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ORIGINAL ARTICLE

Lipoproteins as Risk Indicators of Atherosclerosis in Middle Age Adults, A Clinical Cross Section Study

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ABSTRACT

Aims and Objectives: The aims and objectives of current study was to assess the relationship of lipoproteins with atherosclerosis as a risk factors of cardiovascular diseases in local population for health awareness. This study was conducted from June 2021 to March 2022 in medical units of Lahore General Hospital Lahore, Pakistan.

Materials and Methods: Total 172 male individuals were selected for present study and divided them into two different groups. 72 normal male individuals were placed in Group-C while remaining 100 male individuals with cardiovascular diseases were in Group-A. Blood serum levels of Cholesterol. Triglycerides, Low Density Lipoproteins and High Density Lipoproteins of each person were measured through Colorimetric kit method. Collected raw data was presented bio-statistically with the applications of SPSS version 2021.

Results: The metabolic biomarkers, Blood serum levels of Cholesterol. Triglycerides, Low Density Lipoproteins and High Density Lipoproteins of Group-C and Group-A (200.10±0.01, 150.01±0.02, 130.01±0.04, 45.04±0.03) and (280.10±0.01, 200.11±0.04, 180.02±0.01, 35.01±0.04) were obtained. The measured data of Group-A showed a significant ($p<0.05$) difference than the control group. On the other hand t-test difference for non-metabolic biomarkers i.e. Smokers, Sample size, Cardiac syndrome and Gender (-45,-28,-28,-28) of both groups have higher t-score.

Conclusion: In this prospective clinical research of Pakistani middle-aged men in Lahore, findings have correlation between cardiovascular diseases and high blood serum levels of cholesterol, triglycerides, LDL and low levels of HDL.

Keywords: Cholesterol. Triglycerides, Low Density Lipoproteins and High Density Lipoproteins, Atherosclerosis, Plaque.

INTRODUCTION

In many pathophysiological reports and numerous analysis of cross- sectional clinical studies of morbidity and mortality because of cardiac diseases suggested that family history of cardiac complications play an important role [10]. The risk factors of atherosclerosis are genetic and familial factors which contribute in disease development in normal individuals. Many researchers stated in their studies that high levels of serum lipoproteins concentration have major participation in the origination of atherosclerosis in community [8]. It was concluded by different studies that a high total blood cholesterol level, particularly in the form of LDL cholesterol (LDL-C), is a key risk factor for coronary heart disease (CHD) from last three decades [5].

However the findings of advanced studies claimed that LDL-C is not the only lipoprotein species involved in atherosclerosis [9]. Many other biomarkers are also considered as a risk factors of cardiovascular disease, furthermore, it has been proposed that LDL-C and TC may not be the best predictors of coronary artery disease (CAD) [6]. Majority of the researchers claimed that low levels of high density lipoprotein, intermediate density lipoprotein and very low-density lipoprotein are also the associated risk factors of atherosclerosis [7]. Apolipoproteins are important constituents of lipoprotein particles, and evidence is mounting that measuring different types of apolipoproteins might help predict the risk of cardiovascular disease. The function of apolipoproteins is to synthesis and enhance the metabolic pathways of lipoprotein particles [4].

Atherosclerosis is caused by the narrowing and stiffening of arteries. The accumulation of plaque in the inner lining of an artery causes atherosclerosis [8]. Plaque is made up of fatty substances, cholesterol, cellular waste products, calcium, and fibrin. Plaque builds up in arteries and make it difficult for blood to circulate freely. In any artery of the body, including surrounding to heart, legs, brain, and kidneys, may develop plaque [3]. Blood, oxygen, and nutrients cannot supply properly to the body because of narrow or obstructed arteries. Infarction in legs, arms or in any other part of the body is possible in such situation [2]. Atherosclerosis can cause stock, blood clots, myocardial infarction, chronic kidney syndrome, cardiovascular disease in community.

MATERIALS AND METHODS

Study Design: To assess the relationship of lipoproteins with atherosclerosis as a risk factors of cardiovascular diseases in local population for health awareness and total 172 male individuals were selected for present study and divided them into two different groups.

Division of Subjects: 72 normal male individuals were placed in Group-C while remaining 100 male individuals with cardiovascular diseases were in Group-A.

Sample Collection: 5 ml blood sample of each person were collected from superficial vein and stored in red and blue top tubes for further analysis.

Laboratory Analysis: Blood serum levels of Cholesterol. Triglycerides, Low Density Lipoproteins and High Density Lipoproteins of each person were measured through Colorimetric kit method**.**

Data Analysis: Collected raw data of both groups presented after bio-statistical analysis through SPSS version 2021. Regression comparison of each biomarker, t-test were applied for comparative description of obtained results.

