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CHOLESTEROL TRIGLYCERIDES AND THEIR RELATION SHIP DIABETES

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Abstract:

This study composes two parts:

First: The importance of the research:

Attention is drawn to the fact that diabetics do not only need drug treatment, but rather other factors that help them to continue compatibility with the disease and its complications, such as: ego strength. The environment surrounding the patient, and a diet. The importance of the study in terms of dealing with diabetes and its health and psychological danger to patients in the current era (the sixth disease in the world in terms of mortality rate).

The importance of the study in terms of addressing an interventional method to improve the level of diabetes, fat and cholesterol in diabetics by applying some treatment Background: Previous studies have suggested that elevated triglyceride levels may precede the appearance of glucose metabolic disturbances in adults; nonetheless, this hypothesis has not been tested in children. Hence, we evaluated whether hypertriglyceridemia is associated with impaired fasting glucose (IFG) in normal-weight children

Second: the research problem:

A person in his life is not free from maladjustment, as a person is exposed throughout his life to many physical and psychological pressures and problems that affect his compatibility process, such as his exposure to chronic psychological or physical diseases. Where the individual needs to make more effort to reach a state of full compatibility, and among these diseases, diabetes, and this study deals with diabetes as a chronic disease that the sufferer needs to be able to adapt in his daily life, knowing that this disease is common, and results in acute and chronic symptoms and complications in different body systems, and it may affect the patient's psychological state and other diseases such as high fat and cholesterol. Diabetes is one of the psychosomal disorders that have high rates among different groups of society, and its prevalence increases with age, especially among males.

Introduction

Coronary disease has the increased incidence of cardiovascular disease (CVD) in diabetes, the greater case fatality and 1-year mortality in patients with myocardial infarction strongly suggest that preventive lipid lowering therapy is of great importance.

Cholesterol is a waxy substance that is made by the body and found in some animal-based foods. Blood cholesterol levels describe a group of fats also known as lipoproteins which includes HDL-C, or "good" cholesterol and LDL-C or "bad" cholesterol. Cholesterol is important to overall health, but when levels are too high, cholesterol can be harmful by contributing to narrowed or blocked arteries.

Unfortunately, people with diabetes are more prone to having unhealthy high cholesterol levels, which contributes to cardiovascular disease (CVD).

By taking steps to manage cholesterol, individuals can reduce their chance of cardiovascular disease and premature death

Triglyceride is the most common type of fat in the body. Normal triglyceride levels vary by age and sex. A high triglyceride level combined with low HDL cholesterol or high LDL cholesterol isassociated with atherosclerosis, the buildup of fatty deposits in artery walls that increases the risk for heart attack, peripheral artery disease (PAD) and stroke.

Diabetes tends to lower "good" cholesterol levels and raise triglyceride and "bad" cholesterol levels, which incre. ases the risk for heart disease and stroke. This common condition is called diabetic dyslipidemia

Diabetic dyslipidemia means your lipid profile is going in the wrong direction It’s a deadly combination that puts patients at risk for premature coronary heart disease and atherosclerosis.

Studies show a link between insulin resistance, which is a precursor to type 2 diabetes, and diabetic dyslipidemia, atherosclerosis and blood vessel disease. These conditions can develop even before diabetes is diagnosed.

Learning how to prevent and treat abnormal cholesterol levels is an important step in maintaining optimum health.

Definition of diabetes: It is a defect in the process of the presence of glucose in the human body and this is a disorder in the pancreas, which causes a lack of secretion of insulin, a lack of secretion of it, or a decrease in the effectiveness of insulin, which causes an increase in blood sugar, disturbances in the metabolism of carbohydrates, proteins and fats (1996, Nettina. (1303)Diabetes has been defined as: “a permanent disorder of the metabolism that causes an increase in the level of glucose concentration in the blood, and responsible for this increase is the absolute or relative deficiency of insulin” (Ali, 2001, 9).It is a metabolism disorder that results from either an inability to secrete the hormone insulin or from an unusual resistance to this hormone in the body, which leads to a rise in the blood sugar concentration above the normal level, reaching above (1.26 g) in the case of fasting (240, 2000 Polonovski)

Diabetes genesis

Diabetes has been known for about three thousand years and it was called in the second century AD the word (Diabetes Mellitus), which is a Latin expression meaning the word (Diabetes), passing something and the word (Mellitus) meaning honey, and this means generating large quantities of sweet urine. Diabetes is a condition in which the level of blood sugar in the blood glucose exceeds a certain limit due to the lack of the body's ability to benefit from carbohydrates due to any reason (pickles, 1984, 174)

As for the prevalence of diabetes according to gender, studies indicated that the proportion of men and women is approximately equal in exposure Diabetes mellitus, especially in urban settings (Radwan B, 2002,

57) .The prevalence of diabetes in Syria among those over the age of (15) years is estimated to be (19.5%), meaning that the number of patients is close to one million patients in 2010.

Diabetes is one of the most common diseases among people, and the incidence of it is about (10%) all over the world, and the cause of this disease is a partial or complete defect in the secretion of the hormone insulin, which leads to an increase in the level of sugar in the body more than the normal level (next, 2010, 29)

A World Health Organization report revealed that about (80%) of deaths that occur among diabetics "occur in low- and middle-income countries, which means either the lack of drugs needed to treat diabetes in those countries, or The population is not concerned with the seriousness of complications arising from the disease. In a statement on the occasion of the celebration of the "World Diabetes Day", the United Nations organization stated that "the number of people with diabetes in all parts of the world is currently about (220) million people," warning that this number has It will more than double by the year 2030, if measures are not taken to prevent this(WH0, 2001, 77) according to the statistics presented by the Lebanese Endocrine Society Conference held in Beirut from (3-6 June 2005) that Organized by the

Sanovia Vantes International Foundation, with the participation of doctors From Syria, Lebanon, Jordan, Iraq, the Emirates and Egypt, the death rate due to this disease is about (3.1%) of the general death rate (64, 2005, Annual Report)

The importance of this disease comes from its complications, which constitute about (25%) of the cases that lead to kidney failure and (50%) cases of amputation in the lower limbs, and diabetes is the main cause of vision loss for about five thousand new cases every year (Hashem and Basha, 1988 , 139).

