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**/ BMHP5023 Introduction to Physiology Case
Study Report**

**Assignment Title: Case Study Report: Type 2
Diabetes**

Introduction

Type 2 diabetes is a chronic metabolic disorder where the body struggles to produce the hormone insulin. Insulin is produced by the pancreas and is necessary for regulating the blood sugar levels (glucose) in your body, Type 2 diabetes stops this process from working properly. This inability to use insulin in the body correctly is known as insulin resistance and is responsible for the rise in blood sugar levels (National Institute of Diabetes and Digestive and Kidney Diseases, 2017).

There are several key risk factors associated with the development of Type 2 diabetes, some of which can be controlled and some that cannot be controlled. Amongst the risk factors that cannot be controlled are age, where the risk is increased for people over the age 40, family medical history, and ethnicity, where according to Diabetes UK (2023) “if you are from an African Caribbean, Black African or South Asian background, your risk increases from the age of 25”. Now with these uncontrollable risk factors, there are controllable risk factors such as obesity, lack of an active lifestyle, unhealthy diets, and harmful habits like smoking (Mayo Clinic, 2025).

Type 2 diabetes is the most common type of diabetes that people have with NICE (2024) stating “about 90% of people with diabetes have type 2 diabetes”, and “it is estimated that almost 1.3 million people in the UK are likely to have undiagnosed type 2 diabetes”. This vast number of people affected by such a common chronic disease, indicates a huge health issue that requires so much work to be addressed fully.

This report aims to explain how type 2 diabetes works, the influence it has over daily life and how lifestyle choices can affect this condition, discuss the causes of the disease and widen our understanding of blood sugar levels. There will also be insight into how lifestyle changes can help with this condition with appropriate research and studies.

Section 1: Anatomy and Physiology of Blood Glucose Regulation

To first explain type 2 diabetes, we must first breakdown how blood sugar is usually regulated in the body. This is a controlled process that involves the assistance of several organs and hormones, with the primary organ being the pancreas. The pancreas a

glandular organ located in the upper abdomen, resting between the stomach and spine, it has two vital functions to the body, the focus of this report will be the endocrine. Endocrine is the production of hormones in the body that help regulate the blood sugar levels keeping them balanced, these hormones include insulin and glucagon. Insulin helps lower the blood sugar levels, and glucagon raises the blood sugar (Karpińska and Czauderna, 2022).

Energy in the body is created through a process called cellular respiration, a simple equation of Glucose + Oxygen → Carbon Dioxide + Water + ATP (Energy). The production of ATP allows us to power the cells in our body, from the cells in our muscles to our brain tissue. This energy is disrupted by type 2 diabetes and has a series of effects all over the body (Reed, 2022). We get this energy from food that contains carbohydrates, the body breaks it down into glucose, this energy is split and some is used as fuel for the body and the rest is stored in the liver and the muscles. When the glucose is stored, it is referred to as 'glycogen', and when the blood sugar levels drop it is now the job of glucagon to convert the glycogen back into usable energy for the body, which is when insulin is then used to allow that glucose to enter the cells in the body (Villines, 2023). This is a process known as 'glucose uptake', this is an essential part of the process where several glucose transporters in the body called 'GLUT transporters' help get energy to different parts of the body. GLUT4 is the primary transporter, responsible for getting energy to fat and muscle cells, this transporter is heavily reliant on insulin for activation, as according to Artgerecht (2023), "without insulin, GLUT4 remains inside the cell and glucose cannot enter". When GLUT4 is active it is pushed inside the cell membrane (fat and muscle cells) and allows glucose to enter these cells, this can only be done with the help of insulin binding itself to receptors that are on the surface of the cells. Once these receptors activate a signal is let off and allows the GLUT 4 to be a sort of doorway for glucose to be passively used for energy in those cells (Huang and Czech, 2007).

Section 2: Pathophysiology and Impact of Type 2 Diabetes

When blood sugar levels drop below the normal range, this is described as 'hypoglycaemia', a major concern for people who are diabetic. As Radcliffe Department of Medicine (2026) describes, "when blood sugar levels fall too low, the body normally mounts a rapid hormonal defence to restore them", however in the case of someone with type 2 diabetes, the normal regulation of blood glucose is defective due to insulin

resistance and the cells of targeting parts of the body don't respond adequately to glucose. As a response to this, the pancreas is forced to work harder to produce insulin to those cells and manage the blood sugar levels, this describes a state known as 'hyperinsulinemia', (Cleveland Clinic, 2022). Overworked and exhausted leads to the pancreas having "abnormal insulin secretion" as worded by Mouri and Badireddy (2023), resulting in a rise of the blood glucose levels, this is called 'hyperglycaemia'. This excess of glucose in the body brings a variety of short term and long-term complications to your health. Shorter term complications can appear as feelings of fatigue even when well rested, frequently urinating, or increased thirst. Longer term complications are cardiovascular related diseases, damage to the blood vessels in the retinas, nerve damage and poor blood flow in areas of the body like the foot (can lead to amputation), and kidney damage (Mayo Clinic, 2022).

