Up to date information on...

Diabetes

DiaLeb
National Diabetes Organization
الجمعية الوطنية للسكري

LeMSIC
The International Federation of Medical Students’ Associations (IFMSA), founded in 1951, is one of the world’s oldest and largest student-run organizations. It represents, connects and engages every day with medical students from 135 National Member Organizations (NMOs) in 125 countries around the globe.

Our work is divided into four main global health areas: Public Health, Sexual and Reproductive Health and Rights, Medical Education and Human Rights and Peace. Each year, we organize over 13,000 clinical and research exchanges programs for our students to explore innovations in medicine, healthcare systems and healthcare delivery in other settings. IFMSA brings people together to exchange, discuss and initiate projects to create a healthier world. It trains its members to give them the skills and resources needed to be health leaders. It advocates for the pressing issues that matter to us to shape the world we want. And it does deliver: our projects, our campaigns and our activities positively impact the physicians-to-be, the communities they serve, as well as the health systems around the world in which they practice as a trainee and eventually a medical doctor.

LeMSIC was founded in 1964 by Lebanese medical students. Unfortunately, with the onset of the Lebanese war, all LeMSIC activities were ceased. LeMSIC was reactivated in 1997 with the establishment of the Exchange Program and the 6th international HIV/AIDS summer school. Since then it has grown to embrace hundreds of medical students in its various standing committees and is making its mark internationally. Several LeMSIC members have held high ranking positions in IFMSA, including President of IFMSA.
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General Overview of Diabetes

What is diabetes?

Diabetes is a non communicable disease characterized by a chronically elevated blood glucose (sugar) level due to improper glucose metabolism by body cells.

Before starting it is important to highlight the following recurrent terms in this booklet:

- Glycemia = The concentration of glucose in the blood
- Hyperglycemia = High blood glucose levels
- Hypoglycemia = Low blood glucose levels
- Glycogen = Storage form of glucose

How is glucose metabolized?

Upon consuming carbohydrates, they are broken down in our digestive system and later absorbed as glucose - the major source of energy for our body.

The presence of glucose in the blood triggers the pancreas to release insulin to help the cells absorb their glucose needs. Any excess glucose is mainly stored in the liver in the form of glycogen as a backup to any hypoglycemia. In this case, the pancreas as well will secrete glucagon to release this stored glucose to be used by our cells.

In regards to diabetes, the pancreas may not produce enough insulin or the insulin itself may not work as efficiently as needed. This will eventually lead to glucose buildup in the blood which, if not controlled, can result in many severe and life-threatening complications.

Diabetes can be due to many causes and is thus mainly classified into: type 1, type 2, and gestational (pregnancy) diabetes.

In this booklet, each type, its causes, symptoms, complications and possible treatments will be discussed separately.
## I. General Overview

### What is prediabetes?
It is a serious health condition where blood sugar levels are higher than normal, but not high enough yet to be diagnosed as type 2 diabetes. Millions of people around the world are living with Prediabetes, and this is the only stage where diabetes can be reversed. Prediabetes leads to diabetes unless it is reversed.

### How to reverse prediabetes?

1. **Eat a healthy diet and lose weight.** Losing even 5% to 10% of your weight can make a huge difference.

2. **Exercise (150 minutes of exercise per week).**

3. **Stop smoking.**

4. **Get your blood pressure and cholesterol under control.**

5. **Take medication like metformin to lower your blood sugar if you are at high risk of diabetes.**

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II. Type 1 Diabetes

Type I diabetes is an autoimmune disease in which cells of the immune system recognize insulin-secreting cells as foreign and attack them. Thus, people with Type I diabetes cannot produce insulin which leads to an increase in blood glucose (sugar) after ingestion of a meal.

B. Etiology (causes)

Type I diabetes is caused by an interaction between genetic and environmental factors. The specific causes are still unknown, but it may include:

1. Heredity:
Type 1 Diabetes is less likely to be inherited than type 2 diabetes. Usually autoimmune disorders are inherited together so one would expect to have T1D along with other autoimmune diseases in the same family (such as Alopecia, T1D, Celiac..).

