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a) Introduction

Diabetes mellitus is a chronic disorder that involves an inability for the body to maintain a safe blood glucose level, for one or more of several reasons: that the pancreas no longer produces enough insulin; that the tissues are no longer able to respond to the insulin that is produced; that insulin produced is not structurally normal. Of the people living with diabetes in the UK, nearly 90% are diagnosed with Type 2 (which takes time to develop) and strongly related to weight and lifestyle, while approximately 8% are diagnosed as Type 1, an autoimmune condition (Diabetes UK, 2025). In this report I am concentrating on Type 2 diabetes as that's the most representative of the patients that come to my clinics.

The situation is very serious. Diabetes UK (2025) estimates that nearly 6 million people in the UK live with diabetes, nearly 1.3 million of whom are undiagnosed, and over 12 million adults to be those with diabetes or with prediabetes. The number of diagnoses of Type 2 Diabetes in our surgery is also reflective of a national trend, as Type 2 Diabetes is now more common in young adults (Ahmad et al., 2022).

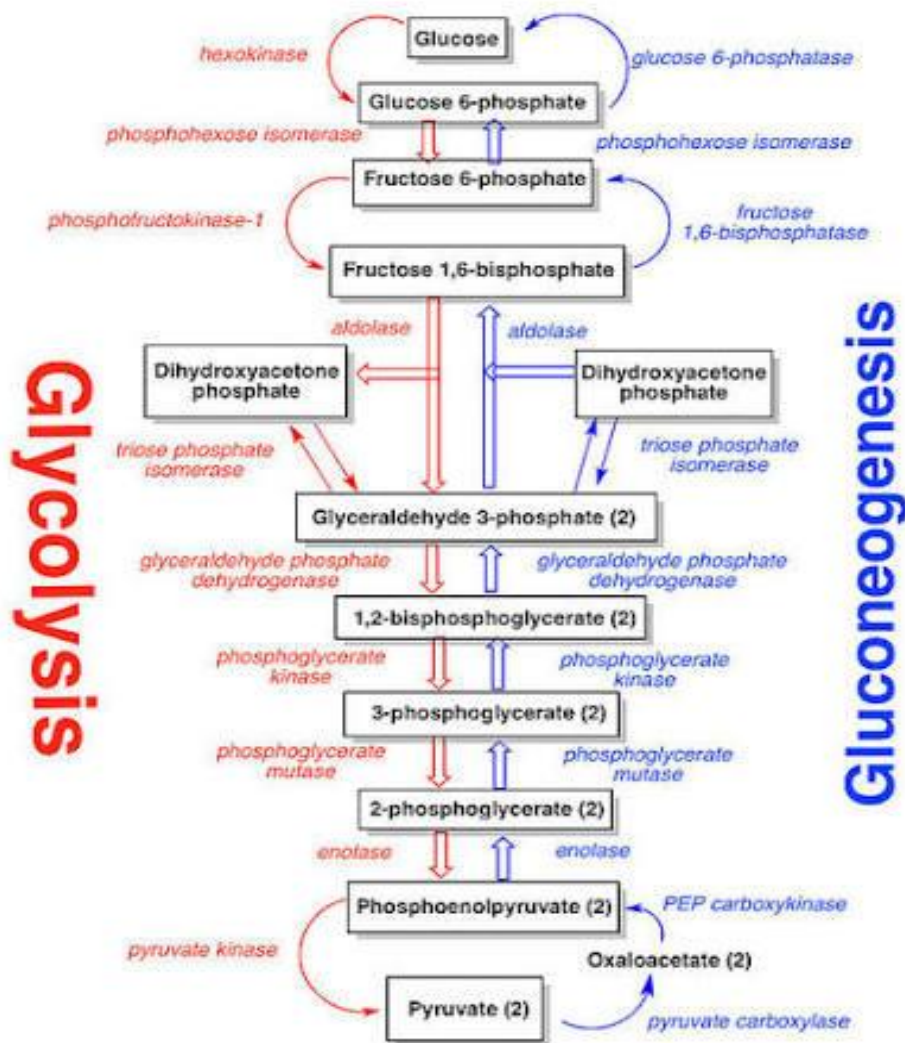
Overweight, sedentary lifestyle, advanced age, having a family member with diabetes, individuals of South Asian descent, those with Black African or African-Caribbean descent and smoking are the risk factors (Ahmad et al., 2022; Qin et al., 2023). However, some can be changed, specifically weight, activity and smoking, hence these are the more practical aspects of this report.

