DOI: https://doi.org/10.53350/pjmhs22168143

ORIGINAL ARTICLE

Correlation of High BMI and Hyperlipidemia with Myocardial Ischemia

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ABSTRACT

Background: Myocardial ischemia is considered as one of most common cause of mortality worldwide. Several Risk factors are linked to an increased incidence of Myocardial Ischemia. The most common risk factors are hypertension, hypercholesterolemia, diabetes mellitus, high BMI, physical inactivity, smoking, age and gender predisposition and socioeconomic status.
Aim: To inspect and compare incidence of myocardial ischemia in cases with hyperlipidemia and elevated BMI.
Methods: 102 patients were selected for our research study and cases were split up into 2 groups of 51 patients each. Group A comprised cases with standard normal lipid profile and BMI with suspected myocardial ischemia. Group B contained 51 patients with hyperlipidemia and high BMI with suspected myocardial ischemia. The study data was then analyzed by SPSS 21st version. The Probability Value (P- Value) of ≤0.05 was coined as statistically convincing value.
Results: The serum Cholesterol levels were 148 ± 11 in first group A and 268 ± 41 in other group B. The triglycerides serum values were 129± 13 in A group and 220± 13 in B group. The serum Low density Lipoproteins values were 109±10 in A group and 179±22 in B group. The serum HDL values were 39±10 in A group and 20±08 in B group. An independent/unpaired samples T- statistical test was used Using a two-tailed 0.05 criterion, the test indicated a statistically convincing difference among the two research groups (p value was <0.05) in relation to cholesterol, triglycerides, HDL, LDL and BMI.
Conclusion: Hyperlipidemia and High BMI contribute significantly to development of acute myocardial ischemia
Keywords: Myocardial Ischemia, Hyperlipidemia, Body Mass index

INTRODUCTION

Myocardial ischemia is considered as one of most common cause of mortality worldwide. Several Risk factors are linked to an increased incidence of Myocardial Ischemia. The most common risk factors are hypertension, hypercholesterolemia, diabetes mellitus, high BMI, physical inactivity, smoking, age and gender predisposition and socioeconomic status. Acute Myocardial ischemia is diagnosed by using investigation parameters as per WHO criteria of Increase or decrease in Cardiac Biochemical markers with at least one of the following: signs of myocardial ischemia clinically and ECG changes like pathologic Q wave rise or elevation or fall of ST segment. Hypercholesterolemia and High BMI is considered as important modifiable risk factors of myocardial ischemia[1,2,3,4].

Atherosclerosis manifesting as Acute Myocardial ischemia remains a significant health issue. Many factors contribute to Acute Myocardial Ischemia, such as high BMI, blood pressure and lipids. Within the lipid profile, the main approach is to lower LDL cholesterol, primarily with lifestyle modifications and subsequently with pharmacological management. Drugs like Statins are considered as first-line pharmacological therapy[5,6,7].

Researchers stated that definition of hyperlipidemia is coined as elevated values of serum cholesterol, upraised low density group lipoprotein (LDL), upraised tri-glycerides values in serum (TG), or a declining levels of serum high density group lipoprotein (HDL). Hyperlipidemia is an established risk factor for myocardial Ischemia[8].

It has been observed that high fat and calorie diet can cause hyperlipidemia and can lead to endothelial dysfunction leading to myocardial ischemia[9].

Obesity and high BMI (kg/m^2) are considered as another important risk factor for acute myocardial ischemia. High BMI increases the incidence rate of other risk factors of myocardial ischemia like hypertension, hyperlipidemia and diabetes mellitus. Patients BMI is categorized by World Health Organization classification system: under-weight (below 18.5kg/m2) standard (18.5 to 24.9 kg per m^2), over-weight (25.0 to 29.9 kg per m^2), and the obese class > 30 kg per square meter. Obese patients are more prone to early acute myocardial ischemia and mortality[10].

The dominant treatment strategy to prevent ischemic heart disease is to reduce prevalence of risk factors such as hyperlipidemia and obesity[11].

This research-study is planned to analyze the possible contribution of Hyperlipidemia and High BMI in manifestation of myocardial ischemia in suspected heart attack cases.

Received on 06-06-2022
Accepted on 03-08-2022

METHODS AND MATERIALS

This cross sectional statistical study was conducted in Coronary Care Unit (CCU) Services Hospital Lahore from 1st December 2021 to May 2022. Total 102 cases split up in two equal A group and B group (51 cases in single group) were selected for this research work. Purposive sampling method with non probability technique was used.