A. Epidemiology

Type I diabetes mellitus (T1D) usually appears in childhood or early life and is increasing on the international scale with an incidence of 15 per 100,000 people and a prevalence of 9.5%. With the increasing trend of T1D, underprivileged countries will face difficulties in their access to insulin; which is the unique treatment for this disease.

In Lebanon, the prevalence of T1DM in particular was estimated at 0.1%, or almost 1% of all detected cases of diabetes mellitus which was lower than international estimates.

2. Injury or Removal of the Pancreas:
Rarely, type I diabetes can develop after the pancreas has been subjected to a trauma or an injury. Also, as expected, T1D develops if the pancreas is surgically removed. Viral infection is one of the major factors that elicit the development of the disease and the appearance of the symptoms.
D. Complications

Refer to the common section which is the “Complications of Type 1 and Type 2 Diabetes” section.

E. Treatment

Treatment ranges from medications to lifestyle changes. It depends on the type of diabetes and the individual differences such as age, physical activity, other comorbidities, and nutritive status. For type 1 diabetes, the standard treatment option is insulin. It is almost unique for type 1 as opposed to type 2 which does not require insulin treatment except in very advanced cases.

1. Insulin treatment

There are different modes of insulin treatment:
- Subcutaneous injections through regular syringes
- Insulin pens
- Pump therapy: through a pump attached to the body that releases insulin on demand.

NB: Blood glucose should be self-monitored by the patient on a daily basis using a glucometer at home. The traditional glucometer relies on pricking one’s finger to check the glucose level. There is another technique called continuous glucose monitoring (CGM) that uses a sensor on the skin to check the reading.

2. Lifestyle changes

Refer to the section “Lifestyle Changes for People with Diabetes” for more information on the important lifestyle changes one should adopt for the treatment of diabetes.
Type 2 diabetes is a chronic condition that affects how our body metabolizes or uses glucose (sugar); our main source of energy. It is mainly caused by insulin resistance.

The exact cause of type 2 diabetes is thought to be a combination of genetic and environmental factors such as family history, being overweight or inactive.

Risk factors for diabetes include:
- Family history.
- Being overweight and inactive (fat around the stomach and waist).
- Race and ethnicities: Hispanics, American Indians, Blacks and Asian Americans are at higher risk.
- Increasing age especially above 45 years old.
- Prediabetes which is when one’s glycemia is higher than normal but not enough to develop diabetes. This is a very slow process that can span up to ten years whereby the pancreas slowly loses its effectiveness. The blood tests used to diagnose prediabetes are found in Table (1).
- Gestational diabetes which is when a pregnant woman’s blood glucose levels are higher than normal. This can predispose to diabetes later in life. More information about gestational diabetes can be found in the Gestational Diabetes section.
- Polycystic ovarian syndrome (PCOS) is when a woman has cysts in her ovaries affecting ovulation. This leads to irregular menstrual cycles and hormonal dysregulations (such as male-pattern excess dark hair growth and acne)

### A. Epidemiology

Diabetes mellitus has shown to have increasing morbidity and mortality rates since the last quarter of the 20th century. Type 2 Diabetes (T2D) accounts for about 90-95% of diabetes cases. It generally has an adult onset and is called “maturity diabetes”. The mean age of diagnosing T2D is around 50 years old but this appears to be slightly earlier in the Gulf Cooperation Council (GCC) countries at an average diagnosis age of 30. However, current increase in T2D rates in adults of less than 30 years have been noticed due to the increasing rates of obesity in this age group. Industrialized Countries like China; India and the USA have the highest numbers of type 2 diabetes worldwide.

### B. Etiology (causes)

The increase of glucose in T2D is due to insulin resistance whereby the body doesn’t respond well to it, eventually leading to glucose accumulation in blood.

