Original Article

Frequency of Low HDL in Young Patients in Acute Myocardial Infarction

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ABSTRACT

Objective: To evaluate the frequency of low HDL in young patients in acute myocardial infarction.
Study Design: Cross-sectional study
Place and Duration of Study: This study was conducted at the Department of Cardiology Ch. Pervaiz Elahi Institute of Cardiology, Multan from Sep, 2019 to Feb, 2020 for a period of 05 months.
Materials and Methods: Patients with acute myocardial infarction admitted within 24 hours were included. Lipid-lowering therapy, diabetes mellitus, and hypothyroidism were regarded as exclusion criteria. Demographic variables and the complete history of the patients were taken. 5 mL of venous blood was taken from patients during 24 hours of AMI and was immediately transferred to plain tubes. The samples were analyzed using calorimetric kit methods for the detection of High-density lipoprotein (HDL). HDL was considered deranged if found <40mg/dL in males or <50mg/dL in females.
Results: The age of the patients ranges from 20 to 35 years with the mean age of 28 ± 6.32 years. Among these 56.6% were males and 43.4% were females. Blood serum of 28 patients 46.6% out of 60 revealed low levels of high-density lipoprotein. Among these 28 patients, 20% were females and 26.6% were females. The comparison of percentages using chi-square revealed no statistically significant difference in the male and female groups ($p>0.05$). However, the overall percentage analysis shows significantly low levels of HDL in a study population of Acute myocardial infarction ($p<0.05$).
Conclusion: There is a high frequency of low HDL in young patients presenting with acute myocardial infarction.

Key Words: Acute myocardial infarction, Dyslipidemia, High-density lipoprotein

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INTRODUCTION

Cardiovascular disease (CVD) has become a leading cause of morbidity and mortality in recent years. It has been estimated that cardiovascular disease is the cause of more than 100,000 deaths annually [(1)]. An epidemic of CVD in South Asians has been reported, hence Pakistan also has a high incidence of coronary artery disease[(2)]. With the increase in the incidence of coronary artery disease, cardiovascular disease has been regarded as a multifactorial disease [(3)]. The risk factors associated with cardiovascular disease include smoking, drinking, diabetes, and dyslipidemia. These risk factors also attribute to acute myocardial infarctions [(4)].
Among these factors, dyslipidemia is considered a strong indicator of cardiovascular outcomes following acute myocardial infarction [(5)].

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Dyslipidemia is a disorder of lipid metabolism resulting in premature atherosclerosis [(6)]. Dyslipidemia can be assessed by lipid profile evaluation. The lipid profile includes total cholesterol (TC), low-density lipoprotein (LDL), high-density lipoprotein (HDL), and triglycerides (TG) [(7)]. Decreased levels of high-density lipoprotein and increased levels of triglycerides, total cholesterol, low-density lipoprotein result in the development of atherosclerosis and consequently coronary artery disease and events like acute myocardial infarction[(8)]. Lipid profile is evaluated differently depending upon age and gender. Recent evidence reveals that different lipid levels are associated with AMI patients belonging to different age groups and gender[(9)]. However, despite being modifiable risk factors of acute myocardial infarction, it is important to understand age-related differences in post-AMI characteristics of dyslipidemia [(10)].
It has been reported that the lipid profile is no longer valid after 24 hours following AMI. The Rapid decline occurs during the first 24 hours of presentation with AMI, however, there is no clear mechanism yet identified that can explain this[(11)]. A sigmoid relationship has been observed between total serum cholesterol and the prevalence of CAD in some studies done on the middle-aged group [(12)]. Along with the high frequency of dyslipidemia, there is also a particular pattern reported that has been termed as atherogenic lipid triad [(13)]. The pattern is associated with increased

levels of very low-density lipoprotein (VLDL), low-density lipoprotein, triglycerides, and reduced levels of high-density lipoprotein [14]. One of the important parameters in this triad is High-density lipoprotein. HDL is known to perform various atheroprotective functions. These functions include the removal of macrophages foam cells present inside arterial walls i.e., cholesterol efflux [15]. HDL also has anti-oxidative and anti-inflammatory potential for example it inhibits the expression of inflammation-induced adhesion molecules. Therefore HDL is involved in the inhibition of the prime events in the initiation of coronary artery disease [16]. It is now a well-established fact that populations with low levels of serum HDL are at higher risk of developing atherosclerosis that ultimately can lead to AMI [17]. The objective of the study was to evaluate the frequency of low HDL in young patients in acute myocardial infarction.

MATERIALS AND METHODS

This cross-sectional study was done from 7th Sep 2019 to 7th Feb 2020 at Department of Cardiology Ch. Pervaiz Elahi Institute of Cardiology Multan. 60 patients between age 20 to 35 years with acute myocardial infarction admitted within 24 hours onset of the chest pain and ST elevation was included in the study. All patients that were admitted later than 24 hours after the development of myocardial infarction or a diagnosed case of hypothyroidism, diabetes mellitus on history were excluded from the study. Besides this, the patients who were on lipid-lowering therapy such as statins and fibrates were also excluded from the study. Demographic variables and the complete history of the patients were taken. The study was conducted after taking written approval from the Institutional Review Board and Ethical Committee.

5 mL of venous blood was taken from patients during 24 hours of AMI and was immediately transferred to plain tubes. The samples were allowed to clot. The serum was then separated by centrifugation and stored until analysis. The samples were analyzed using calorimetric kit methods for the detection of High-density lipoprotein (HDL). HDL was considered deranged if found <40mg/dL in males or <50mg/dL in females.

