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RESEARCH ARTICLE

COMPREHENSIVE LIPID PROFILE- AN INSIGHT INTO THE SURROGATE BIOCHEMICAL INDICATIONS RELATED TO THE ASSESSMENT OF CORONARY ARTERY DISEASE – A NARRATIVE REVIEW ARTICLE

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ABSTRACT

Coronary artery Disease is widely prevalent across the globe and high level of Cholesterol is the significant and well established single major risk factor associated with Coronary Heart Disease. Risk factors for coronary heart disease include health behaviour like physical activity, diet, weight and smoking and health factors like cholesterol, glucose control and blood pressure. Numerous international studies have been confirming the association of dyslipidemia with Coronary artery Disease in most of the world, coronary heart disease produce immense health, imposes high social, economic and personal burden in the globally. Studies described the use of cholesterol lowering agent decrease the occurrence of coronary heart disease. The current study aimed to describe and identify the biochemical and non conventional biomarker as risk factor in early prediction of coronary heart disease.

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INTRODUCTION

Cardiovascular disorders (CVDs) are among the most common cause of death globally, hence WHO has called it as "modern epidemic" (Park, 2007). Non-communicable disease remains to be a significant public health problem in India. It is accountable for a major percentage of mortality and morbidity. Demographic alterations, changes in the lifestyle alongside with increased rates of urbanization are the foremost reasons accountable for the tilt towards the non-communicable diseases (Upadhyay, 2012). Atherosclerosis was earlier known to consequence from a passive procedure of fat growth. In fresh studies it is measured to be an active process comprising of active, inflamed and thrombosed cells (Ranjith *et al*., 2009). Inflammation is the significant method in the mechanism of numerous phases of atherosclerosis which comprises start and succession of atheroma, plaque formation and break and re-stenosis subsequent angioplasty (Braunwald *et al*., 2001). 8.14 million deaths were reported worldwide due to coronary artery disease in 2013 (Naghavi *et al*., 2015)

MATERIALS AND METHODS

We searched for relevant articles on pub med and Google scholar database using the keywords lipid profile in coronary artery disease, LDL, HDL, VLDL, Total cholesterol and small dense LDL in coronary artery disease, those article were published between 1990 to 2018.

The article were written in English and available as free full text were selected for review. Related article (including cohort, descriptive, Cross sectional, randomized controlled trials, interventional, Quantitative and Qualitative studies) were extracted. We have been taken the articles having the criteria which includes Age >40 years and Acute myocardial infarction evidenced by history, physical examination, ECG, Elevated CK-MB, 2D Echocardiography. We have excluded the Patients age below 40years, Individuals with Chronic Liver diseases, diabellitus, familial hypercholesterolemia disorder.

Risk Factors: Research indicated that the risk factors of Coronary artery disease includes high blood pressure, obesity, smoking, diabetes, poor diet, lack of exercise, high blood triglycerides, cholesterol and lipoprotein, hypertension and family history. It's estimated 1/3rd of the United States population has high levels of triglycerides, one of the major risk factor for Coronary artery disease (Schreiner *et al*., 1993; Kivimäki *et al*., 2012; Lee *et al*., 2012). High density lipoprotein has a good protective effect and is associated with lowering the risk of coronary artery disease. Researchers showed that a high triglyceride level can predict Coronary artery disease, which has a high mortality in the Western society (Kannel, 2009). Coronary artery disease being the most common causes of mortality in patients with insulin resistance and essential hypertension (Hedblad *et al*., 2002). Changing day to day lifestyles and modern medicines can help in preventing coronary artery disease. Researchers showed that high levels of triglycerides and cholesterol can prevent vitamin

E from reaching the tissues that is in need it. Vitamin E has antioxidant action which is important for artery walls, and it plays a major role in reducing the oxidation of the LDL-cholesterol. When Low density lipoprotein is oxidized, then it becomes "stickier," and this promotes the accumulation for plaque, inside the arteries. Researches also suggested, vitamin E may prevent thickening of the blood-vessel walls and helps in free flow of blood and favours a good cardiovascular health (Traber *et al*., 2001).

Plasma Lipids: Cholesterol and triglycerides are lipids of different types that circulate in the blood. The Calories intakes are converted into triglycerides and are stored as fat, which leads to hypertriglyceridemia. Fat from our body is removed with the help of High-density lipoprotein. Low-density lipoprotein builds up plaque inside artery causing atherosclerosis. Low-density lipoprotein-cholesterol and High-density lipoprotein are key factors in the atherosclerotic pathogenesis and coronary artery disease. Increased Low-density lipoprotein-cholesterol levels and decreased High-density lipoprotein-cholesterol levels are associated with increased risk for coronary artery disease. Using fish oil having omega-3 rich triglycerides, lavender, garlic, niacin, lemongrass and holy basil together with healthy diet and lifestyle modifications can reduce the severity of hypertriglyceridemia (Seo *et al*., 2000; Qi *et al*., 2002; Simopoulos, 2002; Qi *et al*., 2003; Kwak *et al*., 2012).