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**B. Etiology (causes)**

The increase of glucose in T2D is due to insulin resistance whereby the body doesn’t respond well to it, eventually leading to glucose accumulation in blood.
C. Complications

Refer to the common section which is the “Complications of Type 1 and Type 2 Diabetes” section.

D. Treatment

There are several modes of treatment for diabetes ranging from medications to lifestyle changes. This depends on the type of diabetes and the individual differences such as age, physical activity, comorbidities, and nutritive status.

For type 2 diabetes, the first line treatment to manage glucose level is by diet and exercise, and if further treatment is needed, medications can be prescribed.

1. Lifestyle modifications

Refer to the section “Lifestyle Changes for People with Diabetes” for more information on the important lifestyle changes one should adopt for the treatment of diabetes.

2. Medications

Diabetes medications have many modes of action but the most common ones act to either increase the excretion of glucose, to increase the sensitivity of cells to insulin, or to decrease the absorption of carbohydrates from the digestive tract.

One of the most common medications used is Glucophage (metformin) that works on reducing the glucose production by the liver. In addition, it reduces appetite which can help in weight loss and thus would contribute in stabilizing glucose levels. A combination of different drugs may be prescribed by the physician if needed.
IV. Diagnosis of Diabetes

What tests can be done when suspecting diabetes?

1- The glycated hemoglobin A1C (HbA1C) test: it measures the average glucose concentration in red blood cells over the last 2 to 3 months.

2- Random blood sugar test (RBST) (checking sugar at a random time during the day)

3- Fasting blood sugar test (FBST): obtaining a blood sample following a night of fasting.

4- Oral glucose tolerance test (OGTT): discussed under Gestational Diabetes.

<table>
<thead>
<tr>
<th>Test</th>
<th>Normal</th>
<th>Prediabetes</th>
<th>Diabetes</th>
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</thead>
<tbody>
<tr>
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<td>5.7%&lt;6.4%</td>
<td>&gt;6.5%*</td>
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<tr>
<td>RBST</td>
<td>&lt;200 mg/dl</td>
<td>&gt;200 mg/dl</td>
<td></td>
</tr>
<tr>
<td>FBST</td>
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<td>&gt;126 mg/dl</td>
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<td>&lt;140 mg/dl</td>
<td>&gt;140 mg/dl&lt;199 mg/dl</td>
<td>&gt;200mg/dl**</td>
</tr>
</tbody>
</table>

Table 1: Levels of some blood tests that are used to diagnose prediabetes or diabetes.

* after two tests
** following a duration of two hours
V. Complications of Type 1 and Type 2 Diabetes

Note: These complications can be delayed or even prevented if diabetes is well controlled.

1. Skin Conditions (Diabetic Dermopathy)

Skin conditions can be one of the first signs that might indicate diabetes. These include bacterial or fungal infections, itching and non-painful red patches on the legs. This is due to changes in blood flow in the small blood vessels which irrigate the skin.

Prevention: The most important factor is to keep diabetes under control. In addition to keeping the skin clean and hydrated by using moisturizing creams.

2. Hearing loss

Elevated glucose levels in blood can damage a vast network of small blood vessels in the ear.

3. Cardiovascular complications

People with diabetes are at increased risk of cardiovascular diseases like heart attack, stroke, or even death.

Prevention:
1. Quitting smoking—if applicable.
2. Keeping blood pressure in a healthy range: lifestyle changes and/or medication(s) in case of hypertension (as per their physician's recommendation)
3. Keeping blood cholesterol and triglyceride levels in their healthy range: Statins may be prescribed by the physician to decrease the future risk of heart attacks, strokes, and death, even when cholesterol levels are normal.

4. Kidney complications (Diabetic Nephropathy)

Over time, kidney problems can lead to chronic kidney disease and even kidney failure. This can be assessed by an increased amount of protein (albumin) in the urine. A multitude of medications might be prescribed by the physician if protein in urine persists over time. These include mainly angiotensin-converting enzyme (ACE) inhibitor or angiotensin receptor blocker (ARB). Another class of medications called sodium-glucose co-transporter 2 (SGLT2) inhibitors lowers blood sugar and blood pressure.