Diabetes mellitus and the fate of the person suffering from it depends on thebehavior of the patient himself. From the above, it is clear how dangerousdiabetes is and how widespread it is in the world, and that it is not limited to aspecific age or gender without the other, which makes scientists and doctors all over the world care about this disease and work to conduct studies that help diabetics to coexist and be compatible with this disease and reduce Its complications are dangerous.



The scientific explanation of diabetes

The pancreatic gland is the site of malfunction in diabetes, insulin is one of the secretions secreted by the pancreas, and the first function of insulin is that it helps the use of glucose, and when this function is lost for some reason, diabetes appears (Clark, 1963, 216).

And confirms this (726, 1996, Nettina, who indicated that the main defect in diabetes is in the percentage of insulin secreted from the pancreas, and that percentage increases when a person consumes heavy meals, especially those containing sugars, and the normal level of sugar and glucose in the blood must be preserved. What happens in diabetes is one of the three, either insulin is not secreted from the pancreas completely, or its secretion is less than the level required by the body's need, or insulin secreted from the pancreas is not used in the cells of the human body for any reason (Radwan B, 2002, 57).

The pancreatic gland and the hormone insulin:

The pancreatic gland is responsible for secreting insulin, and it is one of the double-juice glands, ductal and ductal, which determines the percentage of insulin secretion according to the position of the body, and the vagus nerve intervenes in adapting the necessary insulin secretion to the body. The pancreatic gland is 14-18 cm long (Rouiha, 1973, 10)

Insulin is a protein hormone of origin that is secreted by beta cells in the pancreas, and the secretion of insulin is affected by an increase or decrease in response to several things, including increased secretion of special hormones such as: adrenaline and growth hormone and others, as it leads to an increase in the human need for insulin, as well as emotional disorders, and also obesity requires increased secretion Insulin, muscle exertion and diet reduce past insulin secretion, 1998, 29-30

The function of the hormone insulin:

the importance of insulin in the metabolism necessary for human carbohydrates. Carbohydrates are used to provide the body with the heat and energy required to carry out the effort required of it (Moqbel, 2010, 30) It helps in converting fatty acids, which are products of digestion, into fats, which are stored in the body's fatty tissues. And also, converting them into proteins, which are substances that are a mainstay in building tissues and cells, and in their growth, the size of muscles increases (Al-Bakri, 1994, 20). And sugar (glucose) cannot enter the cells in the normal state except with the hormone insulin, and if the insulin hormone deficiency, the accumulation of sugar and glucose in the blood (Al-Homsi, 1985, 152).

From the above, it becomes clear how important the pancreas and the hormone insulin secreted from it, which plays a fundamental role in regulating the level of glucose in the blood,and accordingly, any defect that occurs in that process will play an important role in causing diabetes or in increasing its symptoms and complications in the future.

Types of diabetes

(Hashem and Basha, 1988, 145-148) refer to two types of diabetes in terms of its dependence on insulin:

The first type:

It is called insulin-based ancillary: since there is no insulin secreted through the pancreas, and its cause is usually the destruction of the beta cells in the pancreas that manufacture and secrete insulin, and type I diabetes most of its patients are children and young adults, and this type usually starts between (11- 13) years old and appears urgently with severe symptoms such as nausea, vomiting, and severe dehydration, and some of them initially suffer from increased acidity in the blood. Insulin-dependent diabetes is diagnosed according to the criteria approved by the American Diabetes Association (ADA) (Al-Zahrani, 2006, 13), or the criteria specified in the World Health Organization report (NICE, 2004).

Treatment of type 1 diabetes:

For patients with type 1 diabetes, they need to take insulin daily to survive, and the healthy diet for diabetics is very similar to the diet of people without diabetes. The distribution of carbohydrates eaten throughout the day is flat, and how to divide the time periods between main meals and snacks is a proper division to maintain the stability of the blood sugar level and prevent it from becoming too high or too low. Exercise helps your body to use insulin and reduce blood sugar levels, and exercise and a healthy diet help the patient to get rid of any weight gain. Maintaining a healthy body weight helps prevent high blood pressure and cholesterol and heart disease.

The second type

(non-insulin dependent): In this disease it happens that the body cells defect in absorbing glucose sugar from the blood, so sugar accumulates in the blood fluid in large quantities instead of entering the body cells to provide them with the vital energy needed to carry out their normal functions, so the cells' ability to continue Normal life means health and the continuation of normal life. It is spread among nearly (90%) of those who suffer from diabetes, as it is the most common type and usually begins after the age of forty, it is called adult diabetes, and it can be detected by chance from a transient routine examination or from the patient's complaint of certain symptoms, as it results from a relative lack of Concentration of the hormone insulin in the blood.

Factors that predispose to type 2 diabetes:

In those with "prediabetes" - which may exacerbate and turn into type 2 diabetes and type 2 diabetes, cells resist the effect of insulin action while the pancreas fails to produce enough insulin to overcome this resistance. In these cases, sugar collects and builds up in the circulatory system instead of being distributed to cells in various parts of the body. The direct cause of these conditions is still unknown, but it appears that excess fat, especially in the abdomen - and lack of physical activity are important factors in this occurring. Researchers are still looking for a real and accurate answer to the following question: Why do prediabetes and type 2 diabetes affect certai people and not others. Nevertheless, there are several factors that clearly increase the risk of developing diabetes, including:

- Overweight .
- Lack of physical activity.
- Family history.
- Age: The risk of developing the disease increases with age, especially over the age of (45) (Committee for Patient and Family Education, 2013, 46).
- Hypertension.
- Excessive harmful cholesterol (LDL).
- High levels of triglycerides, which are another type of fat found in the blood.

