



AN OVERVIEW OF CORRELATION BETWEEN LIPID DISORDER AND DIABETES MELLITUS TYPE 2

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Abstract:

Diabetes mellitus (DM), a persistent metabolic noncommunicable disease (NCD), has reached pandemic levels globally. Diabetes is defined by the presence of long-term high blood sugar levels and disruptions in the way the body processes carbohydrates, lipids, and proteins. Our objective was to investigate the correlation between blood lipid levels and the development of type 2 diabetes (T2DM). T2D individuals have dyslipidemia, a condition characterized by abnormal lipid metabolism. Individuals in the middle-aged and older age groups who have elevated levels of triglycerides, cholesterol, and low levels of HDL-C are more susceptible for developing diabetes.

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Introduction:

Diabetes mellitus (DM) is a collection of metabolic illnesses that are characterized by hyperglycemia. This hyperglycemia can be caused by deficiencies in insulin function in the liver and peripheral tissues, insulin production from pancreatic beta cells, or for both of these variables. The incidence of type 2 diabetes is influenced by nutritional status [1].

At the current rate of significant growth in its prevalence, there will be 700 million additional individuals between the ages of 20 and 79 who have type 2 diabetes in the year 2045 [2]. A number of earlier research have attempted to establish a correlation between the levels of glucose in the blood and the characteristics of the serum lipid profile. According to the findings of research, the proportion of body fat that is responsible for the rise in the incidence of this illness among all aspects of the body is mostly fat [2].

One of the most significant contributors to cardiovascular problems in those who have type 2 diabetes is dyslipidemia. Patients with diabetes often have raised levels of plasma triglycerides (TG), low levels of high-density lipoprotein, or HDL, cholesterol levels, and high levels of low-density lipoprotein (LDL) cholesterol [3]. This condition is defined by excessive levels of all three types of cholesterol. While TGs are engaged in a large number of individual molecular species, lipoproteins are involved in a large number of other lipid classes that comprise many molecular species. However, the significance of the individual molecular types in type 2 diabetes is yet unclear [3]. Diets that are high in calories but low in fiber contribute to the accumulation of fat in type 2 diabetes, which in turn produces insulin resistance and leads to lipotoxicity. Those who have type 2 diabetes are more likely to have alterations in their lipid molecules because of an increase in the degree of fatty acid flow that is caused by resistance to insulin [4].

When it comes to people who have type 2 diabetes mellitus, early detection and management of lipid abnormalities can help reduce the risk of atherogenic cardiovascular illness and cerebrovascular accident. The purpose of this review was to investigate the relationship between having a higher cholesterol level and having type 2 diabetes.

Overview:

Diabetes can be influenced by several variables that impact the levels of lipids in the blood, due to the interconnectedness of glucose and lipid metabolism. Consequently, any disruption in the

process of glucose metabolism results in a disruption in the process of lipid metabolism, and vice versa. The majority of people with T2DM have insulin resistance as a main problem. Insulin resistance, when combined with hyperinsulinemia, is highly indicative of the future development of type 2 diabetes in patients without diabetes [5]. Multiple studies have demonstrated that insulin influences the development of apolipoproteins in the liver and controls the activity of the lipase enzyme and the cholesterol ester transport protein. This, in turn, leads to dyslipidemia in individuals with diabetes mellitus. In addition, a lack of insulin decreases the functioning of hepatic lipase and various stages in the synthesis of physiologically active lipoprotein lipase [1,3,5]. Hypertriglyceridemia commonly coexists with reduced levels of HDL cholesterol, which is also a notable characteristic of aberrant lipid levels observed in persons with diabetes. The lipid abnormalities linked to type 2 diabetes mellitus (T2DM) are marked by elevated levels of triglycerides (TG) and tiny, dense low-density lipoprotein (LDL) particles, as well as reduced levels of high-density lipoprotein (HDL) cholesterol. The correlation between decreased levels of HDL cholesterol and an elevated risk of heart disease is firmly established, regardless of TG levels and other risk factors [6]. The potential cause of hypertriglyceridemia may be attributed to heightened hepatic excretion of very low density lipoprotein (VLDL) and sluggish elimination of lipoproteins rich in triglycerides. This is primarily caused by elevated levels of substances that serve as building blocks for triglyceride synthesis, namely free fatty acids and glucose [6]. Correlation studies indicate a strong link between high blood sugar levels (hyperglycemia) and the development of abnormal lipid levels (dyslipidemia). Several recent investigations have confirmed the findings of a previous research, indicating that when blood sugar management is sufficient, the level of total cholesterol is often within the normal range or close to it. However, if control deteriorates, the cholesterol level tends to increase [7].

T2DM is now acknowledged to be associated with dyslipidaemia. A comprehensive investigation done in the USA among middle-aged persons has revealed a substantial correlation between low levels of HDL and increased TG levels and the onset of diabetes [6].

A cohort research conducted on the Korean population revealed that increased levels of total cholesterol (TC), LDL, and TG were identified as separate risk factors for the start of new cases of

type 2 diabetes mellitus (T2DM).⁵ Furthermore, a growing body of research has shown that combined lipid markers, such as non-HDL-C, TG/HDL-C, LDL-C/HDL-C, and TC/HDL-C, are related with type 2 diabetes mellitus (T2DM) and have a greater predictive value for the occurrence of T2DM [8]. Presently, the World Health Organization (WHO) and International Diabetes Federation (IDF) employ the phrase "Metabolic Syndrome" to delineate this aggregation of illnesses [9]. Diabetic dyslipidemia refers to a combination of elevated triglycerides, decreased high density lipoprotein (HDL), and an abundance of tiny, dense low density lipoprotein (LDL) particles. Lipid abnormalities are common in diabetes mellitus due to the impact of insulin resistance or shortage on crucial enzymes and pathways involved in lipid metabolism [9]. Chronic uncontrolled hyperglycemia in diabetics leads to the development of micro-vascular and macro-vascular problems, such as cardiovascular disease (CVD), retinopathy, nephropathy, and neuropathy. Studies suggest that the lipid particles seen in diabetic dyslipidemia may have a higher tendency to cause atherosclerosis compared to other forms of dyslipidemia [8,9]. The causal relationship between atherosclerosis and dyslipidemia is widely recognized. Diabetes is characterized by elevated blood sugar levels, obesity, and alterations in insulin levels, all of which greatly expedite the development of atherosclerosis [10]. A recent study found substantial correlations between higher baseline HbA1c levels and increased risks of coronary heart disease, stroke, and all-cause death. The study included almost 11,000 people from the Atherosclerosis Risk in Communities Study. A substantial correlation was seen between fasting blood glucose levels and the occurrence of coronary heart disease, stroke, or mortality from any cause in those with HbA1c values below 6.5% and those equal to or more than 6.5% [10]. Previous research have sought to establish a correlation between blood glucose levels and serum lipid profile characteristics. These investigations have shown that patients with a lowered risk of micro-vascular problems have lower HbA1c values [11].

Conclusion:

Multiple studies have identified specific associations between key lipid fractions and the likelihood of developing type 2 diabetes mellitus (T2DM). Older individuals with elevated levels of cholesterol and triglycerides and low levels of HDL-C are more susceptible to developing insulin resistance. Several studies have demonstrated that lipoproteins can impact β -cell insulin production and glucose metabolism, suggesting that

dyslipidemia contributes to the onset of diabetes. The alterations in lipid molecules that occur in T2D are thought to be caused by an elevation in fatty acid flow due to resistance to insulin.

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