

Introduction to Physiology

(BMHP5003_LON)

Lecturer: Noura Mohamed

Student: Meliha Drenk
Student ID: 1922136

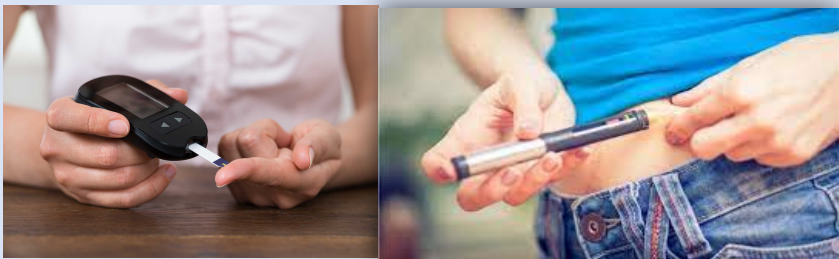


Fig.1 Diabetes (photo: Diabetes UK, 2021) Fig.2 Type 1-Insulin injection (photo: Sick kids,2021)

“Diabetes is a chronic (long-lasting) health condition that affects how your body turns food into energy.” (Centre for disease control and prevention, 2020.) There are two most common types of diabetes: Type 1 and Type 2.

Other types of diabetes

- Cystic fibrosis diabetes
- Type 3c diabetes
- Neonatal diabetes
- Maturity onset diabetes of the young
- Gestational diabetes. (Diabetes UK, n.d.)

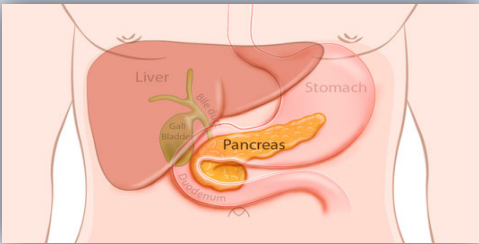


Fig.3 Pancreas (photo: Johns Hopkins, 2021)

The pancreas is located in the abdomen behind the stomach and it has a leaf like structure. (see Fig. 3) It is a part of the endocrine and digestive systems and has two main functions:

- Exocrine function- helps digestion
- Endocrine function- regulates blood sugar

The pancreas’ normal function is to release insulin and regulate blood sugar concentrations.

- Type 1 the pancreas doesn’t produce enough or any insulin.
- Type 2 diabetes are resistant to insulin.

Diabetes

Physiology of diabetes

It involves the central nervous system notifying the plasm concentrations of glucose to utilise energy reserves.

It is based on the speed that plasma glucose concentrations fall, and other available metabolic fuels.

(Moini, J. 2019)

Side effects of diabetes

- Cardiovascular disease
 - Nerve damage (neuropathy)
 - Kidney damage (nephropathy)
 - Eye damage (retinopathy)
- (MFMER, 2020)

Recommendation for Type 1 diabetes

- Exercise often
 - Test glucose levels frequently
 - Use insulin. Injections/pump
 - Maintain healthy weight
 - Eat healthy
 - Carry sugary foods with you
 - Limit alcohol amounts
 - Wear medical bracelet
- (Havas, 2006)

Type 1	Type 2
<u>Symptoms:</u>	<u>Symptoms:</u>
Very thirsty	Weak bladder
Weak bladder	Very thirsty
Extreme exhaustion	Fatigue
Losing weight / malnutrition	Gaining weight
Weak eyesight	Thrush
	Weak immune system
	Bad vision
<u>More at risk if:</u>	<u>More at risk if:</u>
Unhealthy	Over 40
Family member has it	If Diabetes runs in your family
	Are overweight or obese
	You have an Unhealthy lifestyle
	Are of Asian, African-Caribbean or black African race/origin
(NHS, 2020)	No exercise

Recommendation for Type 2 diabetes

- Healthy diet - (meals containing iron)
 - Food containing healthy carbohydrates
 - Eat in intervals
 - Avoid saturated fats
 - Control weight
 - Exercise daily
- (Pietrangelo, 2020)