When these factors appear - hypertension, hyperglycaemia, and blood lipids that are above the normal level - along with obesity (excess weight) there is a relationship between them, together, and insulin resistance.

How is type 2 diabetes treated?

The treatment is based on the following points:

1. Weight loss.
2. Organizing the daily food intake within meals distributed over one day in order to prevent the feeling of hunger and prevent the occurrence of fullness.
3. Control of high blood sugar after food through the type of food and the use of some medicines.
4. Regulating sugar consumption in the body by establishing a structured exercise program.
5. Using some oral medications to stimulate insulin secretion or improve insulin function.
6. Sometimes insulin injections.
7. Educating the diabetic patient to learn methods of controlling his blood sugar and applying the health treatment system (Paradise, Education of

Patients and Their Families, 2013, 31) Treating diabetes correctly means longer life, more active life and better life performance.



There are two other types of diabetes added by some researchers, namely

1. Gestational diabetes: which occurs in some cases of pregnancy as a result of the necessary requirements in the stage of pregnancy, and some of them call this type as "intolerance to carbohydrates in the blood."
2. Diabetes mellitus associated with other symptoms: This type appears as a result of drug abuse, hormonal disorder, or other diseases (& Branner (Suddarth, 1982, 640). All types of diabetes are ultimately either insulin dependent, or non-insulin dependent, and it is not necessarily dependent. On insulin therapy but with other oral drugs.

Diabetes factors:

Factors of insulin-dependent diabetes:

The factors for the occurrence of type 1 diabetes are still not fully understood, and there are multiple factors that can lead to its occurrence, and the most important of these factors are:

1. Immunity factor: The first type is considered Diabetes is an immune disease, as the immune system produces an immune chemical substance called (cytokines) and the composition of this substance is specific, to attack a specific structure or body only, but for an unknown reason, you cannot recognize pancreatic cells known as Beta cells and then attack them Gradually and accelerated, (Al-Hamid, 2007, 15).
2. Genetic factors: As previously mentioned, it is believed that the first type of diabetes is triggered by some type of sepsis (mainly viral) or other types of stimuli on a small scale such as stress or stress and exposure to surrounding environmental influences (such as Exposure to some chemicals or drugs (Wafa, 2005, 34).
3. Medicines and hormones that negatively affect insulin and its secretion (Radwan, 2008, 55).
4. Viral infections: It can be one of the important reasons for the occurrence of type 1 diabetes, especially in people who have a genetic predisposition, and these viruses act as stimulating or auxiliary factors. When a viral infection occurs, the immune system identifies it as a body Strange, so it creates the appropriate antibodies to eliminate them, but for an unknown reason, the composition of this virus from proteins is similar to the structure of pancreatic cells known as (Beta cells), but the immune system does not recognize the difference between them, so it attacks the virus as it attacks the pancreatic cells, Even when viral sepsis ends, the immune system continues to produce antibodies, and then the pancreatic cells continue to be destroyed until they are completely eliminated. There are several viruses involved, including mumps, coxsack virus and rubella (David Sun, 2009, 332).

Diabetes complications:

Diabetes complications occur in a large proportion of patients, but to varying degrees, and their occurrence plays with several things, including the history of the disease or the number of years of infection with it, lack of adherence to prescriptions and an increase in the intake of carbohydrates (Al-Zatma, 1985, 8) (Al-Jadba and Yunus, 1993, 10) identified these complications according to the recommendations of the World Health Organization and include: - Severe complications resulting from a sudden deterioration of the diabetic patient, such as: a coma and acute hyperglycemia. Chronic complications: they are after a period of the occurrence of the disease, and they are:

1. Changes in blood vessels.
2. Changes in the nervous system
3. Changes in the functioning of the kidneys.

And add (Al-Zatma, 1985, 22) to these complications also immunosuppression anddeposition of fat cells around the eyelids. And Marion (1999, 32, Marion) points out that diabetics who do not maintain a moderate level of sugar and glucose in their blood are more likely to develop heart disease, nerve diseases, kidney failure, high blood pressure, and eye diseases.

There are plausible mechanisms and research evidence that support the suggestion that consumption of excess sugar promotes the development of cardiovascular disease (CVD) and type 2 diabetes (T2DM) both directly and indirectly. The direct pathway involves the unregulated hepatic uptake and metabolism of fructose, which leads to liver lipid accumulation, dyslipidemia, decreased insulin sensitivity and increased uric acid levels. The epidemiological data suggest that these direct effects of fructose are pertinent to the consumption of the fructose-containing sugars, sucrose and HFCS, which are the predominant added sugars. Consumption of added sugar is associated with development and/or prevalence of fatty liver, dyslipidemia, insulin resistance, hyperuricemia, cardiovascular disease and type 2 diabetes, and many of these associations are independent of body weight gain or total energy intake. There are diet intervention studies in which human subjects exhibited increased circulating lipids and decreased insulin sensitivity when consuming high sugar compared with control diets.