A Group: Normal individuals with Negative echocardiography scan results.

B Group: Cardiac patients with Positive echocardiography scan results.

Adult patients of both genders (≥18 years age) with suspected myocardial ischemia with cardiac symptoms such as typical or atypical symptoms of suspected acute myocardial ischemia (e.g., pain, tightness or burning in chest, pain in shoulder, palpitations, pain in jaws, or other pain symptoms, such as difficulty breathing were included in our study. While patients having age less than 18 and any comorbidity like cancer, septicemia liver failure or any autoimmune disease were excluded from our study. The statistical interpretation of research work data was programmed by using 21st Version SPSS soft-ware for computer windows. Descriptive data set inferences were given as: mean±SD (abbreviated for standard deviation). An independent/unpaired samples t- statistical test was used for contrasting variables means. P (Probability) values of less than 0.05 were considered as convincing numbers statistically.

Haematological and biochemical analysis: BMI is determined by using formula of kg per square meter. Lipid profile including serum cholesterol, LDL value, triglycerides, and HDL serum value were judged on Hitachi Machine numbered 902 completely self-operating (automation) for blood chemistry analysis.

RESULTS

Table 1: A Group without Myocardial ischemia and Negative Echo Scan (n=51)

Variables	Units	(Mean± SD)	P value
BMI	Kg per m^2	23.33± 2.06	< 0.05
Cholesterol	mg per dl	148 ± 11	< 0.05
Triglyceride	mg per dl	129± 13	< 0.05
LDL Levels	mg per dl	109±10	< 0.05
HDL Levels	mg per dl	39±10	< 0.05

Table 2: B Group with Myocardial ischemia and Positive Echo Scan (n=51)

Variables	Units	(Mean±SD)	P value
BMI	Kg per m^2	3.33±6.09	< 0.05
Cholesterol	mg per dl	268±41	< 0.05
Triglyceride	mg per dl	220±13	< 0.05
LDL Levels	mg per dl	179±22	< 0.05
HDL Levels	mg per dl	20±08	< 0.05

The serum Cholesterol levels were 148±11 in A group and 268±41 in B group. The tri-glycerides blood levels were 129±13 in A group and 220±13 in B group. The serum LDL levels were 109±10 in A group and 179±22 in B group. The serum HDL levels were 39±10 in A group and 20±08 in B group. The unpaired/independent sample T statistical test was used Using a two-tailed 0.05 criterion, the test revealed a statistically significant difference between the two groups ($p < 0.05$) in relation to cholesterol, triglycerides, HDL, LDL and BMI. Based on the inferences of unpaired/independent t-statistical test (probability value of less than 0.05), we did not accept the null statistical hypothesis.

Table 3: Independent samples t test comparing Cholesterol, Triglycerides, BMI, serum LDL and serum HDL serum levels in A group and B group

Variable	A Group (mean±SD)	B Group (mean±SD	P value
BMI(kg/m^2)	23.33 ± 2.06	33.33± 6.09	< 0.05
Cholesterol(mg/dl)	148 ± 11	268 ± 41	< 0.05
Triglyceride(mg/dl)	129± 13	220± 13	< 0.05
LDL levels(mg/dl)	109±10	179±22	< 0.05
HDL Levels(mg/dl)	39±10	20±08	< 0.05

DISCUSSION

Acute myocardial Ischemia (AMI) is considered as most significant and important etiological factor of acute heart attack and is the supreme etiology of mortality[12].

The severity or extent of myocardial ischemia and concomitant mortality is addressable by decreasing factors of risk particularly those factors which can be modified in life by changing certain habits of the patients and proper counselling by the physician. The factors of risk which can be modified for myocardial ischemia are hypertension, habits of frequent smoking, elevated blood sugar leading to diabetes, hyper-lipidemia, and severe obesity with high BMI[13,14,15,16].

In a study held on Pakistani population, results showed 63% Pakistani population among those selected for study work suffered from lipid serum abnormalities. Among these, the recurrent lipid serum abnormality were reduced levels of high density (HDL) group lipoproteins (17.3%) and elevated blood values of TG (tri-glyceride) as 11.2%)[17].

Although variations in serum lipid values were written and mentioned repeatedly, the study-data published is not accordant. In another work of research, researchers announced that Total Cholesterol can reduce upto 47%, Low density (LDL) group lipoproteins levels upto 39%, High Density (HDL) group lipoproteins values upto 11%, and Tri-glycerides can rise upto 50%[18].