<u>Type 1 Treatments.</u>	<u>Type 2 Treatments</u>
• Insulin injections	Metformin (Glucophage)
• Short-acting	Medicine tablets
• Rapid-acting	
• Long acting	
• Intermediate-acting	
• Insulin pump	
• Pancreas transplant.	(MFMER, 2021)

Patient A risk factors of Type 2 diabetes

- 45y (middle-age)
- Unhealthy diet
- Smokes - 1 to 9 cigarettes / day
- Drinks - 3 to 6 units of alcohol / day
- High BP of 140 / 90
- No family history of diabetes
- Only exercises once a month
- BMI 24.2 – on the verge of obesity (70kg.)

Suggestions for Patient A

- More physical activities
- Replace frozen food with fresh
- Consume less sugar and refined carbs
- Reduce the alcohol consummation
- Stop smoking
- Regular check ups
- Avoid stress



Fig.4 Exercises (photo: Vector stock, 2021)

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Diabetes

SPEAKER NOTES

Nowadays we all live a hectic lifestyle, which can lead to many chronic and stress related conditions. One of the most common chronic conditions is diabetes.

“Diabetes is a chronic (long-lasting) health condition that affects how your body turns food into energy.” (Centre for disease control and prevention, 2020).

Diabetes influences a huge majority of the population all over the world and in the UK.

One of the biggest organisations that focuses on diabetes is Diabetes UK. According to them “more than 4.9 million people have diabetes in UK.” (Diabetes UK, n.d.).

Statistics predict that by 2030 the number of the people with diabetes will increase to 5.5 million.

We have 2 most common types of diabetes: Type 1 and Type 2.

Around 8% of people with diabetes have **type 1 diabetes**.

Its diagnosed in children and young adults.

Around 90% of people with diabetes have **type 2 diabetes**.

Its characterised with insulin resistance. This type diabetes is acquired by unhealthy lifestyle, stress or family history.

Around 800 000 people have Type 2 diabetes but are not diagnosed.

About 2% of people with diabetes have **rarer types of diabetes**:

Type 3c, Gestation diabetes, neonatal etc. (Diabetes UK, n.d.).

People with diabetes use device called Glucometer (**Fig,1**) to measure their glucose levels also these with type 1 diabetes may also choose to use CGMs (continuous glucose monitor). These devices measure your blood sugar every few minutes using a sensor inserted under the skin. These sensors are typically worn for

a week or two before they need to be changed. Normal glucose levels are between 4-7 mmol / l.

When we eat food our body breaks it down into sugar (glucose) which provides us with energy. The organ that regulate blood sugar levels is the pancreas. **(Fig.3)** Pancreas is located in the abdomen behind the stomach and it has a leaf like structure. It is a part of the endocrine and digestive systems.

The pancreas has two main functions:

- **exocrine function** - helps in digestion
- **endocrine function** - regulates blood sugar and produce hormones

It has receptors which check the concentration of glucose running in the blood. In people with diabetes the pancreas isn't able to function correctly- the blood glucose levels are either too high or too low.

If the blood glucose levels are high (hyperglycemia) the pancreas releases hormone called insulin. The insulin causes body cells to absorb glucose from the blood and lower the blood sugar levels. The insulin also causes leftover glucose to be converted into **glycogen** (this is the stored form of glucose).

However, if the blood glucose levels are low (hypoglycaemia) pancreas release **glucagon**. It causes glycogen to be converted back into glucose which increases the blood glucose levels in our body. (Hopkins, J. 2021)

In people with Type 1 the pancreas doesn't produce enough or any insulin. This increases the blood sugar levels that's why they need to lower it by inserting insulin in their blood stream. This can be done with insulin injections **(Fig.2)** and insulin pumps.