RESULTS

Table-1: Non Metabolic Markers

Biomarkers	Units	Mean ±SD	($p<0.05$)
Blood serum Cholesterol levels	mg/dl	280.10±0.01	0.00
Blood serum Triglycerides levels	mg/dl	200.11±0.04	0.00
Blood serum Low Density Lipoprotein levels	mg/dl	180.02±0.01	0.00
Blood serum High Density Lipoprotein levels	mg/dl	35.01±0.04	0.00

Group-A Cardiac patients

Table-2: Metabolic Markers

Non Metabolic Markers	Group-C	Group-A	T-test
Age	40-50 years	40-55 years	-5
Gender	72 Male	100 male	-28
Cardiac syndrome	72 normal	100 patients	-28
Sample size	72 individuals	100 individuals	-28
Smokers	31	76	-45

Table-3: Metabolic Markers

Biomarkers	Units	Mean ±SD	(p<0.05)
Blood serum Cholesterol levels	mg/dl	200.10±0.01	0.00
Blood serum Triglycerides levels	mg/dl	150.01±0.02	0.00
Blood serum Low Density Lipoprotein levels	mg/dl	130.01±0.04	0.00
Blood serum High Density Lipoprotein levels	mg/dl	45.04±0.03	0.00

Group-C normal individuals

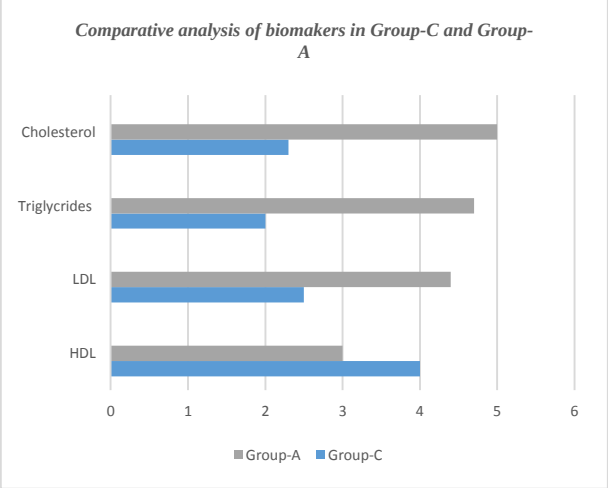

Figure-1

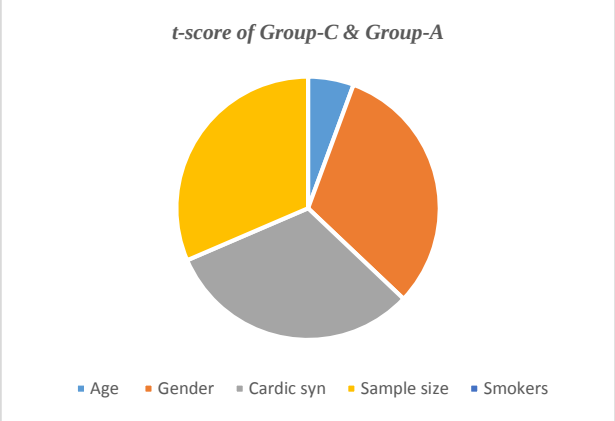

Figure-2

The metabolic biomarkers, Blood serum levels of Cholesterol. Triglycerides, Low Density Lipoproteins and High Density Lipoproteins of Group-C and Group-A (200.10±0.01, 150.01±0.02, 130.01±0.04, 45.04±0.03) and (280.10±0.01, 200.11±0.04, 180.02±0.01, 35.01±0.04) were obtained. The measured data of Group-A showed a significant (p<0.05) difference than the control group. On the other hand t-test difference for non-metabolic biomarkers i.e. Smokers, Sample size, Cardiac syndrome and Gender (-45,-28,-28,-28) of both groups have higher t-score.

DISCUSSION

The underlying cause of heart attacks and strokes is atherosclerosis. Researchers concluded by different studies that cholesterol is a major component which formed plaque and it deposit in the arteries to develop atherosclerosis [1]. The atherosclerotic cardiovascular complications are directly correlated with raised levels of low density lipoproteins and Apo- lipoprotein B (apoB) 100 in human beings. It has measured that main structural protein of low density lipoproteins are directly proportional to the atherosclerosis [11]. Endothelial dysfunction is caused by arterial damage, which leads to the alteration of apoB-containing lipoproteins and the influx of monocytes into the sub- endothelial region [12]. Heart attack and other cardiovascular diseases in all over the world according to different studies caused by atherosclerosis and this is a major symptom of death and morbidity in present time.

The medical complications of blood vessels and heart nominated collectively as cardiac syndromes [13]. Atherosclerosis is a disease that occurs when a material called plaque accumulates in the arteries' walls. The deposit of plaque narrows the arteries and making blood flow more difficult. A blood clot can obstruct the flow of blood. A heart attack or stroke can occur as a result of this. A heart attack happens when a blood clot blocks blood flow to a portion of the heart. If the clot fully blocks off blood supply, the heart muscle fed by that artery begins to perish [15]. The majority of people survive their first heart attack and go on to live productive lives for many more years. The most frequent type of stroke is an ischemic stroke, which occurs when a blood vessel feeding the brain becomes blocked, usually due to a blood clot. When a blood artery in the brain bursts, it causes a hemorrhagic stroke. Uncontrolled hypertension is the most likely reason [10].