5. Eye complications (Diabetic Retinopathy)

This condition can lead to vision loss and eventually blindness if not treated properly. Regular eye exams are essential for detecting retinopathy at an early stage.
6. Foot problems

Diabetes can decrease blood flow to the feet and damage the nerves that carry sensation; this is known as "diabetic neuropathy." People may lose their ability to sense pain and are at increased risk for developing ulcers which may go unnoticed.
Self-exams — It is important to examine the feet routinely every day. Signs can include broken or thickened skin, ulcers, and areas of increased warmth or redness.

8. Diabetic Ketoacidosis

Diabetic Ketoacidosis (DKA) is a major health concern in patients with T1D. DKA is due to buildup of ketone acids in the body after switching to fat as the major energy source.
Main symptoms include dry mouth; thirst; nausea; vomiting; frequent urination and fruity breath. It is mainly treated with administration of insulin, fluids and electrolytes IV.

9. Diabetic hyperglycemic hyperosmolar syndrome

Hyperglycemic hyperosmolar syndrome (HHS) is a condition of high blood sugar (glucose) level, severe dehydration and decreased consciousness and it is more often seen in uncontrolled T2D. This syndrome may occur following an infection, the use of medicines that decrease the effect of insulin, or increases fluid loss.
Symptoms of HHS that may get worse over time include increased thirst and urination, feeling weak, nausea, weight loss, and fever.
VI. Life Changes for People with Diabetes

Healthy nutrition and diet
There is no “diabetic diet”, there are many options and choices one can discuss with a licensed/registered dietitian. It is advised to enjoy a healthful diet that is rich in nutrients similarly to the general population.

- Moderation, variety, balance and adequacy are keys to a healthy diet.

- Consumption of fresh unprocessed plant-based foods such as vegetables, fruits, whole grains, beans and nuts are associated with positive health outcomes and are recommended for persons with diabetes. Similarly, to the general public, it is advised to avoid excessive consumption of added sugar, saturated fats, trans fats and sodium.

- Multiple strategies have been shown to help persons with diabetes manage their blood sugar, among these are: carbohydrate counting, consistency in carbohydrate intakes, and low carbohydrate diets.

- The Mediterranean diet is a dietary pattern that has been shown to have a positive effect on diabetes outcomes both on the long term and short term. Thus, it is helpful to attain adequate blood sugar control, but also to prevent complications associated with diabetes. The Mediterranean diet is high in vegetables, fruits, nuts, seeds, beans, whole grains and unsaturated fats particularly olive oil and fish. The diet is also low in red meats and added sugar and very low in processed foods.
Diabetes Plate Shape

The shape of diabetic patients’ plate should be abiding by the following:

1. Fill half the plate with non-starchy vegetables. These include asparagus, broccoli, cauliflower, cabbage, cucumber, lettuce, spinach, zucchini, tomatoes among others. The aim is that these vegetables do not contain a high amount of starch and will not raise the blood sugar level significantly.

2. Fill one quarter of the plate with lean protein such as chicken, fish, beef, soy products, eggs, lean beef, falafel, nuts, seeds, and so on. Be aware not to consume lots of saturated fats from animal products such as fatty beef and choose lean beef instead.

3. Fill one quarter of your plate with carbohydrates. This includes starchy vegetables as well as whole grains like whole-grain rice, whole-grain breads and wholewheat pasta. Go for complex starches like whole grain bread, brown rice, quinoa, beans, lentils and so on. Limit milks and yogurts to 2 times per day.

4. Drink water!

Limit Alcohol intake: Men with diabetes should not drink more than two drinks per day and women no more than one per day.
Exercise

Maintaining a regular exercise routine of at least 150 min per week is highly recommended for adults with diabetes. According to the American Diabetes Association, moderate to vigorous aerobics of 30 min for five days per week are recommended for people with diabetes as it helps in managing their hyperglycemia with at least 2 days per week of resistance training such as weight-lifting. For children, the exercise recommendation is 60 minutes per day.