My goal is to provide information to patients that can be used in between appointments: What is normal glucose control, how glucose is converted to energy, why it is important to record glucose results, and which lifestyle changes have the best evidence for achieving wellness. Each section is connected to what goes on at a routine practice nurse check-up and the language is maintained to make the information suitable for use in a patient leaflet.

b) How the level of glucose in the blood is maintained

Following food, carbs are converted to glucose and glucose enters the bloodstream causing blood glucose to increase. This is sensed by the beta cells in the pancreatic islets, which results in the secretion of insulin. Insulin is like a key, it tells muscle and fat cells to move glucose transporters (GLUT4) to the surface of the cells, allowing glucose to get in, and the liver to store the glucose as glycogen in the liver and not make more glucose. So, blood glucose returns to the normal level. When glucose is low, between meals, alpha cells produce glucagon which stimulates the liver to convert glycogen and produce glucose (gluconeogenesis), otherwise hypoglycaemia could occur.

The result is a negative feedback system that continued to ensure the brain, a brain that relies on glucose, is well supplied (Ahmad et al., 2022).

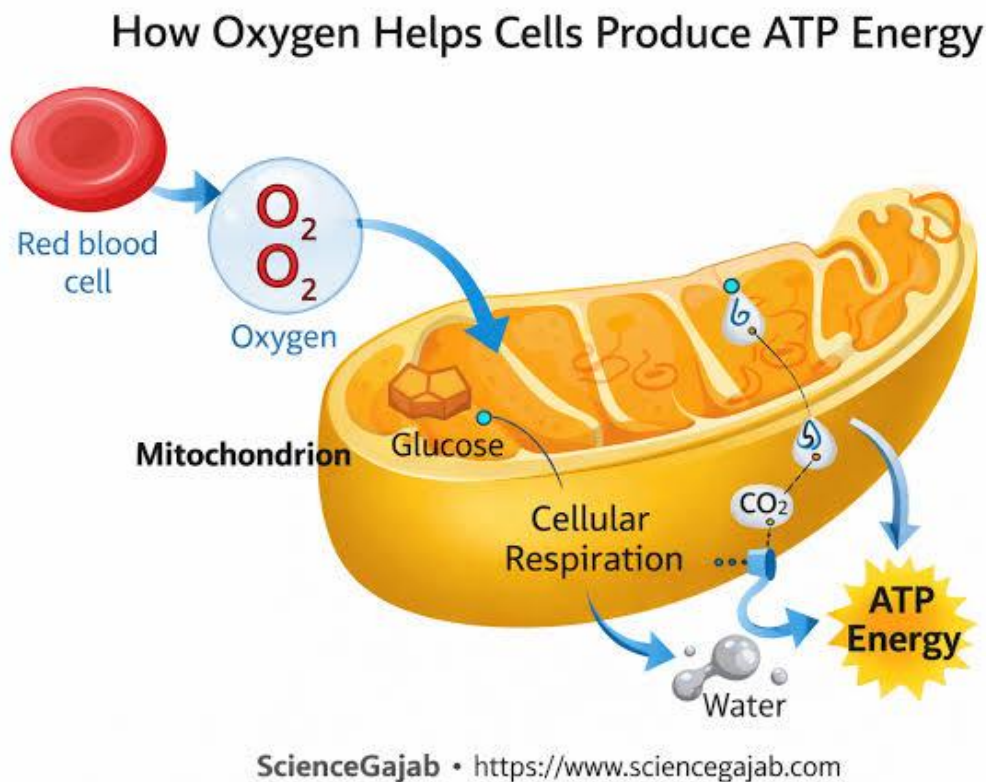


(Lineage medical, 2022)

With Type 2 diabetes the loop doesn't function on two related fronts. Insulin resistance means that the muscle, liver and fat don't react strongly enough to insulin and therefore less glucose is allowed into them and glucose is secreted by the liver when there is already plenty in the blood. Second, the beta cells at first compensate with higher insulin levels, but eventually, they cannot keep pace and blood glucose remains elevated (Ahmad et al., 2022). For obese individuals and those with Type 2 Diabetes, metabolic flexibility is also impaired (Galgani et al., 2022), meaning they are not able to switch between carbohydrate and fat burning during fasting as well.

