

Different Complications of Diabetes Mellitus on Human Body: A Review

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Abstract

Diabetes is very serious metabolic disorder which occurs by high blood sugar level. This disorder cause many symptoms in human body like excessive thirst, frequent urination, weight loss, sweating and blurred vision. Diabetes is very fast growing disease in adult due to bad lifestyle two most common diabetes type 1 and type 2 both are cause by different factors like lifestyle genetic. Type 1 diabetes is autoimmune disorder and destruction of insulin produces by beta cells. It occurs at 20 years old and Type 2 diabetes occurs at any age but mostly in adult. There are various effects by diabetes in human body's part like eye, kidney, liver, heart, nerve damage and male reproductive system.

Diabetes is cured by many drugs like metformin, acarbose, tolbutamide and glipizide and the last insulin is the main treatment. There are many therapies included in this project like diet and exercise therapy, combination drugs therapy and novel drug delivery system for insulin. There are various complications occur after diabetes like diabetic retinopathy, neuropathy, blurry vision and sexual dysfunction.

Keywords: Excessive, urination, autoimmune, metformin, retinopathy, neuropathy, dysfunction, tolbutamide, glipizide, acarbose.

Introduction

Diabetes is a disorder which occurs due to insufficient level of insulin that causes high blood sugar level in body. Glucose is a source of energy that comes from foods and Insulin is a hormone which helps to decrease blood sugar level. Blood sugar level often increases after meal.

There are two main type of diabetes Type 1 diabetes it is estimated insulin dependent and Type 2 diabetes is non insulin dependent, both have different symptoms and causes. Management of type 2 diabetes by exercise, physical activity, walking and cycling because type 2 diabetes patients are over weighted and obese problem which is also lead to cardiovascular and hypertension disease.

There are two types of Diabetes

1. Type 1
2. Type 2

Type 1:- Diabetes is an autoimmune disease and insulin dependent diabetes. It mostly occurs in juvenile phase under the age of 20 years. It is treated by periodic insulin treatment. Insulin is a hormone which is secreted by beta cells for converting glucose to glycogen (glycogenesis).

Symptoms of Type 1 diabetes -

1. Sweating
2. Fatigue
3. Hunger
4. Frequent urination
5. Excessive thirst
6. Sleepiness
7. Nausea

Causes of Type 1 Diabetes-

1. Frequent urination cause dehydration.
2. Weight loss due to frequent urination.
3. Ketoacidosis due to insufficient intake of sugar.
4. Damaging nerves due to high blood sugar level.

Type 2:- It is non insulin dependent diabetes and insufficient level of insulin.

Approximately 6.5 percent in a total population is of adult. The two basic factors are responsible for diabetes metabolic and heredity. The first classification of diabetes was published in 1979.

Symptoms of Type 2 Diabetes-

1. Headache
2. Excessive thirst
3. Dry mouth
4. Obesity
5. High blood pressure
6. Frequent urination
7. Weight loss

Etiology

Diabetes is a metabolic disorder which is based on insulin. There are two types diabetes Type 1 diabetes is based on weak immune system if body is not able to fight against infection and desolate the beta cell which produces insulin. It occurs under the age of 20 years old and In Type 2 diabetes insulin is not working against blood sugar level and insufficient level of insulin. 80 to 90 percent decreases the insulin level. Obesity is one of the common problems with type 2 diabetes. Quite specific nutrition-related environmental factors have an effect on the improvement of kind 1 insulin structured diabetes and sort 2 non-insulin based diabetes. IDDM is characterized by using innovative beta-cell destruction which leads to complete insulin deficiency, at the time of prognosis eighty-ninety percent of beta cells had been destroyed, in youngsters there may be epidemiological proof that high intake of nitrites and N-nitro compounds, early introduction of cow's milk to the food plan

and short length or absence of breastfeeding boom the danger of IDDM. NIDDM is characterized via insulin resistance that's complex by impaired insulin secretion at the time of appearance of hyperglycemia and clinical diabetes. Its preclinical improvement is insidious and poorly defined, and there is little direct evidence that the identical elements which impact metabolic control in clinical diabetes additionally type, is not unusual in those who broaden NIDDM, and weight manipulate with the aid of appropriate eating regimen and physical exercise might be the most crucial degree for preventing NIDDM. High (saturated) fats intake seems to be related to insulin resistance, weight problems and extended hazards of NIDDM, diets high in carbohydrate seem to protect from glucose intolerance and diabetes especially because of their high fiber content.

