



## DIET ROLE IN DIABETES MELLITUS AND OBESITY – A CASE STUDY

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**Abstract:** *Diabetes mellitus is one of the non-communicable diseases it occurs due to high-calorie intake, genetics, lifestyle, and less physical activity. Mainly obesity leads to diabetes, cardiovascular diseases and cancer. By the dietary modifications along with physical activity, we can maintain health in further years. Keywords: Diabetes, obesity, medical treatment, glucose.*

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### 1. INTRODUCTION:

Diabetes mellitus type 2 (previously considered as noninsulin-dependent diabetes mellitus (NIDDM) or adult-onset diabetes) High blood glucose is a metabolic disorder characterized by increased blood glucose levels in the perspective of insulin resistance and relative lack of insulin. This is in contradiction to type 1 diabetes, which causes an absolute insulin deficiency due to islet cell destruction in the pancreas.. Excessive thirst, continuous urination, and unending hunger are the primary symptoms. Type 2 diabetes accounts for roughly 90% of all diabetes cases, with the remaining 10% caused primarily by diabetes mellitus type 1 and gestational diabetes. As a general rule, obesity is thought to be the main cause of type 2 diabetes in people is by genetic inheritance.

Type 2 diabetic condition is initially managed by increasing exercise and dietary modification. If these measures would not adequately lower blood glucose levels, would need medications such as metformin or insulin. There is typically a requirement to routinely check blood sugar levels for those on insulin.

Diabetes rates have risen dramatically in the last 50 years, paralleling the rise in obesity. In 2010, there were nearly 285 million people living with the disease, up from around 30 million in 1985. Long-period complications of high blood sugar include heart disease, strokes, diabetic retinopathy, which impairs vision, kidney failure, which may necessitate dialysis, and poor circulation of limbs, which may necessitate amputation. Acute ketoacidosis, a severe form of type 1 diabetes, is rare. However, nonketotic hyperosmolar coma may occur.

### 2. Signs and symptoms:

Diabetes condition is characterized by polyuria (frequent urination), polydipsia (increased thirst), polyphagia (increased hunger), and weight loss. Other manifestations that may be present at the time of treatment include blurred vision, itchiness, peripheral neuropathy, recurrent vaginal infections, and fatigue. However, many people have no symptoms for the first few years and are diagnosed through routine testing. Nonketotic hyperosmolar coma is a rare complication of type 2 diabetes mellitus (a condition of very high blood sugar that is associated with a decreased level of consciousness and low blood pressure).

### 3. Complications:

Type 2 diabetes is typically a chronic ailment associated with a ten-year or shorter life expectancy. This is partly due to some Complications, including a two to fourfold increase in the risk of cardiovascular problems, such as ischemic heart disease and stroke; giving a 20 times increase in lower limb amputations; and higher hospitalized fees. Type 2 diabetic condition is considered to be one of the major causes of non-traumatic blindness and kidney failure in the developed world and is becoming more prevalent elsewhere. It has also been interlinked to an increased risk of cognitive dysfunction and dementia caused by diseases like Alzheimer's and vascular dementia. Other complications include acanthosis nigricans, sexual dysfunction, and frequent infections.



#### 4. Cause

Type 2 diabetes development is caused by lifestyle and genetic factors. While some prospects, such as diet and obesity, are under personal control, while others, such as increasing age, female gender, and genetics, are not. Sleep deprivation has been linked to type 2 diabetes. This is thought to work by influencing metabolism. The mother's nutritional status may also play a role during fetal development, with one proposed mechanism being altered is DNA methylation.

#### 5. Life style

Obesity (defined as a body mass index greater than thirty), lack of physical activity, poor diet, stress, and urbanization are all known to play a role in the development of type 2 diabetes. Excess body fat is linked to 30% of cases in Chinese and Japanese people, 60%-80% of cases in European and African people, and 100% of cases in Pima Indians and Pacific Islanders. Those who are not obese would frequently have a large waist-to-hip ratio.