For patients, understanding Type 2 diabetes helps explain why high blood glucose causes thirst and tiredness. Lautsch et al. (2022) found that only 39.1% of 5,331 patients achieved their individualised HbA1c target. This highlights the importance of explaining HbA1c results and treatment goals. During consultations, I explain what HbA1c measures and encourage patients to participate in managing their condition (Lautsch et al., 2022).

c) How Oxygen and Glucose produce energy



(Sanjay, 2026)

After glucose is taken into a cell, it can be used to produce adenosine triphosphate (ATP), which is the molecule that drive muscle contraction, nerve signaling and tissue repair. This occurs in a series of “hops.” Glycolysis (in the cytoplasm) in which glucose is broken down into two pyruvic acid molecules with a net gain of two ATP it does not require oxygen. In the presence of oxygen, the pyruvate enters the mitochondria, is converted to acetyl-CoA, and enters the Krebs cycle, yielding high energy electron carrying molecules NADH and $FADH_2$, and the waste product carbon dioxide. These electrons are then passed along the electron transport chain on the inner mitochondrial membrane to be received by O_2 at the end to produce water, which in turn causes

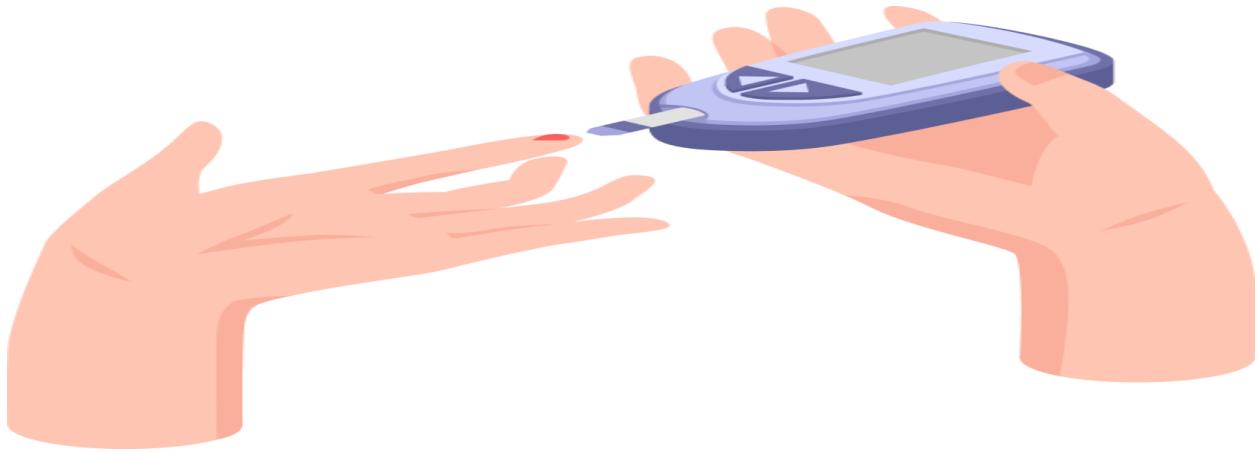
ATP synthase to generate the majority of the ~30 to 32 ATP molecules per glucose. In the event of the lack of oxygen, cells switch to anaerobic glycolysis, which only generates two ATP and generates lactate. This is important in diabetes in that insulin helps to transport glucose into cells and, following carbohydrate consumption, to switch fuel towards glucose oxidation. In insulin resistance, this impetus is lessened, and less usable glucose reaches the cells despite high blood glucose, along with fuel switching becoming more difficult (Galgani et al., 2022).

I make this two strategically helpful messages. Smoking adds carbon monoxide to haemoglobin which outcompetes oxygen and tissues are starving for final, most productive stage of energy production. When exercise energy is expended, the muscle needs ATP and adds in the uptake of glucose, which is reflected on trials in reduced HbA1c (Jayedi, Emadi and Shab-Bidar, 2022).

d) Recording and tracking blood glucose

By writing it down, I make single numbers into a pattern and now the patient and I have a pattern that we can all work with. There are two sorts of measurement quantity. Laboratory tests are carried out to monitor average glucose levels - these are measured as HbA1c and are requested every 3 to 6 months until stable then 6-monthly (NICE, 2022). Home monitoring between these tests can demonstrate the effects of food, activity and sickness and medication on glucose throughout the day.

Earlier this year, NICE (2022) reviewed the evidence once prior for finger stick self-monitoring for adults with Type 2 diabetes, which concluded that generally this should not be routinely offered as there is not significant evidence of benefit and testing is inconvenient and expensive. It is available, if there is a clear purpose for it such as for people taking insulin, those who have had episodes of hypoglycaemia or on medicines which can cause such events and for a short term period, such as commencing treatment with corticosteroids or to confirm a suspected episode of hypoglycaemia. If monitoring continued, a structured evaluation is recommended at a minimum once a year. So, I agree with each patient as to whether or not to monitor or to provide each patient with a meter.