Pathophysiology

The Pathophysiology is diabetes involve sugar concentration in blood. Diabetes is a disease of inappropriate level of insulin which cannot able to control blood sugar level. In Type 1 destruction of beta cell which is auto immune program and type 2 diabetes functioning of beta cells is reduces 50 percent and insulin resistance in front of blood sugar. These complications are occurs micro-vascular, macro-vascular and various muscles due to uncontrolled blood pressure and affects many parts of body like kidney nerve liver eye ear. And after diabetes body suffer from many problems like weakness fatigue thirst frequent urination. As we research extra about the Pathophysiology of diabetes, we discover that there is more but to be located. Diabetes is a syndrome with disordered metabolism and irrelevant hyperglycemia due to both a deficiency of insulin secretion or to aggregate of insulin resistance and insufficient insulin secretion to compensate. Type-1 diabetes is due to pancreatic islet B cellular destruction predominantly with the aid of an autoimmune process, and these humans are vulnerable to Ketoacidosis. Diabetes can result in serious complication, resulting in more than one sicknesses or problems that affect a couple of systems that can result in premature demise.

Normal pathology of the human body in human beings which are healthful, the pancreas, an organ placed at the liver and belly, secrete digestive enzymes and the hormone insulin glucagon into the bloodstream to govern the quantity of glucose inside the frame. The launch of insulin into the blood lowers the levels of blood glucose (simple sugars from food) through permitting glucose to enter the frame cells, in which it is metabolized. If blood glucose stages get too low, the pancreas secretes glucagon to stimulate the release of glucose from the liver. The upward thrust in blood glucose degrees indicators important cells within the pancreas, known as beta cells, to secrete insulin, which pours into the bloodstream. Within 20 minutes after a meal insulin rises to its peak degree. Insulin enables glucose to enter cells in the body, mainly muscles and liver cells.

Methodology

- **Diabetes effect on human eye –**

Diabetes cause blurry vision in eye Due to high sugar level in your blood it can damage retina which are help in detection of light and also damage many blood vessels. And then patients suffer from blurry vision and due to high blood sugar level cause problem in blood vessels and cause problem in

vision. 70 percent diabetic patients are suffering from this problem. This article provides information about effects of diabetes on eyes.

Retinopathy is one of the most common diseases in this condition blood flow in tissues which results in retina vascular disease and cause problem in vision. This is also classified in two categories proliferative and non proliferative.

- **Nerve Damage by diabetes-**

Diabetes damages blood vessels and nerve. When the sugar level increase in blood in decrease size of vessels and then blood are not able to supply in sufficient level which result in high blood pressure and rupturing the blood vessels. It is also known as neuropathy. Diabetic neuropathy is a very complicated disorder, 50 percent of diabetic patients are suffer from this complication. It leads to decrease the blood circulations. Peripheral neuropathy is loss of feeling such as touch, pain, temperature etc.

Symptoms of Peripheral neuropathy

1. Lack of awareness
2. Infection and ulcers
3. Cramps
4. Burning sensation

- **Diabetes effect on liver –**

.Liver is the largest organ of human body which is approximately 1.4 kg in adult it is located right side of the body and liver play key role to regular blood sugar level, body detoxification and liver metabolizes many biomolecules like fats, carbohydrate, protein and the main role of liver to secrete bile which are help in digestion or breaking down RBC and fats but in the case of diabetes liver are not able to function as comparison to normal liver and if fat level increases in liver by eating excess level of refined sugar which result in the form of fatty liver.

Diabetes increases the risk of nonalcoholic fatty liver disease by buildups of fat in liver without any alcohol consumption. This occurs mostly in type 2 diabetes due to obesity factor. Hypertension and high cholesterol level increases the risk of nonalcoholic fatty liver disease. In this condition, the size of liver increases as a scarring which develop the risk of type 2 diabetes.

How to protect yourself from fatty liver disease

1. Avoid alcohol consumption.
2. Weight loss
3. Workout and physical activity

- **The effects of Diabetes in pregnancy-**

As we know in diabetes blood sugar level increases due to deficiency of insulin. In pregnancy diabetes may lead to gestational diabetes if diabetes before pregnancy it is called pre gestational

diabetes in this condition. It is very difficult to stabilize blood glucose level which create problem in developing baby body and sometimes it lead to baby death.