Triglycerides are correlated with the cardiovascular complications. Increased serum total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), triglycerides (TG), or a decreased serum high-density lipoprotein cholesterol (HDL-C) concentration are all signs of dyslipidemia [9]. The cardiovascular diseases are dominated more frequently in those persons which have high levels of cholesterol, triglycerides, LDL and low levels of HDL in their blood. LDL-C is thought to be a substantial risk factor for revascularization, ischemic strokes, atherothrombotic disease, and cardiovascular mortality [6]. The findings of present study are very similar and correlated with the previous studies of different researchers. But further research is required for such indications because these all are life threatening problems.

REFERENCES

1. Baigent C, Keech A, Kearney PM, Blackwell L, Buck G, Pollicino C, et al. Efficacy and safety of cholesterol-lowering treatment: Prospective meta-analysis of data from 90,056 participants in 14 randomised trials of statins. Lancet. 2005;366:1267–78.
2. Cholesterol Treatment Trialists' (CTT) Collaborators. Kearney PM, Blackwell L, Collins R, Keech A, Simes J, et al. Efficacy of cholesterol-lowering therapy in 18,686 people with diabetes in 14 randomised trials of statins: A meta-analysis. Lancet. 2008;371:117–25.
3. Cui Y, Blumenthal RS, Flaws JA, Whiteman MK, Langenberg P, Bachorik PS, et al. Non-high-density lipoprotein cholesterol level as a predictor of cardiovascular disease mortality. Arch Intern Med. 2001;161:1413–9.
4. Deedwania P, Barter P, Carmena R, Fruchart JC, Grundy SM, Haffner S, et al. Reduction of low-density lipoprotein cholesterol in patients with coronary heart disease and metabolic syndrome: Analysis of the Treating to New Targets study. Lancet. 2006;368:919–28.
5. Heart Protection Study Collaborative Group. MRC/BHF heart protection study of cholesterol lowering with simvastatin in 20,536 high-risk individuals: A randomised placebo-controlled trial. Lancet. 2002;360:7–22.
6. Holme I, Aastveit AH, Hammar N, Jungner I, Walldius G. Relationships between lipoprotein components and risk of ischaemic and haemorrhagic stroke in the Apolipoprotein MOrtality RISk study (AMORIS) J Intern Med. 2009;265:275–87.

7. Jun M, Foote C, Lv J, Neal B, Patel A, Nicholls SJ, et al. Effects of fibrates on cardiovascular outcomes: A systematic review and meta-analysis. Lancet. 2010;375:1875–84.
8. Musunuru K, Pirruccello JP, Do R, Peloso GM, Guiducci C, Sougnez C, et al. Exome sequencing, ANGPTL3 mutations, and familial combined hypolipidemia. N Engl J Med. 2010;363:2220–7.
9. riqui MH, Heiss G, Cohn R, Cowan LD, Suchindran CM, Bangdiwala S, et al. Plasma triglyceride level and mortality from coronary heart disease. N Engl J Med. 1993;328:1220–5.
10. Robinson JG, Wang S, Smith BJ, Jacobson TA. Meta-analysis of the relationship between non-high-density lipoprotein cholesterol reduction and coronary heart disease risk. J Am Coll Cardiol. 2009;53:316–22.
11. Sacks FM, Carey VJ, Fruchart JC. Combination lipid therapy in type 2 diabetes. N Engl J Med. 2019;363:692–4.
12. Sever PS, Dahlöf B, Poulter NR, Wedel H, Beevers G, Caulfield M, et al. Prevention of coronary and stroke events with atorvastatin in hypertensive patients who have average or lower-than-average cholesterol concentrations, in the Anglo-Scandinavian Cardiac Outcomes Trial – Lipid Lowering Arm (ASCOT-LLA): A multicentre randomised controlled trial. Lancet. 2020;361:1149–58.
13. Simes RJ, Marschner IC, Hunt D, Colquhoun D, Sullivan D, Stewart RA, et al. Relationship between lipid levels and clinical outcomes in the long-term intervention with pravastatin in ischemic disease (LIPID) trial: To what extent is the reduction in coronary events with pravastatin explained by on-study lipid levels? Circulation. 2021;105:1162–9.
14. TG and HDL Working Group of the Exome Sequencing Project, National Heart, Lung, and Blood Institute. Crosby J, Peloso GM, Auer PL, Crosslin DR, Stitziel NO, et al. Loss-of-function mutations in APOC3, triglycerides, and coronary disease. N Engl J Med. 2014;371:22–31.
15. Triglyceride Coronary Disease Genetics Consortium and Emerging Risk Factors Collaboration. Sarwar N, Sandhu MS, Ricketts SL, Butterworth AS, Di Angelantonio E, et al. Triglyceride-mediated pathways and coronary disease: Collaborative analysis of 101 studies. Lancet. 2010;375:1634–9.