MEDICAL PHYSICS LABORATORY

FOR 3RD YEAR MEDICAL PHYSICS STUDENTS

Dr. Ban Hassan

LEC. NEEAN F. MAJEED

LEC. FADIA JABBAR ALWAN

EXPERIMENT ONE

BLOOD GLUCOSE LEVELS TEST

Diabetes mellitus is a chronic metabolic disease. DM is classified as an increase in blood glucose levels that result from insulin resistance in peripheral tissues or disruption of insulin secretion by the pancreas. The diabetes can cause many complications. Serious long-term complications include cardiovascular disease, stroke, chronic kidney disease, foot ulcers, unhealthy lipid levels, damage to blood vessels (vascular and micro vascular), organ damage such as to the kidneys (diabetic nephropathy), nerve damage (diabetic neuropathy) and damage to the eyes. Diabetes is due to either the pancreas not creating enough insulin or the cells of the body not responding properly to the insulin produced. The normal range of blood glucose is 80-120mg/dL. The number of patients with DM has quadrupled (from 108 million in 1980 to 422 million in 2014) within 34 years only, while the worldwide incidence of diabetes among adults over 18 years of age has risen to 8.5% (2014) from 4.7% (1980). The WHO estimates that diabetes will be the 7th primary cause of fatality by 2030. The IDF Diabetes Atlas (2021) reports that 10.5% of the adult population (20-79 years) has diabetes, with almost half unaware that they are living with the condition. By 2045, IDF projections show that 1 in 8 adults, approximately 783 million, will be living with diabetes, an increase of 46%.

MEDICAL PHYSICS LAB.

N.F.M

DIABETES:

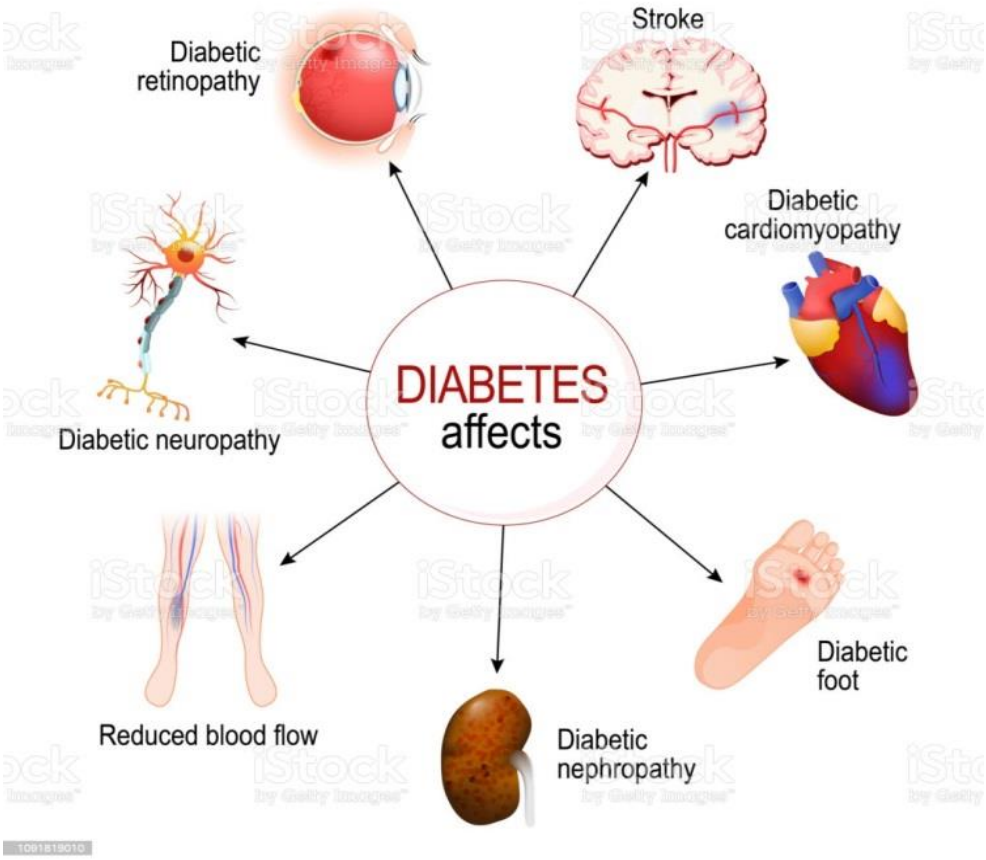
Symptoms, Complications, Treatment

SYMPTOMS

COMPLICATIONS

- Permanent Kidney Damage
- Cerebrovascular Diseases
- Eye Damage
- Diabetic Foot
- Peripheral Neuropathy
- Coronary Heart Disease