Symptoms of gestational diabetes

1. Weakness
2. Weight gain
3. Delivery of baby before correct timing
4. Physical activity decreases
5. Fatigue

• Effects of Diabetes on Heart

As we know in diabetes the blood sugar level increase in body which increase the risk of blood vessels damage, insufficient oxygen level in body and imbalance of nutrients due to build up of sugar in blood or narrowing of blood vessels which decreases the blood circulation which increases the risk of heart attack and atherosclerosis and also effect other parts of the body like arms, peripherals vascular disease and physical activity.

• Effect of diabetes on cholesterol

In the treatment of diabetes the bile composition formation cause gall stone. Atherosclerosis occurs in diabetes by increasing the level of plasma lipid and plasma triglycerides. In the diabetic patients the cholesterol absorption is very low but the formation of cholesterol in body is high. Decreasing the weight increases the absorption of cholesterol.

• Effects of diabetes on kidney

As we know in diabetes blood sugar level increase which are not good for kidney health it narrowed the vessels of kidney or even sometime damage the vessels which results in protein excretion in urine or increases the pressure in units of kidney which are use in filtering the blood and type 1 diabetes damage the kidney within 3 to 5 year. The diabetic kidney disease is known as nephropathy.

• Effects of diabetes on spermatogenesis

Male fertility dysfunction is one of the very important effects of diabetes where quality of sperm are effected and also decreases sex drive of patient but not effects the volatility. Sperm metabolism of glucose helps in formation of sperm which help in transporting haploid male DNA to female DNA. Adenosine tri phosphate (ATP) helps sperm motility. Various biomolecules are used as an energy sources like glucose, fructose and zinc. Sperm cell divides in three parts top piece, mid piece and end piece. Top piece contain acrosome, centrioles and nucleus.

Acrosome involves GLUT1, GLUT2, GLUT8 and GLUT9b.

Mid piece involve GLUT3, GLUT5, GLUT8, GLUT9a and GLUT9b

End piece involve GLUT1, GLUT2, GLUT5, GLUT8 and GLUT9b

- **Effects of diabetes on foot**

Diabetic patients suffer from one of the most common effects foot ulcer and damage of feet. Neuropathy is nerve damage where loss of feeling like hot, cold, pain and touch etc. Loss of sensation cause various risk of injury and blisters. It occurs at a sole of feet in the form of edema and ulcer which create various problems like walking, wearing shoes and any other physical activity. In diabetic foot blood vessels are blocked due to deposition of fats as ischemia.

Diabetic foot care

1. Proper clean your foot to protect from infection.
2. Regular exercise of your foot.
3. Regular check your foot.
4. Protect from extreme temperature.
5. Take proper food with low sugary and fats.

- **Effects of diabetes on salivary gland**

Diabetes is a disorder of high blood sugar level chronic disease. It effect the salivary gland functioning and reduce secretion of saliva which result in the form of dehydration. This effect is shown on both types of diabetes Type 1 and Type 2. Dysfunctioning of salivary gland cause various infections in mouth and dental necrosis. Composition of saliva is amylase, salivary glucose, potassium, calcium, bicarbonate and sodium. Saliva is an enzyme which breakdown the carbohydrate, starch into smaller units sugar.

Anti diabetes drugs

1. Sulfonyl ureas
 - I. 1st generation
 - a) Tolbutamide
 - b) Chlorpropamide
 - II. 2nd generation
 - a) Glibenclamide
 - b) Glipizide
 - c) Gliclazide
 - d) Glimepiride
2. Biguanides- metformin
3. Meglitinides-repaglinide
4. Insulin-regular insulin
5. Thiazolidinedione-

- a) Pioglitazone
- b) Rosiglitazone
- c) Troglitazone

Mode of action of drug and its uses

- **Mode of action of Tolbutamide**

The anti diabetes effects of tolbutamide which stimulate the pancreas to secrete insulin. Tolbutamide blocks ATP sensitive K^+ channel and help in releasing insulin.

- **Mode of action of Chlorpropamide**

Chlorpropamide is a 1st generation drug of Sulfonyl ureas which also use in stimulating pancreas to secrete insulin. And release in urine as an unchanged form.

- **Mode of action of Biguanides**

Biguanide acts on gastrointestinal absorption of biomolecules specially carbohydrate. Biguanide activate insulin receptor to increase absorption of glucose by tissues also it is help in controlling weight it is one of the important drug which is mostly prescribed.