Diabetes treatment:

It is well known that there is no cure for diabetes, and the aim of the treatment measures followed is to alleviate the symptoms of the disease and to reduce the potential complications that may occur later. (Al-Zatma, 1985, 7) indicates that the first step in the treatment of diabetes should be directed towards Educate patients about diabetes, its acute and chronic symptoms and complications. Among the therapeutic measures for diabetes is what it specified (Nettina, 1996, 743): Introducing the patient to the diet and its importance in reducing the severity of the disease and its complications, in terms of quantity and quality of food. Regular and light physical sports, the best of which is walking. , Giving treatments such as oral tablets or insulin injections, and teaching the patient the characteristics of each treatment and its importance for diabetes. Take care of personal hygiene. Instruct patients about the necessity to see a specialist doctor to monitor diabetes and the effectiveness of treatment. Richard and others (263, 1995, Richard) add to the previous guidelines the following: The patient must know his illness and know what is good and bad for him.Get away from anxiety as much as possible. Self-reliance and non-dependence on others in regulating the level of sugar and glucose in the blood.



Triglycerides:

Triglycerides are one of the types of fats found in the blood. Eating food, your body transforms instantly. Your triglycerides are stored in your fat cells. Later on, it releases the three hormones that go between restaurants. Foods containing foods high in carbohydrates, you may have a high level of triglycerides (hypertriglyceridemia).

Chemical structure:

Triglycerides are tri-esters consisting of a glycerol bound to three fatty acid molecules. Alcohols have a hydroxyl (HO–) group.Organic acids have a carboxyl (–COOH) group. Alcohols and organic acids join to form esters. The glycerol molecule has three hydroxyl (HO–) groups and each fatty acid has a carboxyl group (–COOH). In triglycerides, the hydroxyl groups of the glycerol join the carboxyl groups of the fatty acid to form ester bonds:

$$HOCH2CH(OH)CH2OH + RCO2H + R′CO2H + R″CO2H \rightarrow RCO2CH2CH(O2CR′)CH2CO2R″ + 3H2O$$

The three fatty acids (RCO2H, R′CO2H, R″CO2H in the above equation) are usually different, as many kinds of triglycerides are known. The chain lengths of the fatty acids in naturally occurring triglycerides vary, but most contain 16, 18, or 20 carbon atoms. Natural fatty acids found in plants and animals are typically composed of only even numbers of carbon atoms, reflecting the pathway for their biosynthesis from the two-carbon building-block acetyl CoA. Bacteria, however, possess the ability to synthesise odd- and branched-chain fatty acids. As a result, ruminant animal fat contains odd-numbered fatty acids, such as 15, due to the action of bacteria in the rumen. Many fatty acids are unsaturated; some are polyunsaturated (e.g., those derived from linoleic acid).[4] Most natural fats contain a complex mixture of individual triglycerides. Because of this, they melt over a broad range of temperatures. Cocoa butter is unusual in that it is composed of only a few triglycerides, derived from palmitic, oleic, and stearic acids in the1-, 2-, and 3-positions of glycerol, respectively.[4]

Homotriglycerides:

The simplest triglycerides are those where the three fatty acids are identical. Their names indicate the fatty acid: stearin derived from stearic acid, palmitin derived from palmitic acid, etc. These compounds can be obtained in three crystalline forms (polymorphs): α, β, and β′, the three forms differing in their melting points.

Role in disease:

Main article: Hypertriglyceridemia In the human body, high levels of triglycerides in the bloodstream have been linked to atherosclerosis, heart disease[9] and stroke.[8]However, the relative negative impact of raised levels of triglycerides compared to that of LDL:HDL ratios is as yet unknown. The risk can be partly accounted for by a strong inverse relationship between triglyceride level and HDL-cholesterol level. But the risk is also due to high triglyceride levels increasing the quantity of small, dense LDL particles.[10]

What is the normal range?

A simple blood test can reveal whether or not your triglycerides are at their healthy level, as follows: Normal - Less than 150 milligrams per deciliter (mg / dL), or less than 1.7 millimoles per liter (mmol / L)

Borderline elevation - 150 to 199 mg / dL (1.8 to 2.2 mmol / L) High - 200 to

499 mg / dL (2.3 to 5.6 mmol / L) Very high - 500 mg / dL or higher (5.7 mmol / L or higher) Your doctor usually checks for high triglycerides as part of a cholesterol test sometimes called a lipid profile or lipid profile. You must fast before drawing your blood in order to accurately measure your triglycerides.

Reducing triglyceride levels:

Weight loss and dietary modification are effective first-line lifestyle modification treatments for hypertriglyceridemia.[14] For people with mildly or moderately high levels of triglycerides, lifestyle changes, including weight loss, moderate exercise[15][16] and dietary modification, are recommended.[17]This may include restriction of carbohydrates (specifically fructose)[14] and fat in the diet and the consumption of omega-3 fatty acids[16]from algae, nuts, fish and seeds.[18]Medications are recommended in those with high levels of triglycerides that are not corrected with the aforementioned lifestyle modifications, with fibrates being recommended first.[17][19][20] Omega-3-carboxylic acids is another prescription drug used to treat very high levels of blood triglycerides.[21] The decision to treat hypertriglyceridemia with medication depends on the levels and on the presence of other risk factors for cardiovascular disease. Very high levels that would increase the risk of pancreatitis is treated with a drug from the fibrate class. Niacin and omega-3 fatty acids as well as drugs from the statin class may be used in conjunction, with statins being the main medication for moderate hypertriglyceridemia when reduction of cardiovascular risk is required.[17]

What is the difference between triglycerides and cholesterol?

Triglycerides and cholesterol are separate types of fats that circulate in the blood: Triglycerides store unused calories and provide the body with energy. Cholesterol is used to build cells and certain hormones.

Why are high triglycerides important?

High triglycerides can contribute to atherosclerosis or thickening of the artery walls (atherosclerosis). This increases the risk of stroke, heart attack, and heart disease. Very high triglycerides can lead to severe inflammation of the pancreas (pancreatitis).