The progression of Type 2 diabetes is partially dependent on various lifestyle factors, as mentioned before, there are a few factors that can't be helped but there are plenty that still can. Having poor dietary habits is a major contributor to type 2 diabetes, a diet that contains a lot of highly processed foods, refined carbohydrates, and saturated fats increase the risk of type 2 diabetes (Integrus Health, 2023). Aside from a poor diet, inactivity or living a sedentary life also contributes to the development of type 2 diabetes. Carbohydrates and fat are important sources of fuel for the muscles in your body when exercising and according to University Hospitals Coventry and Warwickshire NHS Trust (2025) "the body uses different sources of fuel depending on the length and intensity of the exercise". Starting from the glucose that goes directly to the muscles, then the bloodstream (supported by the liver), then after enough time fat, the presence of insulin allows this fuel (glucose) to be utilised. Long periods of inactivity will hinder this ability to use insulin, with Misra (2025) stating that, "after one day of prolonged sitting, your body's ability to use insulin effectively can drop significantly".

Smoking is another huge risk factor to the development of type 2 diabetes, the nicotine found in cigarettes damage the body causing inflammations and rises in your blood sugar levels (inflammation makes regulation difficult) (CDC, 2024). The increase in blood sugar levels results in people who are diabetic needing larger doses of insulin, and as stated by Rouland et al. (2024), "active smoking also has negative impact on glycemic control in both type-1 and type-2 diabetic patients". Ultimately smoking worsens all the chronic complications that comes with a disease like diabetes and tends to make these complications more likely to happen the longer it persists.

Section 3: Monitoring and Data Use in Type 2 Diabetes

An important part of managing type 2 diabetes is the tracking of blood glucose levels throughout the day, allowing professionals and yourself to be able to assess the state of your diabetes and how it is being controlled. This then allows better evaluations of the effectiveness of your treatment plans but also spotting any early complications that can quickly worsen over time. Hb1A1c tests (glycated haemoglobin) are the main tools used to track long term blood glucose levels, this test reflects the past 2 to 3 months and moving forward helps with long term treatment strategies and further diagnoses (Lab Tests Online UK, 2013).

Having daily routines for management over an individual's Type 2 diabetes is responsible for limiting the growth of chronic complications. Being able to self-monitor any inconsistencies, or anything out of the ordinary may be what saves an individual from their condition from worsening. Also, not everyone responds to diabetes the exact same, so understanding how an individual's routine needs to be tailored to their needs is important too (National Institutes of Health, 2025).

Section 4: Evidence-Based Lifestyle Recommendations

Going back to the risk factors that can be controlled, appropriate and realistic steps to support change starts with the main contributing factors such as diet, physical activity, and bad habits like smoking. First, the most important is dieting. A vital inclusion to your diet will be foods rich in fibre, Integrus Health (2023) mentions that "fibre is your friend is your friend when it comes to either preventing or reducing your risk of diabetes", fibre slows down that quick absorption of sugar in the bloodstream and limits the spikes in your blood glucose and insulin levels. As well as fibre, there should be an emphasis on non-starchy vegetables and foods, fruits, proteins packed with fibre like legumes, whole grains are important also, with Integrus Health (2023) saying that "one study found eating two servings of whole grains can decrease the risk of type 2 diabetes by 21 percent".

Maintain a consistent physically active lifestyle does wonders in reducing the risk of type 2 diabetes. By moving the body, the muscles, you can increase its sensitivity to insulin, this increase in sensitivity according to Misra (2025) means that, "your pancreas doesn't have to work overtime to produce huge amounts of it to get the job done", this helps counter the effects of insulin resistance, strengthening your body's receptiveness to insulin

signals. A mixture of any aerobic exercises to get the heart going and strength training to build muscle so that they can store more glucose instead of having an excess around the body is the best method for countering the effects of type 2 diabetes. Misra (2025) states that “research shows that you can significantly lower your risk of developing type 2 diabetes with just half an hour of exercise a day”.

The pressure lifted off the pancreas when significant lifestyle changes are adopted is great. The pancreas no longer must burn itself out by working overtime to help regulate an already spiked blood glucose level and the physiological demand to produce insulin is significantly lowered and it can now function as normal and improve its ability to secrete insulin naturally without overdoing it.

Conclusion

To conclude, this report has analysed the causes of type 2 diabetes, how it affects the lives of individuals, and how the disease develops through the various of lifestyle factors, controlled or not, and how things can be done to reduce its risks. It touches on the importance of maintaining good health and have healthy habits that can be supported by monitoring your current condition to ensure you are tailoring your routine to your needs. This report has explored how complex type 2 diabetes can be, but also how dangerous the inability to produce insulin, or insulin not being utilized correctly in the body can be detrimental to your overall health. Understanding the long-term complications that can easily be fatal due to excess glucose being in the body with no where to be stored as fuel, extending to body parts like the nervous system, the brain, kidneys, eyes, etc. However, the emphasis on lifestyle changes shows promise and hope that health changes can be administered to prevent these risks from occurring, being able to catch them in their early stages by being attentive to current health conditions and blood glucose levels.

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