TREATMENT



Types of Diabetic and Causes

There are three major types of diabetes:

1-Insulin dependent diabetes mellitus (IDDM, Type 1) or type 1 diabetes, Type 1 DM results from the pancreas's failure to produce enough insulin This is because the body's immune system attacks and destroys the insulin-producing cells in the pancreas. Treatment with insulin remains the most suitable therapy for T1DM patients. However, in many patients leading to long term vascular damage associated with kidney failure, heart disease, retinopathy and neuropathy

2-Non-insulin-dependent diabetes mellitus (NIDDM, Type 2) or type 2 diabetes, type 2 DM begins with insulin resistance, a condition in which cells fail to respond to insulin properly. As the disease progresses, a lack of insulin

may also develop. . It differs from type 1 diabetes because it is not caused by the body's immune system but solely from a combination of genetic predisposition and environmental factors. It's the most common form of diabetes.

3-Gestational diabetes is the third main form and occurs when pregnant women without a previous history of diabetes develop high blood sugar levels, which is a disorder that is diagnosed in the second or third trimester of approximately 7% of all pregnancies .

Type 1 Diabetes	Type 2 Diabetes
Often diagnosed in childhood	Usually diagnosed in over 30 year olds
Not associated with excess body weight	Often associated with excess body weight
Often associated with higher than normal ketone levels at diagnosis	Often associated with high blood pressure and/or cholesterol levels at diagnosis
Treated with insulin injections of insulin pump	Is usually treated initially without medication or with tablets

Table (1-1) shows the differences between type 1 and type2 diabetes

Common symptoms of diabetes

The general symptoms of diabetes include:

1-increased hunger

2-increased thirst

3-weight loss

4- frequent urination

5- blurry vision

6- extreme fatigue

7- Cuts and bruises don't heal properly or quickly.

Hyperglycemia is high blood sugar, while **hypoglycemia** is low blood sugar. Because both can cause major health problems for people with diabetes, it's important to keep blood sugar within a healthy range.

How does hypoglycemia occur with diabetes?

If you have diabetes, hypoglycemia can occur when you take too much insulin or another diabetes medication. Too much medication in your bloodstream causes your body's cells to absorb too much glucose.

How does hyperglycemia occur with diabetes?

The reason for hyperglycemia with diabetes depends on whether you have type 1 diabetes or type 2 diabetes.

If you have type 1 diabetes, your pancreas is unable to produce insulin. If you have type 2 diabetes, your pancreas doesn't produce enough insulin to stabilize your blood sugar. In both conditions, glucose can build up in your bloodstream, resulting in hyperglycemia.

Your diabetes medication keeps your blood sugar within a safe range. If you don't take your medication as instructed, you might experience blood sugar spikes. This can also occur due to poor eating habits, inactivity, or an infection.

HYPERGLYCEMIA
VERSUS
HYPOGLYCEMIA

HYPERGLYCEMIA	HYPOGLYCEMIA
Hyperglycemia refers to an excess of glucose in the bloodstream	Hypoglycemia refers to a deficiency of glucose in the bloodstream
Blood sugar level rises more than 130 mg/dL	Blood sugar level drops less than 70mg/dl
Can be caused by non-compliance of anti-glycemic agents	Can be caused by excessive intake of anti-glycemic agents beyond the prescribed dose

Table (1-2) Blood test levels for diagnosis of diabetes and prediabetes

	HbA1C range	**Fasting blood sugar (mg/dL)**
Diabetes	**≥ 6.5**	**≥ 126**
Pre-diabetes	**5.7 to 6.4**	**100 to 125**
Normal	**Approximately5**	**≤ 99**