High triglycerides are often a sign of other conditions that increase the risk of heart disease and stroke, including obesity and metabolic syndrome. It is a group of conditions that involve too much fat around the waist, high blood pressure, high triglycerides, high blood sugar and abnormal cholesterol levels. High triglycerides could be a sign of:

Having type 2 diabetes or prediabetes Metabolic syndrome is a condition in which high blood pressure, obesity and high blood sugar combine, which increases the risk of heart disease.

Low levels of thyroid hormones (hypothyroidism) Some rare genetic conditions that affect how the body converts fat into energy.

Sometimes, high triglycerides are a side effect of taking certain medications, such as:

- Diuretics
- Estrogen and progestin
- Retinoid

- Steroids
- Beta blockers
- Some immunosuppressants
- Some HIV medicines.

The relationship of triglycerides to diabetes?

Triglycerides do not cause diabetes, but instead their levels indicate that the system for converting food into energy is not working properly, and naturally the body produces insulin, which accompanies glucose, which is a type of sugar in the blood inside the cells, and there the body It converts glucose into energy, and insulin allows the body to use triglycerides for energy production. An increase in carbohydrates in the diet is a common cause of high triglycerides, high TG signals, insulin resistance, and this is when you have an increase in insulin, and blood sugar does not respond in a normal way to insulin, and this results in higher blood sugar levels than usual.

Do fats raise sugar?

That leads to high levels of carbohydrates in the blood. But this study has a different aspect, and the cover of what dietary fats are overlooked: what type

- saturated or polyunsaturated - as well as the effect of fats with carbohydrates.

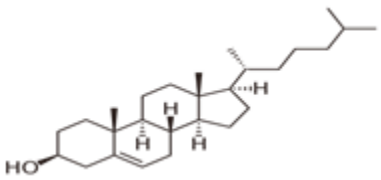
The study journal, in the journal PLOS Medicine, examined 102 different clinical trials? A group consisting of a total of 4220 food groups and a total of two parts from different food groups were included in the study. 9- Meals at the same time, food differentials, sleep, sleep, state, sleep, state, sleep, state, sleep, state, sleepiness,day, activity, copy, sleep, and measles of foods. Some fats have been found to raise blood sugar levels. Hence, fats have little to no effect on blood sugar levels. Foods containing foods found in foods containing foods found in foods.

Cholesterol:

Cholesterol is a waxy, fat-like substance that's found in all the cells in your body. Your body needs some cholesterol to make hormones, vitamin D, and substances that help you digest foods. Cholesterol is mainly comprised of fat and lipoproteins. A lipoprotein is comprised of cholesterol, protein, and fat (triglycedes). Cholesterol comes from two sources. Our body manufactures some cholesterol on its own. In addition, cholesterol comes from animal products, such as milk, eggs, cheese, and meats. Small amounts of cholesterol are important for a healthy cell membrane (good cholesterol), and some cholesterol has been deemed, “the bad cholesterol,” due to these cholesterol particles tends to cause atherosclerosis, or hardening of the arteries. Some cholesterol is “good,” cholesterol, that tends to carry the bad cholesterol away and out the body.

The chemical composition of cholesterol

Technically and chemically, cholesterol is a “steroid alcohol,” namely C27H45OH, and it has the responsibility of moving fluid across cell membranes, and participating in various metabolic functions in the body



Types of cholesterol:

Total Cholesterol

It is the total number of all of the different types of cholesterol in your bloodstream. Generally, the goal for total cholesterol is to keep it under 200 mg/dl. Just because the total cholesterol number is within the normal range, it doesn't mean that the other cholesterol numbers will be in the normal range. Many people with diabetes, for example, have dyslipidemias, and have a combination of low "good" cholesterol, and high "bad" cholesterol. Often the total cholesterol number is in the normal range.



High density lipoprotein (HDL-C)

It is sometimes called "good" cholesterol because it carries cholesterol from other parts of your body back to your liver. Your liver then removes the cholesterol from your body .

Your HDL-C number should be greater than 50 mg/dl. Having a low HDL-C also puts you at risk for cardiovascular disease, and conversely, a high HDL-

C is heart protective. A higher HDL-C will help your body perform a natural cleansing of LDL-C, which is taken out of the body by HDL-C, via the liver. When triglycerides are high, it tends to lower HDL-C in the bloodstream .

Other factors lower HDL-C, including smoking, being overweight, and the lack of physical activity. Also, people with Type 2 diabetes tend to have lower HDL-C. Taking drugs such as steroids and beta blockers for blood pressure can also lower your HDL-C number.

Low density lipoprotein (LDL-C-)

It is sometimes called "bad" cholesterol because a high LDL level leads to the buildup of plaque in your arteries. When you have high LDLC, you are at a greater risk for cardiovascular disease. These are the larger cholesterol molecules that are responsible for plaques forming on the inside of your arteries.

People with high LDL-C should take statin medications, and work with their primary care provider in order to manage their high LDL-C. Interventions for high LDL-C include a diet low in saturated and trans fats, as these kinds of fats can raise your LDL-C. In general, you will want to keep your LDL-C below 100. If you are a high risk patient who already has CVD, your doctor may want you to do intensive therapy and keep your LDL-C less than 70 mg/dl.

Very low-density lipoprotein (VLDL)

Is another type of "bad" cholesterol. Development of plaque on the arteries has been linked to high VLDL levels. It's not easy to measure VLDL, so most of the time these levels are estimated based on triglyceride measurements.

The liver is responsible for making VLDL-C. The liver releases VLDL-C into your blood in order to supply your body with the type of fat called “triglycerides.” About half of a VLDL-C molecule is comprised of fat or triglycerides. High levels of VLDL-C are correlated with plaque formation in the arteries that can restrict or block the flow of blood. You may or may not see this blood value on your cholesterol panel.

Many panels do not include it, due to it is not so easy to measure in the bloodstream. If you do see it on your laboratory report, it is considered elevated if it is greater than 30 mg/dl.

the best way to keep this number low is to keep your triglycerides less than 150 mg/dl. Weight loss and activity will also keep VLDL-C low.