Data Analysis: The data was collected and analyzed using the Standard package for the Social Sciences (SPSS version 16.0). Demographic variables were expressed as mean and standard deviation using descriptive statistics. A Frequency and percentage analysis of the obtained HDL results was done. Chi-square test was used and a p-value <0.05 was considered significant.

RESULTS

60 young participants were included in the study. The age of the patients ranges from 20 to 35 years with a mean age of 28 ± 6.32 years. Among these 34 (56.6%) were males and 26 (43.4%) were females. The mean BMI of the patients was calculated with a mean value of 25 ± 4.1. Total 18 patients (30%) were hypertensive based on the recorded history while no patient showed deranged glucose levels as expected following exclusion criteria. 10 of the patients with a history of high blood pressure were males and 8 were females.

Blood serum of 28 patients (46.6%) out of 60 revealed low levels of high density lipoprotein (Table II). Among these 28 patients, 12 (20%) were females and 16 (26.6%) were females (Table III). The comparison of percentages using chi square revealed no statistically significant difference in the male and female groups ($p>0.05$). However, the over-all percentage analysis shows significantly low levels of HDL in a study population of Acute myocardial infarction ($p<0.05$).

Table No.1: Demographic and clinical characteristics of Patients (n=60)

Variable	Variable	Value (Mean ± SD)
Age (years)	Mean SD	28 ± 6.32
Gender	Male (n) Female (n)	56.6% (34) 43.3% (26)
BMI (Kg/m2)	Mean SD	25± 4.1
Hypertensive	Male (n) Female (n)	16.6% (10) 13.3% (8)

Table No.2: Frequency of low HDL in Acute MI Patients

HDL	Frequency	% age
Low HDL	28	46.7%
Normal HDL	32	53.3%

Table No.3: Frequency of low HDL with respect to genders

Age (20-35 years)	Low HDL	Normal HDL
Male		
Frequency	16	18
%age	26.7%	30%
Female		
Frequency	12	14
%age	20%	23.3%

DISCUSSION

Being a part of the ethnic region where coronary artery disease is prevalent it has been estimated that around 100,000 people suffer from acute myocardial infractions annually in Pakistan [18]. Several studies have been done to date to correlate lipid profile with the incidence of acute myocardial infarction. However, there are no reports that particularly focus on High density lipoprotein and its link with acute myocardial infarction among the young population [19].

Significantly high levels of triglycerides and low levels of HDL are suggestive of atherosclerosis and its related cardiovascular events [20]. The low levels of HDL in

patients with acute myocardial infarction have also been reported in other Asian countries. The etiology behind this can be the genetic predisposition and the dietary habits [21].

Our study showed that there can be a relation of hypertension on serum levels of HDL as 30% of the patients showed a history of high blood pressure.

21 patients showed HDL cholesterol levels of less than 40mg/dl which is below normal as recommended by the National Cholesterol Education Program [22]. As these results are significant so there can be an association of low HDL levels with underlying coronary artery disease that led to the incidence of acute myocardial infarction in the study group [23]. There are shreds of evidence, particularly that a reduced Low density lipoprotein or high levels of High density lipoprotein can act against atherosclerosis, hence preventing the occurrence of cardiovascular events [24].

Another related factor found in literature is Human serum paraoxonase. It is an HDL bound enzyme, synthesized by the liver having antiatherogenic potential[25]. As this enzyme prevents oxidation of HDL it is considered a protective agent against coronary heart disease [26]. Therefore it can be inferred that the populations that show low levels of serum paraoxonase and HDL are at higher risk of developing myocardial infarction [27].

Countless epidemiological studies show that a higher concentration of HDL cholesterol in plasma is associated with a lower risk of coronary heart disease. The correlation of two variables alone cannot imply that one causes the other [28]. As there are other genetic and environmental factors that can influence these variables.

Furthermore, several clinical studies emerged with the concept that HDL function might be a better indicator in comparison to HDL cholesterol levels [28]. Similarly, it has been demonstrated among patients of acute myocardial infarction that HDL is defective in its antioxidative activity. Moreover, the severity of AMI events is also thought to have an impact on HDL function, AMI is a pro-inflammatory state which causes a decrease in cholesterol efflux potential of HDL [29].

Interestingly the decrease in anti-inflammatory properties of HDL results in high plasma myeloperoxidase levels which in turn is a strong predictor for future cardiovascular events in patients with AMI [30]. However, there are very few reports that investigated different functions of HDL relative to CVD.

All researchers have agreed with the concept that serum HDL rise and serum TGs fall right after acute MI. However, there is ambiguity in understanding of the events that causes the maximum change and later on causes the serum levels return to baseline. The serum HDL levels reach their maximum in 4 to 7 days and then return to normal in few months.

Besides this, there are methodological limitations to the interpretations of all HDL studies as till now no gold standard has been established for HDL isolation. Therefore, all available methods have their associated advantages and disadvantages [31].

CONCLUSION

The study concluded that there is a high frequency of low HDL in young patients presenting with acute myocardial infarction. It can be due to their genetic makeup and nutritional habits involving high consumption of saturated fats.

Author's Contribution:

Concept & Design of Study:	Kashif Ali Hashmi
Drafting:	Muhammad Saeed Khalid, Hafiz Abdul Kabir
Data Analysis:	Hafiz Abdul Kabir, Muhammad Saeed Khalid
Revisiting Critically:	Kashif Ali Hashmi, Muhammad Saeed Khalid
Final Approval of version:	Kashif Ali Hashmi

Conflict of Interest: The study has no conflict of interest to declare by any author.

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