(Health Hub, 2020)

If monitoring is indicated, a diary can be the most helpful if it includes a record of the time, reading position, meal or activity and symptoms, such as dizziness, thirst or sweating. When I meet people for review, I am specifically searching for trends, high blood sugar readings during the time of day, high blood sugar readings at certain mealtimes, or low blood sugar at specific exercise times. When a patient sees the readings going higher after a big evening meal, they can be told "not to eat so much" and "not to eat so late" - rather than just "your readings are high. Readings can be accessioned through the hospital's IT server or Varius Clinical software, with the results then downloaded and transferred to its CED system. Clear safety netting also needs to be provided for patients to contact the surgery for repeated low readings, persistent high readings with thirst and weight loss or if feeling unwell. Technologies are expanding the possibilities. Conditional NICE (2022) guidance indicates the use of intermittently scanned CGM for adults with type 2 diabetes who receive multiple daily insulin injections and fulfil certain criteria. In a meta-analysis of 12 randomized clinical trials, there was an average reduction of 0.3% in HbA1c with continuous glucose monitoring compared to fingerstick testing, regardless of whether there was use of insulin or not (Jancev et al., 2024). The benefit is small and I offer this as additional support to behaviour change not as an alternative to the lifestyle measures below.

e) Recommendations

Smoking

Most of the evidence is about the risk of developing diabetes so I use this to explain why stopping is important and attach it to the oxygen-delivery point in section c for those that are already diagnosed. A meta-analysis of ten prospective cohort studies (251,620 individuals) showed that exposure to second-hand smoke increased the risk of Type 2 diabetes (pooled relative risk, 1.27;

95% CI, 1.19–1.36) (Qin et al., 2023). One of the challenges patients can point to is that quitting often causes patients to gain weight. Meta-analysis results for 11 cohorts revealed a greater risk of developing CVD among those quitters who gained weight than continuing smokers (hazard ratio (HR) = 1.71) but not in the case of those who quit smoking in the long run (HR = 0.91) (Yu et al., 2026). For this reason I suggest that patients don't put off stopping smoking because they are worried about weight gain, refer them to the NHS stop-smoking services and discuss nutrition and exercises at the same appointment to minimise any weight gain.

Diet

Forty-two randomised controlled trials (each with a minimum duration of six months, involving 4,809 adults) comparing ten dietary approaches were included in a network meta-analysis, which indicated that ketogenic, Mediterranean, moderate-carbohydrate and low-glycaemic-index diets were effective in reducing HbA1c and fasting glucose levels (Jing et al., 2023). The Mediterranean or low-glycaemic-index dietary pattern may be more sustainable for many patients in the UK than a very-low-carbohydrate diet, which may require medication adjustments. For patients with excess weight, a systematic review and meta-regression analysis of randomised controlled trials found a strong association between weight loss and Type 2 diabetes remission. The likelihood of remission increased as the amount of weight lost increased, highlighting the importance of structured weight-management support (Kanbour et al., 2025). However, remission is not a permanent cure, and continued support is important to help patients maintain weight loss and manage their condition. Structured diabetes education is also a priority in NICE guidance (NICE, 2022), so I would refer patients to appropriate programmes rather than provide only brief advice.

Exercise

HbA1c levels decreased dose-dependently based on aerobic exercises; the high dose of the exercise in supervised moderate to vigorous intensity Cu Class decreases the HbA1c levels (Jayedi, Emadi and Shab-Bidar, 2022). Resistance exercise also lowers the HbA1c and fasting glucose levels, therefore it is advisable to engage in both. I start by increasing from what they are currently doing, such as a brisk walk after each meal of 10 minutes and try to move towards the national recommendations of activities. Additionally, there will be some mini strength training twice in a week using either resistance bands or body weight. Individuals who use insulin or any other medication that might cause hypoglycemia need to check their glucose levels before and after exercise and carry fast acting carbohydrates. Exercise referral is also recommended locally

(evidence suggests supervision). Progress is monitored during each visit where patients record the time they were active according to their glucose levels.

f) Conclusion

Type 2 diabetes is widespread, increasing in the number of people who have it and for many, easy to manage once they realize what's going on in their body. Insulin resistance and failing insulin are responsible for glucose to accumulate in the blood while the cells are not able to generate energy, which accounts for the thirst and fatigued symptoms experienced by patients. HbA1c testing provides structure to that experience, for all, with only people who would benefit needing to test at home or continuously, as recommended by NICE (2022). Fundamentals of lifestyle change are: quitting smoking, eating a sustainable Mediterranean-style diet or following a low GI diet, losing weight, if necessary, and doing aerobic and resistance exercise.

In my clinic I will use this information, for example, to create a patients leaflet, and to standardise 3 questions at every review: what have you been reading, what is 1 thing you will change this month, and what support do you need? These steps acknowledge patient choice, implement evidence into practice and involve patients in their care plans to safely and effectively manage their blood glucose.

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