People with type 2 diabetes are resistant to insulin. The **pancreas** produces more insulin to meet the body's needs but the body cells cannot use it. As a result, the blood sugar levels increase. To normalize it people with type 2 take pills - Metformin or Glucophage.

Another pancreas hormone is **Leptin**. Leptin and Insulin regulate each other. Leptin is a hormone who gives signal to the brain (hypothalamus) for the amount of food intake - that we are full. People with type 2 have huge appetite because their body

doesn't produce enough leptin. This leads to obesity, excess levels of circulating insulin and insulin resistance.

Physiology - It involves the central nervous system notifying the plasma concentrations of glucose to utilise energy reserves.

It is based on the speed that plasma glucose concentrations fall, and other available metabolic fuels. (Moini, J. 2019).

Every illness has a variety of side effects which can range from harmless to deadly.

Diabetes' most common side effects are the following:

- **Side effects of diabetes:**
- Cardiovascular disease (heart problems)
- Nerve damage (neuropathy)
- Kidney damage (nephropathy)
- Eye damage (retinopathy)

(MFMER, 2020)

Type 1 and Type 2 diabetes are two completely different illnesses however they both have similar symptoms that indicate if you have type 1 or 2.

Symptoms Type 1

Very thirsty

Weak bladder

Extreme exhaustion

Losing weight

Weak eyesight

Type 2

Weak bladder

Very thirsty

Fatigue

Gaining weight

Weak immune system

Bad vision

(NHS, 2020)

Type 1 diabetes has many recommendations which can help improve your lifestyle even with diabetes. By following the recommendations below it can help control your diabetes and maintain a normal and healthy blood sugar level.

Recommendation for Type 1 diabetes

- Exercise often
- Test glucose levels frequently
- Use insulin. Injections/pump
- Maintain healthy weight
- Eat healthy
- Carry sugary foods with you (hypoglycaemia)
- Limit alcohol amounts
- Wear medical bracelet (Havas, 2006)

Type 2 diabetes also consists of similar recommendations to type 1 diabetes. However, type 2 diabetes is reversible. By following the recommendations, some people can reverse it and maintain a healthy blood sugar concentration without needing to take metformin or medicine tablets.

Recommendation for Type 2 diabetes:

- Healthy diet- meals containing iron
- Food containing healthy carbohydrates
- Eat in intervals
- Avoid saturated fats

- Control weight
- Exercise daily

(Pietrangelo, 2020)

Although neither type of diabetes can be cured, there are treatments for both which help you maintain regular blood sugar levels. In type 1 diabetes it cannot be reversed, and it can only be maintained through the use of treatments. However, in type 2 diabetes you can reverse it by taking medicine and changing your lifestyle choices which can lead you to maintain a normal glucose levels without needing to take medicine. But, type 2 is an ongoing disease so even if you reverse it, you will still have it permanently. Type 2 can become type 1.

Type 1 Treatments

- Insulin injections
- Short-acting
- Rapid-acting
- Long acting
- Intermediate-acting
- Insulin pump
- Pancreas transplant

Type 2 Treatments

Metformin (Glucophage)
Medicine tablets

(MFMER, 2021)

In conclusion, all the information provided allows me to evaluate that patient A is at an extremely high risk of developing Type 2 diabetes. Patient A is a middle-aged person (45y) who:

- Unhealthy diet
- Smokes between 1 to 9 cigarettes / day
- Drinks between 3 – 6 units of alcohol / day
- Has a high BP of 140 / 90
- No family history of diabetes
- Only exercises once a month
- BMI 24.2 – on the verge of obesity (170 cm / 70kg)

Considering her diet which consists of frozen meals 3-4 times a week (chips, sugar food, chocolate). If she carries on her unhealthy lifestyle it is safe to say that she is possible to develop Type 2 diabetes. However, if she decides to change the way she lives by following the recommendations for Type 2 diabetes that I listed earlier on she will live a happy, healthy, and fulfilled life.

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