Examples of exercise include: walking, jogging, cycling, swimming, dancing, aerobics and many more fun activities.

Physical activity can help in many ways:
- improving heart and lung fitness and lowering the risk of heart attacks.
- increasing muscle strength
- weight control
- Better mental health
- reducing the levels of bad LDL cholesterol and triglycerides, raise levels of good HDL cholesterol, and combat inflammation and infections

The amount of exercise and daily intake of a diabetic patient have to be decided by the physician and the registered dietitian as they depend on many personal factors.
Etiology
During pregnancy, the placenta secretes hormones that can increase the risk of insulin resistance. In normal conditions; the body can produce excess insulin to counteract this resistance, but gestational diabetes happens when the pancreas is not able to produce enough insulin. This is called the “contra-insulin” effect and it begins at around 20-24 weeks of pregnancy.

Possible complications for the mother
1. High blood pressure and risk of preeclampsia
2. Having a C-section surgical delivery
3. Possibility of developing GD in future pregnancies and T2D later on in life.

Screening
The oral glucose tolerance test (OOGT) test: A blood sample is first taken in the morning after 8-10 hours of fasting. The pregnant woman is then given a glucose drink and asked to wait for 2 hours. A second blood test is taken to examine how well the body is regulating glucose. The OGTT is done at 24-28 weeks of pregnancy for women with no prior history of GD. If the woman has a history of GD, the OGTT is administered for the first time early in the pregnancy and is repeated for a second time at 24-28 weeks if the first test is normal.

Treatment options
The goal of management is to keep blood sugar levels within normal limits.
1. Healthy diet and Exercise as set by you and your dietitian. It is important to not stop carbohydrates.
2. Daily monitoring of blood glucose levels.
3. Insulin injections as per the doctor’s recommendations.

Risk Factors

- Being overweight or obese; lack of physical activity
- High risk of becoming obese or having type 2 diabetes later in life
- Genetics- Family history of diabetes
- Minority races (African-American, American Indian, Asian American, Hispanic or Latino, or Pacific Islander)
- Being a woman over 25 years of age
- Previous gestational diabetes or prediabetes
- Having delivered an infant weighing more than 9 pounds (approx. 4kg)
- High risk of becoming obese or having type 2 diabetes later in life

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Nowadays, it is necessary to shed light on the relation between diabetes and COVID-19. Several questions regarding the topic are being asked and debated

1. Are people with diabetes more prone to infection by COVID-19? And is an infected diabetic person at an increased risk of having more severe infection?

So far, there is no evidence that suggests that patients with diabetes are at an increased risk of contracting the virus; however, they may be at a higher risk of experiencing more COVID complications (such as pneumonia).

Trends observed in the general population apply here as well. People with diabetes of younger age have less severe disease than people with diabetes of older age. The essential part is monitoring the blood glucose level, for better regulation is associated with better chances of fighting the virus.

In critical cases, the usual medications taken by people with diabetes might need to be discontinued and replaced by insulin therapy in the hospital. For instance, glucophage should be stopped when there is respiratory distress since it may cause lactic acidosis (where the body can’t remove excess acid).

2. If you do have diabetes, what can you do?

1- Monitor your blood glucose level continuously.

2- Ensure you have access to enough water and fluids that you would need to consume a lot of if you get the infection.

3- Ensure you have a good supply of your diabetes medications.

4- Monitor your body temperature

5- If you experience any slight COVID-19 symptoms, contact your healthcare professional.

6- Exercise indoors regularly

7- Meet with a dietitian (virtually) to plan a healthy diet that suits your lifestyle

8- Address any worries by seeking credible information from expert

9- Take extra caution when it comes to meeting people and avoid being in closed public spaces)
IX. References

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