Some other researchers found that Total Cholesterol can reduce by 1.25% to 47%, Low density (LDL) group Lipoproteins as 1.7% to 39%, High density (HDL) group lipoproteins are reduced as 0% to 11% and Tri-glycerides show rising trend by 9.8% to 50%[19].

In a project based on Indian population, registered cases were studied for 90 days, the total Cholesterol and Low density (LDL) group lipoproteins values were unremarkable during their hospital admission and after 90 days followups. But progressive fall in serum levels of High Density (HDL) group lipoproteins was observed on 2nd day and continued same trend in coming days and remained consistent after 90 days when cases were re-examined at clinic at their routine followups. The Low Density (LDL) group Lipoproteins /High Density (HDL) group lipoproteins ratio is convincingly high at just before discharge in comparison to the 1st hospital admission day. Triglycerides were also noted to be on higher side on the 3rd admission day of Myocardial Ischemia[20].

The serum lipid parameters should be analyzed and evaluated in every cardiac suspected patient admitted due to suspected acute syndrome of coronary arteries particularly for 1st day at hospital then keep on repeating the test until a desired healthy physiological homeostasis is obtained. Generally less variations are seen on 1st day of hospital admission. Therefore, the first serum value can give us convincing information for choosing the drugs for lipid blood lowering management. Still it is presumed that correct recognition of the base-line serum value is still not straightforward. Since a declining pattern of Total Cholesterol, Low density (LDL) group Lipoproteins, and High Density (HDL) group Lipoproteins is observed over a certain period after Myocardial Ischemia, lipid-blood reducing therapy should be continued, no matter the results of lab tests are normal in early days[21].

In a research work announced by Kumar et al, it is observed that deranged lipid profile was observed in patients with acute myocardial ischemia and lipid levels were found to be gradually decreasing in acute myocardial ischemia patients over a time period of 48 hours. This is in consistent with our study that Hypercholesterolemia plays significant role in acute myocardial ischemia[22].

In another research work displayed by aladeen et al, they mentioned that there is consistent positive correlation among incidence of coronary artery disease and deranged lipid profile which is in line with our results[23].

In a study project of Jun et al, it is concluded that high BMI and obesity contributes to increased risk of Acute Myocardial ischemia which is in constant with our findings but in other studies conducted by Emer et al it was concluded that high BMI is not associated significantly with Acute myocardial infarction which is in contrast to our study findings[24,25].

CONCLUSION

Our research project concluded that High BMI and Hyperlipidemia contribute significantly in development of acute myocardial ischemia.

Limitations: Our research-work has many constraints, firstly the patients selected number was relatively small. Other risk factors were not included in our research-work. Large population-scale research works are required to describe other etiological factors associated with onset of of acute myocardial ischemia

Contribution of authors: IAZ: Corresponding Author and Main Researcher, HS: Literature search and Referencing, **SN:** Statistical Analysis, **SG:** Data collection and manuscript writing, **FQM:** Manuscript editing and proofreading, **SH:** Biochmeical Analysis

Acknowledgements: The authors acknowledge CCU unit Services Hospital Lahore for giving us access to the patients.

Conflict of interest: Nil

REFERENCES

1. Bisciglia A, Pasceri V, Irini D, Varveri A, Speciale G. Risk Factors for Ischemic Heart Disease. Rev Recent Clin Trials. 2019; 14(2):86-94.
2. Anand SS, Islam S, Rosengren A, Franzosi MG, Steyn K, Yusufali AH, Keltai M, Diaz R, Rangarajan S, Yusuf S; INTERHEART Investigators. Risk factors for myocardial infarction in women and men: insights from the INTERHEART study. Eur Heart J. 2008; 29(7):932-40