Cholesterol test:

A cholesterol test can give your health care provider important information about the cholesterol levels in your blood. The test measures the levels of total Cholesterol, HDL, LDL and VLDL.

Why do I need a cholesterol test?

Your doctor may order a cholesterol test as part of a routine exam, or if you have a family history of heart disease or one or more of the following risk factors:

- High blood pressure
- Type 2 diabetes
- Smoking
- Excess weight or obesity
- Lack of physical activity
- A diet high in saturated fat

Your age may also be a factor, because your risk for heart disease increases as you get older.

What do the results mean?

Cholesterol is usually measured in milligrams (mg) of cholesterol per deciliter (dL) of blood. The information below shows how the different types of cholesterol measurements are categorized.

Total Cholesterol Level	Category
Less than 200mg/dL	Desirable
200-239 mg/dL	Borderline high
240mg/dL and above	High

LDL (Bad) Cholesterol Level	LDL Cholesterol Category
Less than 100mg/dL	Optimal
100-129mg/dL	Near optimal/above optimal
130-159 mg/dL	Borderline high
160-189 mg/dL	High
190 mg/dL and above	Very High

HDL (Good) Cholesterol Levl	HDL Cholesterol Category
60 mg/dL and higher	Considered protective against heart disease
40-59 mg/dL	The higher, the better
Less than 40 mg/dL	A major risk factor for heart disease

- **Normal VLDL levels are from 2 to 30 mg/dL (0.1 to 1.7 mmol/l).** A healthy cholesterol range for you may depend on your age, family history, lifestyle, and other risk factors. In general, low LDL levels and high HDL cholesterol levels are good for heart health.

Cholesterol and pre diabetes:

A dyslipidemia may clue providers in to the need to test a person for prediabetes or diabetes due to the connection between the insulin resistance in Type 2 diabetes and dyslipidemia.

How does having lower cholesterol prevent diabetes?

Seeing that dyslipidemias appear to be a precursor at least for Type 2 diabetes, it stands to reason that having no dyslipidemia, or having all cholesterol numbers in the normal range, would likely help to prevent the onset of Type 2 diabetes.

Does having higher cholesterol levels present a risk factor for diabetes?

Diabetes has actually been determined to be a coronary heart disease (CHD) risk factor. So just like smoking and inactivity, diabetes predisposes you to CHD. To put this into perspective, the risk for a CHD in a diabetic patient with no previous CHD is the same as for those of people without diabetes, and no heart disease. That's significant. Not only that, but people with diabetes are two to four times more likely to die from a coronary event, with risk of death especially greater in the first 28 days following a coronary event. Women with diabetes were even more likely to die following a coronary event. Research in this area has been replicated, and is reliable.

What are the causes of high cholesterol?

Many different things can cause a person to have high cholesterol levels.

Some we can control, and some we cannot control are:

- genetics
- age
- gender
- certain diseases and conditions that we already have, such as thyroid disorder

there are risk factors for high cholesterol that can be controlled. Interestingly, the same risk factors that can be controlled to bring down high cholesterol also can bring down our risk for diabetes.

They are…

- our nutritional intake, including how much bad and good cholesterol is in the foods we eat
- our weight as extra pounds increase cholesterol levels
- whether or not we are physically active
- whether or not we are taking certain medications

Dangers of high cholesterol and diabetes

There is an increased risk for cardiovascular disease with diabetes. Dyslipidemia or problems with cholesterol compound the problems presented by high blood glucose.

Are there any diets for high cholesterol and diabetes?

Yes, when you have high cholesterol, you should follow a heart healthy diet. You should increase your "good" cholesterol intake, and decrease your "bad" cholesterol intake. Remember, the "good" cholesterol carries the "bad" cholesterol out of your body by way of the liver, so you will want to know how to increase those oils and foods that contain HDL-C, and decrease the foods that contain LDH

Methods:

How to prepare for a blood glucose test?

For a fasting blood glucose test, you can't eat or drink anything but water for eight hours before your test. You may want to schedule a fasting glucose test first thing in the morning so you don't have to fast during the day.

Fasting tests are more common because they provide more accurate results and are easier to interpret. The patient may be asked to stop taking a particular medication before your test temporarily because the medications that can affect your blood glucose levels ..such as:) diuretics ,birth control pills ,hormone therapy ,aspirin ,ect) Severe stress can also cause a temporary increase in your blood glucose.

How to prepare for Cholesterol and Triglycerides tests?

you should avoid eating or drinking anything other than water for nine to 12 hours before your test. If you're taking medications that could increase your cholesterol levels, such as birth control pills, your doctor may ask you to stop taking them a few days before your test. Cholesterol tests are usually done in the morning.

Blood collection...

We need to:

1. Gloves
2. Syringe
3. Tourniquet
4. Cotton
5. Alcohol 70%
6. Container
7. Gel tube
8. Centrifuge

_ Ensure that the laboratory form matches the patient's identity , and ask the patient to extend his arm.

Attaching a tourniquet around the upper arm, pressing moderately on the hand; This is so that the vein protrudes, and the patient is asked to form a fist with his hand so that the veins are more prominent.

Clean the area where the vein is protruding with a 70% alcohol swab for 30 seconds, and leave it to dry completely.

Put the needle into the vein quickly and at an angle of 30 degrees or less. Remove the tourniquet after collecting enough blood. Gently withdraw the needle, and gently press the site with clean gauze, while the arm is extended and raised, with the need not to bend the arm; Because that causes a hematoma.

After removing the needle and opening the tube, the blood is emptied from the syringe, and the blood is pushed against the tube wall without speed to avoid degradation or breakage of the blood during the emptying.