- **Mode of action of repaglinide**

It act in pancreatic beta cells to closure of ATP sensitive K^+ channel and activate beta cells to produce insulin.

- **Mode of action of thiazolidinediones**

This drug use with other anti diabetic drugs in the treatment of combination therapy and mostly used with Sulfonyl ureas drugs.

This drug is use in compressing gluconeogenesis and decreasing blood sugar level.

- **Mode of action of Glipizide**

MOA of glipizide open the voltage gated calcium channel by blocking potassium channels in beta cells and enhance the secretion of insulin.

- **Mode of action of Glimepiride**

Glimepiride act on insulin producing pancreatic beta cells for production of insulin by activating intracellular receptors and decreases blood glucose level.

- **Mode of action of Meglitinide**

Meglitinide act on ATP dependent potassium channel in pancreatic beta cells for the excretion of insulin to control blood sugar level at a short time period.

Combination therapy for diabetes

Combination therapy is used to treat diabetes by combination of two or more drugs. It control the type 2 diabetes by improving insulin insensitivity to beta cells when immunotherapy are not able to control blood sugar level then occur combination therapy by using first line drugs metformin + Sulfonyl ureas and thiazolidinediones + metformin where thiazolidinediones compressing gluconeogenesis liver and decrease insulin resistance and metformin are use to decrease hepatic gluconeogenesis and are used to treat obese person.

Diet and exercise therapy for diabetes

The healthy diet for diabetic patients is the natural foods like fruits, vegetables, and grains it is very effective if it is taken in control manner and remove high amount fatty foods. And Exercise is a movement of body which helps in reducing risk of cardiovascular disease and control blood sugar level. Physical exercise include cycling, walking, pull-ups, pushups, etc

There are two types of diabetes

Type 1 diabetes is autoimmune disease where destruction of beta cell. It involves 5 percent of total diabetes patients.

Type 2 diabetes body cannot produce sufficient level of insulin. It contains 90 percent of all cases of diabetes patients. Type-2 diabetes is a global pandemic disease in this disorder patients get overweight and obese in the response of type 2 diabetes patients need to physical exercise. Patients with exercise are 30 to 40 percent less risk as comparison to without exercise.

Novel drug delivery system for insulin

NDDS is very highly therapeutic effect with various carriers. Diabetes is very common disorder in elder person. After many research insulin remains a first line treatments for both type of diabetes when anti diabetes drugs and physical exercise fail to control sugar level in novel drug delivery system to treat diabetes by insulin there are various routes like nasal, vagina, urethra, dermal, oral, rectal but they all are not able to be positive results after clinical trials but nasal insulin delivery system are give good results with high bioavailability and pharmacokinetic property. The inhalation of insulin 2 or 3 times in a day is required for better metabolic control.

Result

Diabetes is a long term disease which is characterize by high blood sugar level. Lifestyle is a main reason of Type 2 diabetes with increases weight. Various techniques are used to treat diabetes like medication adherence, regular exercise, manage stress level, drink water more and restriction of calorie. There are various therapies which are use treat diabetes. Diet and exercise therapy, combination drug therapy, and NDDS for insulin. The success result of Novel drug delivery system in comparison to conventional dosage form is better with high therapeutic effect in diabetic patients by various carriers' liposomes, micro particle, and micro emulsion to give more satisfaction with high acceptability. Diet and exercise therapy reduces the risk of heart disease and control glucose

level. Various programmes are needed to control the ratio of diabetes patients like to educate people about lifestyle, to aware and inform people about causes of diabetes and better patients understanding.

Conclusion

Diabetes is a long term disease with high blood sugar level. Unavailability of insulin and insufficient level of insulin cause diabetes. There are various symptoms like frequent urination, excessive thirst, hunger, weakness and fatigue. Two types of diabetes type 1 insulin dependent diabetes and type 2 non-insulin dependent diabetes. Various harming effects of diabetes on body's organs like kidney, liver, heart, eye and foot Diet and exercise therapy reduces the risk of cardiovascular diseases and control blood sugar level. Combination therapies are used to treat diabetes by using two more drugs like Sulfonyl ureas + metformin. Novel drug delivery system for insulin is a new method developed by scientist to overcome limitation of conventional dosage form which provides high stability, site specific drug delivery treatment with high metabolic control and qualitative treatment of diabetes. Because when oral anti-diabetic drugs are not able to treat and control blood sugar level then diabetes treated by only insulin.

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