The risk of developing type 2 diabetes is also influenced by dietary factors. Excessive consumption of sugar-sweetened beverages is linked to an increased risk. The type of fats in the diet is also important, with saturated and trans-fatty acids that increase the risk and polyunsaturated and monounsaturated fats decreasing it. Fats reduce the risk. Eating a high quantity of white rice appears to increase risk as well. A lack of exercise is thought to be responsible for 7% of cases.

#### 6. Genetics

In many cases of diabetes involve many genes, with each being a small contributor to an increased probability of becoming type 2 diabetic. [6]. If one identical twin has diabetes, the other is more than 90 percent likely to develop diabetes within his lifetime, whereas the rate for nonidentical siblings is 25–50 percent. As of 2011, more than 36 genes were linked to an increased risk of type 2 diabetes. Even when all of these genes are combined, they only account for 10% of the total heritable component of the disease. The TCF7L2 allele, for example, increases the risk of developing diabetes by 1.5 times and is the most significant risk of the common genetic variants. Most of the genetic conditions linked to diabetes are involved in beta cell functions.

Maturity onset diabetes in the young constitutes 1–5% of all cases of diabetes in young people. Many rare cases of diabetes arise due to an abnormal condition observed in a single gene (known as the monogenic form of diabetes or "other specific types of diabetes"). These may include maturity-onset diabetes of the young (MODY), Donohue syndrome, and Rabson-Mendenhall syndrome.

#### 7. Pathophysiology:

In the context of insulin resistance, type 2 diabetes is caused by insufficient insulin produced from beta cells. Insulin resistance, defined as the inability of cells to respond adequately to normal insulin levels, is most common in the muscles, liver, and fat tissue. Normally glucose release is suppressed by insulin in the liver. In the case of insulin resistance, however, the liver inappropriately releases glucose into the blood. Individuals differ in the proportion of insulin resistance versus beta cell dysfunction; some have insulin resistance mainly and only a minor defect in insulin secretion, whereas others, have slight insulin resistance and primarily a lack of insulin secretion.

Many of the other was potentially important mechanisms that are associated with type 2 diabetes and insulin resistance Includes: increased lipid breakdown within the fat cells, resistance or and the lacking of incretin, high levels of glucagon in the blood, increased salt and water retention by the kidneys, and improper central nervous system regulation of metabolism. However, not everyone with insulin resistance develops diabetes because insulin secretion by pancreatic beta cells is also impaired.

#### 8. Prevention:

Type 2 diabetes can be extended or prevented by eating well and exercising regularly. Intensive lifestyle changes would cut the risk by half. Exercise benefits regardless of the person's initial weight or subsequent weight loss. However, proof for the benefit of dietary changes alone is limited, with some proof for a diet rich in green leafy vegetables [and some for controlling sweetened drink intake]. Diet and exercise, either alone or in combination with metformin or acarbose, may reduce the risk of increasing diabetes in people with impaired glucose tolerance. Metformin is not as effective as lifestyle interventions.

#### 9. Lifestyle:

Controlled diet and exercise are the basic rules of diabetic care, with more exercise yielding better results. Aerobic exercise reduces HbA1C and improves insulin sensitivity. Resistance training is also beneficial, and combining



the two types of exercise may be the most effective. It is critical to follow a diabetic diet that leads to weight loss. While the best diet to achieve this is debatable, a low glycemic index diet has been shown to enhance blood sugar control. For at least six months, culturally relevant learning may help people with Type 2 diabetes regulate their blood sugar levels. If lifestyle changes for those with mild diabetes which did not result in improved blood sugar levels within six weeks, then medications should be considered.