A 5 ml needle was used and 3 ml of the patient's blood were collected in it. It was excreted into a gel tube and then placed in a Centrifuge for 4 minutes at a power 5000(rpm) to separate blood components.

Dispose of gloves, cotton, needles, and syringe in the container

Tools used in the practical procedure

1. Test Tubes
2. Pipette 10 micro
3. Pipette 1000 micro
4. Cuvette

Devices used in the practical procedure

1. Water bath
2. Spectrophotometer

The Material used in the practical procedure

1. Sample (serum)
2. Stander
3. Reagent Note**....** We use the blank tube to zero the spectrophotometer (Blank tube It just contains 1 ml of reagent

Practical procedure for estimating blood glucose levels ...

1. Take two tubes and labelled (sample tube and stander tube).
2. Add 1ml of reagent for each tube .
3. Add 10 micron of serum in sample tube .
4. Add 10 micron of stander in stander tube.
5. Mix.
6. Put tubes in water bath for 10 min .
7. Read absorbance for each tubes by spectrophotometer at 500 nm.
8. Blood glucose concentration is calculated by the following equation

(Concentration of blood glucose =A sample/ A stander ×100 mg/dl) ☆**Normal Range (70 _ 120) mg/dl.**

Practical procedure for estimating total Cholesterol levels..

1. Take two tubes and labelled (sample tube and stander tube).
2. Add 1ml of reagent for each tube .

3. Add 10 micron of serum in sample tube .
4. Add 10 micron of stander in stander tube.
5. Mix.
6. Put tubes in water bath for 5 min .
7. Read absorbance for each tubes by spectrophotometer at 500 nm. 8- Total cholesterol concentration is calculated by the following equation (Concentration of total Cholesterol =A sample /A stander ×200 mg/dl). ☆**Normal Range= less than 200 mg /dl.**

Practical procedure for estimating triglyceride levels ..

1. Take two tubes and labelled (sample tube and stander tube) 2- Add 1ml of reagent for each tube .
2. Add 10 micron of serum in sample tube .
3. Add 10 micron of stander in stander tube.
4. Mix.
5. Put tubes in water bath for 5 min .
6. Read absorbance for each tubes by spectrophotometer at 500 nm. 8- Triglyceride concentration is calculated by the following equation (Concentration of triglycerides =A sample /A stander ×200 mg/dl).

☆**Normal Range= (40-140) Mg/dl.**

The results

Table (1) Show the comparison between Hypercholesterolemia and type II diabetes

The sample	Gender	Age	Glucose	Cholesterol	Triglyceride
1.	Female	60	571	297	252
2.	Male	70	232	325	300
3.	Female	60	385	252	164
4.	Female	50	124	244	166
5.	Female	45	414	208	121
6.	Female	65	188	230	163
7.	Female	65	144	249	148
8.	Male	46	188	230	163
9.	Male	60	251	213	100
10.	Female	65	272	232	153
11.	Female	45	120	216	140
12.	Female	35	363	220	178
13.	Female	68	358	247	174
14.	Female	63	369	231	227
15.	Female	47	454	298	68
16.	Female	54	149	205	114
17.	Female	60	239	244	223
18.	Female	35	336	220	178
19.	Male	46	188	130	163
20.	Female	65	272	232	153
21.	Female	45	120	216	140
22.	Male	52	230	257	189

Table (2) Show the compression between Hypertriglyceridemia and type II diabetes

Sample	Gender	Age	Glucose	Triglyceride	Cholesterol
1.	Male	50	520	535	331
2.	Male	77	529	307	112
3.	Male	50	138	390	247
4.	Female	53	227	573	185
5.	Female	48	199	369	187
6.	Male	70	232	325	300
7.	Male	47	207	353	159
8.	Male	50	261	319	230
9.	Male	51	238	309	230
10.	Male	45	288	321	209
11.	Male	65	123	316	133
12.	Female	50	217	384	315
13.	Male	60	180	409	295
14.	Male	47	137	376	305
15.	Female	57	212	356	154
16.	Female	46	295	226	196
17.	Male	52	122	222	219
18.	Male	55	199	274	179
19.	Male	54	164	274	179
20.	Female	62	369	227	221
21.	Male	50	287	229	210
22.	Female	65	155	276	217
23.	Female	60	571	252	247
24.	Female	66	286	272	177
25.	Male	55	166	275	200
26.	Female	65	364	212	198
27.	Female	53	275	211	127
28.	Male	66	208	271	185
29.	Female	40	385	216	168
30.	Female	45	414	297	143
31.	Male	42	350	251	185
32.	Male	45	278	258	211
33.	Female	44	336	288	221
34.	Male	50	250	242	211
35.	Female	65	385	249	154
36.	Female	65	175	282	191
37.	Female	65	346	213	199
38.	Male	54	275	221	127

Table (3) Show the type I diabetes relationship with cholesterol and triglyceride

Sample	Gender	Age	Glucose	Triglyceride	Cholesterol
1.	Female	**1**	**176**	101	203
2.	Male	12	443	185	211

3.	Female	1	207	196	111
4.	Male	9	188	230	163
5.	Male	11	482	194	94
6.	Male	21	176	181	467
7.	Female	25	336	220	178
8.	Female	12	495	147	101
9.	Female	19	319	192	60
10.	Male	6	327	247	117

Table (4) Show the normal ranges of cholesterol and triglyceride with type ll diabetes.

