the AMI patients. It was a complementary marker in the conventional lipid profiling.

INTRODUCTION

Cardiovascular is one of the most commonly known non-communicable disease among the humans. The highest mortality rates are associated with the myocardial infarction. The disease is effecting a number of people in the developing countries. To determine the risk factors associated with this disease the scientists are conducting extensive research [1, 2]. The notable changes in lipid profiling ultimately leads to the elevated risk of the disease. The protein within the lipoprotein particles are linked with the lipids to form the apolipoproteins. These play role in the metabolism of lipoprotein. The chylomicron has the Apolipoprotein B and is the best predictor of the acute myocardial infraction [3, 4]. The one of the strongest risk factor associated with the atherosclerotic cardiovascular diseases is high concentrations of LDL-cholesterol. There is a close relationship between the myocardial infraction development risks and Apolipoprotein B. These are the strong predictor of the acute coronary syndrome [5]. Their role is superior to the role played by the traditional lipids in coronary risks estimations. These are the foundation of the pathogenesis of the disease. The apolipoprotein B are showed as atherogenic particles as they play important

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role in the risk prediction of coronary artery diseases. Pakistan share the highest burden of the cardiovascular diseases in the world. The reported consequences of the atherosclerosis are the plaque rupture and fissuring. Due to the retention of the apo B lipoprotein the inflammatory process occur within the blood vessel wall [6]. The highly known basic unit of injury to the vascular wall are the Apo B lipoprotein contacting particles. The patients diagnosed with AMI normally have the fluctuating levels of lipid profile [7]. The levels of apolipoproteins are reflective of the anti-atherogenic particles in the blood. The lipid ratios are the determinants of the risk associated with the CAD. The need of the hour is to identify the highly specific and sensitive biomarkers associated with the diagnosis of the AMI. In this study the ApoB levels of the patients included in the control or experimental group were studied [8, 9]. The aim of the study was to evaluate the role of the total cholesterol (TC), low density lipoprotein-cholesterol (LDL-C), high density lipoprotein-cholesterol (HDL-C) and triglycerides (TG) in the diagnosis of the AMI. This study provide with the insight into devising of the disease specific algorithms [10].

METHODS

This cross-sectional study was conducted on the 81 patients visited the cardiovascular department of the Akbar Niazi Teaching Hospital, Islamabad and Khyber Teaching Hospital, Peshawar. The ethical committee of the hospital approved the study. The patients diagnosed with the AMI were included in the experimental group while the healthy patients who visited the hospital for routine check-up were included in the control group. The duration of the study was from December 2021 to May 2022. The informed consent were given to the participants. The convenient sampling technique was used for the sampling of the enrolled patients. For the comparison of the lipid profile the laboratory specific reference range was used. The tubidimetric method was used for laboratory analysis and for lipid profiling of the HDL-C, TC, TG and Apolipoprotein B enzymatic method was used. LDL-C select FS kit was used for the measurement of the LDL-C present in serum. The SPSS was used for the statistical analysis.

RESULTS

Demographic studies of the patients predicted that there were 53 male patients (65 %), and 28 female patients (35 %) in the AMI category. The proportion between males to females was 1.8:1. The myocardial infarction range of the patients was selected from more than 31 years to 84 years. The average age of the patients was 55± 10. However, 61 years of age was the median and the interquartile limit was 46 to 61 years for male patients, and for female patients was 49 to 68 years. Of 93 patients (6.5 %) the sufferers were of age lower than 40 years. In the experimental group, 46 of the patients were smokers and in the control group, only 15 people were smokers. In table 1, the average value of ApoB and its optimum range along with the details of the control group is represented.

Characteristics	AMI Average ± SD limit	Control group Average ± SD limit	p-value
Triglycerides	3.28 1.80	2.51 ± 1.30	0.439
	0.14 to 6.0 milimoles/L	0.12 to 5.00 milimoles/L	
TC (mmole/L)	5.0± 1.00	4.87± 0.30	< 0.05
	3.0to 7.1 milimoles/L	2 to 5.1 milimoles/L	
High-density lipids (milimoles/L)	1.06± 0.15	1.60 ± 0.27	< 0.001
	0.9 to 1.5 milimoles/L	1.3 to 2.4millimoles/l	
Low-density lipids (millimoles/L)	2.57± 0.7	2.09± 0.5	< 0.05
	11.3 to 4.5 milimoles/L	91.2 to 3.3 milimoles/L	
Very low-density lipids (millimoles/L)	1.45±0.88	1.23± 0.5	< 0.05
	0.08 to 3.08milimoles/L	90.08 to 2.38milimoles/L	
Non-High-Density Lipid Cholesterol	3.98±0.91	3.25± 0.39	< 0.001
	2.38 to 5.95milimoles/L	2.56 to 4.24milimoles/L	
Low-density l ipid//high-density lipid	2.23±0.51	1.35± 0.39	< 0.001
	1.35 to 3.34	0.76 to 2.05	
ApoB (milligram/dl)	98.26 ± 18.80	71.72 ± 17.75	< 0.001
	27 to135 miligram/dl	36.5 to127 miligram/dl	

Table 1: Lipid and ApoB characteristics along with experimental group and control group

In the given table the level of ApoB is comparatively higher in the AMI group than in the control group. The risk ratio was calculated by comparing it with the reference value prescribed on the kit. Then the comparison of the average value of different lipid characteristics was compared with the AMI group as well as the control group. This study predicts that the level of lipids aspects in the experimental group was higher than in the control group, while the level of high-density lipids was higher in the control group. The cutoff value and risk ratio of different lipids are represented in the given table 2.