## 10. Medications:

There are various classes of anti-diabetic medications available. Metformin is generally recommended as a first-line treatment as there is some evidence that it decreases mortality. If metformin is insufficient, a second oral agent of a different class may be used. Sulfonylureas, nonsulfonylurea secretagogues, alpha glucosidase inhibitors, thiazolidinediones, glucagon-like peptide-1 analogues, and dipeptidyl peptidase-4 inhibitors are examples of other medications. Insulin injections can be used in conjunction with or in place of oral medication. Metformin should not be used in people who have severe kidney or liver disease.

Most people do not require insulin at first. When it is used, a long-acting formulation is usually added at night, with oral medications continuing to be taken. The doses are then increased to achieve the desired effect (blood sugar levels are well regulated). When overnight insulin is insufficient, twice daily insulin may be used to improve control. As of 2010, the long-acting insulins glargine and detemir did not seem to be significantly better than neutral protamine Hagedorn (NPH) insulin but were significantly more expensive, rendering them ineffective. Insulin is usually the treatment option of choice in pregnant ladies.

## 11. Surgery

Obese people can benefit from weight loss surgery to treat their diabetes. Following surgery, many patients are able to maintain normal blood sugar levels with little or no medication, and long-term mortality is reduced. However, there is some short-term mortality risk of less than 1% from the surgery. The BMI cutoffs for when surgery is indicated are not yet known. However, it is recommended that this option be considered for those who are unable to get both their weight and blood sugar under control.

## 12. Case Study:

A 61-year-old female patient suffering from type 2 diabetes Miletus for the last several years and obesity grade II, recently diagnosed with Hypertension. The patient consulted the doctor to begin medical treatment for weight loss and diabetes management. As advised by the doctor in the medical treatment procedure, the patient consulted a dietician for diet counselling. After a few investigations and the patient's physical condition, she must follow the nutritional advice that the dietician has modified. According to the lab investigations, her Glucose levels are high, fasting at 182mg/dl instead of 70-110mg/dl, and post-prandial glucose levels are 191mg/dl instead of 90-140mg/dl. Based on the anthropometric measurements, height is 156 cm, weight is 82 kg, body mass index is 34, and the patient's ideal body based on height and weight is 54 kg.

Based on the Anthropometric measurements, energy requirements are 1400 kcal per day, protein 54 gms per day, carbohydrates 65% i.e., 228 gms per day, and fat 22 gms per day, but she is consuming less nutrients according to her 24hour dietary recall. If the patient continues her diet with fewer nutrients, it may lead to nutritional deficiency. According to the patient medical complaints, she must follow the nutritional advice, the modified diet will provide adequate nutrients and also help lose weight. Through weight loss, the blood glucose levels may also return to normal. The dietician advised A diabetic diet is one that is comprised of low carbohydrates, high fiber, and high protein. Through the consumption of low carbohydrate foods, glucose levels fall in the body. High protein is required to maintain muscle mass and to repair the cells. High fiber can lower the risk for heart disease, stroke, and diabetes, improve skin health and help to lose weight. Even though it may prevent colon cancer. Along with a modified diet, she has to participate in physical activity. Exercise improves people's total energy expenditure, which helps them maintain energy balance or even lose weight, as long as they don't eat more to cover the additional calories they burn. Physical activity reduces waist fat and total body fat, slowing the progression of abdominal activity. The above nutrients, which the dietician prescribes, are present in a balanced diet. And to lose weight and maintain glucose levels, patients must maintain a time gap between meals. So patients are advised to consume a diet on a 2 hourly basis. According to the dietician, patients should follow a balanced diet with adequate nutrients needed to lose weight and maintain glucose levels and physical activity for two months. After two months, she lost 4 kg (82 kg to 78 kg), which is a healthy weight loss, and maintained normal blood glucose levels.



### 13. CONCLUSION:

The above suggested nutritional advice and physical activity were followed by the patient, if she continues the same diet along with physical activity, she can lose weight and can maintain normal blood glucose levels in the future. With a healthy weight and normal blood glucose levels in her body, she can overcome the health issues that are prone to diabetes and obesity.

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