Sample	Gender	Age	Glucose	Triglyceride	Cholesterol
1.	Female	40	288	163	82
2.	Female	65	291	190	162
3.	Male	67	262	63	58
4.	Female	40	260	167	198
5.	Male	40	273	171	153
6.	Female	56	291	140	194
7.	Female	40	224	178	136
8.	Female	49	255	156	184
9.	Female	45	414	197	121
10.	Male	60	252	181	100
11.	Male	65	163	184	141
12.	Female	62	311	177	172
13.	Female	47	454	198	68
14.	Male	38	177	141	165
15.	Female	52	300	182	168
16.	Female	55	265	144	63
17.	Female	50	231	150	93
18.	Male	57	164	165	189
19.	Male	65	225	186	76
20.	Male	47	245	110	121

The discussion

We collected 90 samples from the diabetes health centre and hospitals, and after conducting the analyzes, the results showed us as shown in the following tables:

In Table (1), there are 22 samples of people with type 2 diabetes who showed us high levels of total cholesterol and blood sugar, and high diabetes in turn leads to a low level of good cholesterol and an increase in bad cholesterol. This means that fatty deposits will form inside the walls of blood vessels, and these deposits will be obstructed, Eventually, the blood flow in the arteries stops, and the heart's blood supply stops, leading to a heart attack. Or stop the supply of blood to the brain, leading to a stroke. It appears in Table (2) that 38 samples of people with type 2 diabetes suffer from high triglycerides. The result is high blood sugar, and this is likely due to the relationship of high fat to hindering the production of the enzyme GnT-4a, which helps the beta cells responsible for secreting insulin to absorb glucose and know its percentage in the blood.

Among the samples that were analyzed for people with diabetes type 1 children and young adults. Table (3) shows the results, where they were almost normal levels of cholesterol and triglycerides, because the main cause of type 1 diabetes is either genetic or when your immune system attacks Insulin-producing beta cells in the pancreas and destroys them. In Table (4) the results of 20 samples of people with type 2 diabetes showed normal levels of both cholesterol and triglycerides, and the reason for this type is likely for two main factors: the inability of the pancreas to secrete a sufficient amount of insulin, the hormone responsible for regulating the movement of sugar into cells or that the cells do not respond to the hormone insulin properly and therefore absorb a small amount of sugar. Through our discussion, it becomes clear to us that the increase in the number of people with diabetes, especially the second type, is that cultural awareness and diet, which are almost non-existent among members of our society, and the nature of life and the harsh conditions in which the people of this country live.

T2DM may trigger disorders whereby the majority of the lipid profile results are abnormal; for example, among the sample we collected 89% of the patients had dyslipidaemia in this study. This shows that dyslipidaemia was prevalent in most of the diabetic patients. The most affected lipid profile component in DM is HDL, as the lack of insulin action increases triglyceriderich molecules, which increase the exchange of the HDL to LDL and accelerate its excretion, as evidenced by the 40% of male and 49% of female T2DM patients who had higth HDL. The entire group of T2DM patients had poor control of the, diabetic disorder

Correlation between Glucose and Lipid Profile:

There was a significant positive linear correlation between elevated blood glucose and total cholesterol, triglycerides, LDL and negative correlation between glucose and HDL -C. This is an important finding which shows that hyperglycem ia is closely associated w ith hypercholesterolemia, hypertriglyceridemia, elevated LDL, and reduced HDL which are all docum ented as risk factors for CHD.

Therefore diabetic patients w ith lack o f diabetic control (high FBS) have higher lipids, less HDL cholesterol. This also points to the significance o f control o f blood glucose in diabetic patients.

In addition, correlation studies w ithin the lipid groups also showed interesting results. As cholesterol increased, it was accompanied with increase in triglyceride, LDL and aw hile HDL decreased. Similar findings with triglyceride levels, w hich correlated positively w ith VLDL and LDL, but negatively with HDL. These results stress the need for control o f plasm a cholesterol and triglyceride levels in order to have lower LDL levels and elevated HDL levels. These latter two parameters (Low LDL and high HDL) are also protective against CHD. This shows that the various lipids and lipoproteins are closely correlated w ith each other, and control o f one influences the others.

This is in agreement with the reports o f (El- Hazmy and W arsy 1994 and Hague.,1994). That long-standing hyperglycemia rather than blood glucose level is broadly related to the diabeti complications seen in the diabetics. The correlation analysis carried out in this study showed that increases in the durationo f diabetes, glucose and lipid values were significantly increased. This increase may due to poor glycemic control and age-related pathology w ith duration o f diabetes are thought to accelerate degenerative changes in a cooperative m anner (Kitabchi and Bryer., 1997; Colwell., 1996).

Does high cholesterol cause diabetes?

Diabetes is what helps increase cholesterol due to disturbing the balance of healthy fats and unhealthy fats in the body, however, high triglycerides (as in cases of obesity) may lead to an increase in fats around the body cells, which causes insulin inability to enter these cells, which may be It causes type 2 diabetes

CONCLUSIONS AND RECOMMENDATIONS

Conclusions:

- Serum levels o f cholesterol, triglyceride, LDL-cholesterol and very low VLDL-cholesterol elevated in diabetic patient compared to non- diabetic subjects.
- Low level o f serum HDL-cholesterol in diabetic patients com pared to nondiabetic subjects.
- There is a relation between levels o f lipids and duration o f diabetes. Inversely correlations were found between triglyceride and H D Lcholesterol may be due to dyslipidemia.
- N o gender differences in lipid profile observed in diabetic patients.
- Patients healthcare and public awareness is very low and m ost patients are not controlled and they are unaware o f their condition
- The majority o f diabetic patients are unaware o f their healthcare.
- Diabetic dyslipidemia or atherogenic dyslipidemia is characterized by low HDL, high TG and high small dense LDL. Early screening of diabetic patients for dyslipidemia and early intervention is required to minimize the risk of future cardiovascular mortality.

Recommendations:

- Measurement o f serum lipid profile should be introduced to the management plan o f diabetes.
- To establish regional and national training courses for diabetic educators and creation o f new evidence-based management plan for diabetics in Sudan for better healthcare.

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