3. Dugani SB, Ayala Melendez AP, Reka R, Hydoub YM, McCafferty SN, Murad MH et al. Risk factors associated with premature myocardial infarction: a systematic review protocol. BMJ Open. 2019; 9(2):e023647.
4. Pencina MJ, Navar AM, Wojdyla D, Sanchez RJ, Khan I, Elassal J, et al. Quantifying Importance of Major Risk Factors for Coronary Heart Disease. Circulation. 2019; 139(13):1603-1611
5. Ray KK, Corral P, Morales E, Nicholls SJ. Pharmacological lipid-modification therapies for prevention of ischaemic heart disease: current and future options. Lancet. 2019; 394(10199):697-708
6. Mal K, Kumar R, Ejaz M, Fatima K, Shaukat F. Comparison of Lipid Profile in Patients With and Without Acute Myocardial Infarction. Cureus. 2019; 11(12):e6467
7. Ali SN, Bashir M, Sherwani M. Pattern of dyslipidemia in young patients with acute ST elevation myocardial infarction. http://www.jszmc.com/Files_pdf/JSZMCVol07No03/998.pdf J Sheikh Zayed Med Coll. 2016;7:998–1001
8. Hedayatnia M, Asadi Z, Zare-Feyzabadi R, Yaghooti-Khorasani M, Ghazizadeh H, Ghaffarian-Zirak R et al. Dyslipidemia and cardiovascular disease risk among the MASHAD study population. Lipids Health Dis. 2020; 19(1):42.
9. Tveden-Nyborg P, Birck MM, Ipsen DH, Thiessen T, de Bie FL, Lindblad MM, et al. Diet-induced dyslipidemia leads to nonalcoholic fatty liver disease and oxidative stress in Guinea pigs. Transl Res. 2016; 168:146–60.
10. Gregory AB, Lester KK, Gregory DM, Twells LK, Midodzi WK, Pearce NJ. The Relationship between Body Mass Index and the Severity of Coronary Artery Disease in Patients Referred for Coronary Angiography. Cardiol Res Pract. 2017;2017:5481671
11. Reiner Ž. Hypertriglyceridemia and risk of coronary artery disease. Nat Rev Cardiol. 2017; 14(7):401.
12. Scheon FJ. Pathologic Basis of Disease. China: Saunders. 2019. 2018. Myocardial infarction; pp. 555–618.
13. De Backer G, Ambrosioni E, Borch-Johnsen K. European guidelines on cardiovascular disease prevention in clinical practice: Third joint task force of European and other societies on cardiovascular disease prevention in clinical practice. Eur Heart J. 2003; 24:1601–1610.
14. Zodpey SP, Shrikhande SN, Negandhi HN, Ughade SN, Joshi PP. Risk factors for acute myocardial infarction in central India: a case-control study. Indian J Community Med. 2015;40(1):19-26.
15. Yusuf S, Hawken S, Ounpuu S, Dans T, Avezum A, Lanas F, et al. INTERHEART Study Investigators. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): Case-control study. Lancet. 2004;364:937–52.
16. Prospective Studies Collaboration. Lewington S, Whitlock G, Clarke R, Sherliker P, Emberson J, Halsey J, et al. Blood cholesterol and vascular mortality by age, sex, and blood pressure: A meta-analysis of individual data from 61 prospective studies with 55,000 vascular deaths. Lancet. 2007;370:1829–39.
17. Plasma lipid abnormalities in Pakistani population: trends, associated factors, and clinical implications. Zaid M, Hasnain S. Braz J Med Biol Res. 2018;51:0.
18. Myocardial injury the acute phase response and lipoprotein metabolism. Rosenson RS. J Am Coll Cardiol. 1993;22:933–940
19. The modification of serum lipids after acute coronary syndrome and importance in clinical practice. Balci B. Curr Cardiol Rev. 2011;7:272–276.
20. Serum lipid profile in patients with acute myocardial infarction. Nigam PK, Narain VS, Hasan M. Indian J Clin Biochem. 2004;19:67–70.
21. 18. Lipid testing and statin dosing after acute myocardial infarction. Wang WT, Hellkamp A, Doll JA, et al. J Am Med Assoc. 2018;25:0.
22. Kumar N, Kumar S, Kumar A, Shakoor T, Rizwan A. Lipid Profile of Patients with Acute Myocardial Infarction (AMI). Cureus. 2019 Mar 18;1
23. Alloubani A, Nimer R, Samara R. Relationship between Hyperlipidemia, Cardiovascular Disease and Stroke: A Systematic Review. Curr Cardiol Rev. 2021;17(6):e051121189015.
24. Zhu J, Su X, Li G, Chen J, Tang B, Yang Y. The incidence of acute myocardial infarction in relation to overweight and obesity: a meta-analysis. Arch Med Sci. 2014 Oct 27;10(5):855-62.
Joyce E, Hoogslag GE, Kamperidis V, Debonnaire P, Katsanos S, Mertens B et al. Relationship Between Myocardial Function, Body Mass Index, and Outcome After ST-Segment-Elevation Myocardial Infarction. Circ Cardiovasc Imaging. 2017;10(7):e005670.