Proctical demerits in the diagnosis and prognostic value lipids in cad: Triglycerides, phospholipids and Cholesterol were measured by using enzymatic methods (Raum *et al*., 2007; Schöttker *et al*., 2013). Un-esterified cholesterol was measured before hydrolysis by cholesterol esterase. HDL cholesterol measured after precipitation of apolipoprotein –B containing lipoproteins with Na- phosphotungstate plus MgCl2 in the supernatant obtained (Warnick, 19982). Apolipoprotein. A-I and B and lipoprotein(a) was measured by immune turbidimetric assay (Winkelmann *et al*., 2001). Low-density lipoprotein levels are estimated by the Friedewald formula, (Friedewald, 1972) if the Triglycerides level are <4.5 mmol/l. The contents of Very Low-density lipoprotein, intermediate-density lipoprotein, Low-density lipoprotein, and High-density lipoprotein were measured after ultra-centrifugation in a KBr-NaCl density gradient. The distribution and size of Low-density lipoprotein and High-density lipoprotein particles are determined by 2–20 percent poly-acrylamide linear gradient gel electrophoresis of Sudan Black2 prestained plasma, followed by1 densitometric scanning at 590nm. (Asztalos *et al*., 2004; Campos *et al*., 1992).

Small dense low-density lipoprotein: Many experimental studies showed the atherogenic properties of Small dense Low-density lipoprotein particles. Small dense low-density lipoprotein-cholesterol particles can penetrate easily into the arterial walls because of their small size (Khan *et al*., 2012; Mikhailidis *et al*., 2011; Bongard *et al*., 2013). They have more affinity to proteoglycans in the arterial wall, leading to their prolonged stay in the sub-endothelial space (Koba *et al*., 2006). Besides, the affinity of Small dense low-density lipoprotein-cholesterol for low-density lipoprotein receptors is lower than larger low-density lipoprotein-cholesterol particles and its clearance is delayed from plasma. Small dense low-density lipoprotein-cholesterol particles are in vitamin E deficient and are more susceptible to oxidization. All the above features describe the increased atherogenicity of small dense low-density lipoprotein subclasses. Small dense low-density lipoprotein-cholesterol is a important emerging risk factor for coronary artery disease. Small dense low-density lipoprotein-cholesterol is a considering biomarker to predict future cardiovascular events in the secondary prevention of stable coronary artery disease (CAD) (Nishikura *et al*., 2014).

Difficulty in establishing small density ldl: Triglyceride, High-density lipoprotein-cholesterol and Total-cholesterol were determined by standard enzymatic method. HDL-C was measured after isolation of the HDL supernatant following dextran sulfate magnesium precipitation. LDL-C was calculated by using the Friedewald equation. For the purposes of this study, we used archived plasma samples that had been frozen at -80 °C and never previously thawed for the assessment of direct LDL-C and sdLDL-C by automated standardized enzymatic analysis on a Hitachi 911 autoanalyzer. (Hirano *et al*., 2005).

Triglyceride, high-density lipoprotein-cholesterol ratio is surrogate marker of small dense ldl: The ratio of Triglyceride and High-density lipoprotein-cholesterol, initially described by Gaziano *et al*, is an atherogenic index is significantly proved to be a highly independent predictor of myocardial infarction, even stronger than Low-density lipoprotein cholesterol**,** High-density lipoprotein-cholesterol ratio. The Copenhagen Study was found that triglyceride levels by High-density lipoprotein-cholesterol levels showed highly accurate coronary artery disease.18 High triglycerides and High-density lipoprotein-cholesterol caused to atherosclerosis due to the higher rich triglyceride, very low-density lipoprotein that generates small, dense Low density lipoprotein during lipolysis and exchange of lipids. These accumulated LDL particles forms small dense low density lipoprotein particles in the circulation, which closing the atherogenic circle after undergone catabolism.

RESULTS

Among the all revived articles, Majority of the studies were Low-density lipoprotein having positive correlation, and Low-density lipoprotein, HDL ratio values are significantly correlated, HDL having negative correlation and majority of studies showing there was no correlation of triglyceride with coronary artery disease. New predictors like small dense Low-density lipoprotein having very significant correlation with coronary artery disease.

Conclusion

The finding from current study, most of the patient having significant high levels of Triglycerides and Low density lipoprotein cholesterol even after recovery from Coronary artery disease. Triacyliglycerol levels also significantly increased among the coronary heart disease group from the control group, but were not significant statistically. HDL-C was reduced significantly in the coronary heart disease groups, compared to control groups. The Triglycerides cholesterol, high density lipoprotein cholesterol and Low density lipoprotein cholesterol High density lipoprotein cholesterol ratios were increased significantly in the coronary heart disease groups. Triglycerides and high density lipoprotein cholesterol ratio was a significant surrogative marker for Small dense LDL levels, It may be useful for choose the patients to starts an

earlier and aggressive treatment for prevent the progression atherosclerosis and coronary vascular events.

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