Characteristics	Required limit ATP III prescription, NCE	Total Cases of lipid profile outside the required range	Control group (lipid profile outside the required range)	Odds ratio 95 % CI	The ratio of risk 95 % CI
The total amount of cholesterol	Lower than 5.18 millimoles/l< 201miligram/dl	36	7	4.77 [1.85,1 2.99]	1.575 [1.32, 2.11]
Low-Density Lipid cholesterol	Lower than 2.61 millimoles/l <100miligram/dl	36	9	3.4 [1.44, 8.23]	1.439 [1.132, 1.881]
High-Density Lipid cholesterol	More than 1.24 millimoles/l >40miligram/dl	37	1	38 [4.33, 261.80]	1.843 [1.555, 2.433]
TG	Lower than 1.89 mmoles/l [<150mg/dl]	58	38	0.27 [0.23,1 .20]	0.7532 [0.48, 0.98]
Non High Density Lipids cholesterol	Lower than 3.2 mmoles/l [≤130mg/dl]	60	13	6.932 [2.72, 16.5]	2.025 [1.3,2.6]
Very Low Density Lipids	Lower than 0.78mmoles/l [≤30mg/dl]	58	30	1.266 [0.45, 2.96]	1.083 [0.7976, 1.4]

Table 2: Lipid profile beyond required range

The relation of ApoB level was predicted by comparing it with the other lipid profile characteristics. The relation between these quantities is represented in table 3.

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	Total amount of cholesterol	Low-Density Lipid cholesterol	High-Density Lipid cholesterol	TG	Non High-Density Lipid cholesterol
ApoB	r=0.19, p=0.053	r=0.286, p=0.012	r=-0.480, p< 0.012	r=0.158, p=0.129	r=0.388, p<0.011

Table 3: Relation between ApoB and lipids.

DISCUSSION

In our experiment, it was predicted that the males are most affected by AMI as compared to the females. The infection rate is double among males as compared to females. The initiation of AMI is observed in younger patients. Mostly this disease is observed in patients with ages less than 40 [11]. Mostly the disease begins after 20 years of age. Here in this experiment, the average age calculated for men was 34 years and for women was 29 years. It is thus predicted that, lipoprotein metabolism has a link with the AMI initiation. The relationship between different components of lipoprotein metabolism like the total amount of lipoprotein, low density lipids, high density lipids, and non-high density lipid cholesterol was studied with the initiation of different heart diseases like myocardial infarction and other cardiovascular diseases. The ratio of these lipids was also considered for the initiation of different diseases [12, 13]. For the assessment of the different cardio related issues, the biomarker ApoB was selected. In this experiment, 32 patients with AMI has ApoB values above than the normal range (100 mg/ml). The same results were obtained for more than 40 % of the cases. The appropriate range of the ApoB was selected according to the ranges mentioned in the protocols. The three samples of the control group show deviation from the normal results, these samples show false positive results because a high level of ApoB was detected [14]. When the samples of different disease level were tested, then the ApoB marker concentration was measured for AMI and other cardio diseases. The patients in the study had only a normal range of ApoB. The ApoB level was not increased up to the risk level. But there was a significant difference of ApoB level between the control group and diseased persons [15]. ApoB range can also be used for the measurement the number of other risk factors like the components related to the lipid metabolism. The different concentrations of the lipids also play role in the determination of AMI level. By considering all facts, it is clear that the level of ApoB has a strong correlation with cardiovascular diseases and AMI levels. The increase in ApoB level was noted for each of the patients, then the peaks for each of the lipoprotein component was estimated and monitored completely to observe the progression of the disease. In the population under study, the level of ApoB raised in normal patients as well as in AMI patients. Therefore, it is not a good marker for the prediction of different heart diseases like myocardial infarction and AMI [16, 17]. It is particularly not efficient for the diagnostic of cardiovascular disease in those patients who are already having some therapy for the lowering of blood cholesterol levels. The patients under treatment were not subjected to being diagnosed by ApoB marker test. According to the guidelines of the program of ATP III cholesterol education, the dysregulations of lipids were found in healthy patients as well as in control patients. This dysregulations of lipids was lead to the AMI or sometimes may cause the initiation of AMI. This factor highlights the risk of the development of disease in healthy patients as well. Therefore, there is need to control the lipid proteins, and cholesterol level within blood. In this way, 99 % of heart diseases can be controlled by simply avoiding bad fats. For a healthy person, the High density cholesterol level should be 99 % of the required range [18, 19]. Sometimes lipoprotein also carries ApoB which has a more critical role for the initiation of disease as compared to the cholesterol level. For the assessment of AMI, the cholesterol level measurement along with lipoprotein and TGs is also required. For the initiation of AMI, the non-high density lipids play an equal role as high density lipids do play. Therefore, for the appropriate estimation of AMI and other cardiovascular diseases, there is a need to measure the non-high density lipids as well. The factor ApoB has a strong relation with low density lipids, positive relation with non-high density lipids, and negative relation with high density lipid [20]. So, in the above study after optimization, it can be speculated that ApoB can be used for the measurement of cardiovascular diseases as well as the profile of different lipid components. However, AMI patients show some limitations in the identification due to varying lipid profiles and ApoB [21, 22].

CONCLUSION

In this study, it was predicted that the level of ApoB has a relation to the AMI level. In the case of AMI the level of ApoB was raised. The ApoB also shows the line between the high-density lipids and non-high-density lipids. Therefore, the level of ApoB can be used as a marker for the prediction of cardiovascular diseases prediction by considering the lipid profiles.

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