Type 2 diabetes is associated with a range of serious complications, and accounts for significant costs to the NHS. Dietary and lifestyle change can reduce its impact.

Reversing type 2 diabetes with lifestyle change

In this article...

- Incidence of type 2 diabetes
- Pathophysiology of type 2 diabetes
- Effects of dietary and lifestyle modifications on type 2 diabetes

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Type 2 diabetes is now at epidemic levels in the UK and becoming increasingly costly for the NHS to treat. Risk factors include a high-carbohydrate diet and sedentary lifestyle. This article examines the effectiveness of a healthy, calorie-controlled diet and exercise regime in reversing type 2 diabetes.

Type 2 diabetes is the most common form of the condition and accounts for 90% of cases worldwide (World Health Organization, 2011). In February 2014 there were 3.2 million people with the condition in the UK and becoming increasingly costly for the NHS to treat. Risk factors include a high-carbohydrate diet and sedentary lifestyle. This article examines the effectiveness of a healthy, calorie-controlled diet and exercise regime in reversing type 2 diabetes.

Pathophysiology and causes

Type 2 diabetes usually appears in people over the age of 40 (Diabetes UK, 2012), although it has also been diagnosed in children as young as seven due to obesity and physical inactivity (Wilson, 2013; Rosenbloom, et al, 2009). The condition develops when the body is unable to produce enough insulin to maintain normal glycaemic control. If obesity is also present, insulin released in response to a rise in blood glucose cannot work effectively because excess body fat interferes with its usual action on cells; this is known as insulin resistance (Hauner, 2010).

A range of disorders contribute to the development of type 2 diabetes, such as metabolic syndrome, fatty liver disease, and genetic factors, but obesity is the greatest risk factor. It accounts for 80-85% of overall risk, and underlies the current worldwide epidemic of the condition (Diabetes UK, 2012). However, obesity does not cause type 2 diabetes – the condition develops in people who are not obese, and those who are obese do not always develop it.

Genetic and environmental factors also contribute towards the risk of developing...
type 2 diabetes, meaning that those with close family members with the condition are two to six times more likely than the general population to develop it (Vaxillari and Froguel, 2010). South Asian people are six times more likely to develop type 2 than the general population, predominantly around the age of 25, and those of Afro-Caribbean origin are three times more likely to develop the condition than Caucasians (Department of Health, 2001).

**Signs and symptoms**

Ongoing symptoms such as excessive excretion of urine, increased thirst, persistent hunger, tiredness, numbness in the feet and legs and changes in vision may be subtle, and so not considered of note. For this reason, type 2 diabetes may not be diagnosed until secondary long-term complications, such as circulatory system disease, eye disease or peripheral nerve damage has occurred.

**Management of type 2 diabetes**

The management of type 2 diabetes should address all aspects of individual patients’ lifestyle and be personalised to their specific glucose problems and other health conditions (National Institute for Health and Care Excellence, 2014a). This includes dietary advice from an appropriately trained health professional, in which the glycaemic haemoglobin level (HbA1c) may be set above the usual 6.5% target because patients managed with diet alone have no available means, such as injected insulin, to reduce blood glucose levels.

Patients are taught to self-monitor their blood glucose levels, as well as its importance and how to interpret their test results. Self-monitoring is important for those using either glucose-lowering medications or insulin (patients with type 2 require insulin when glucose-reducing medication becomes less effective), so they can respond to any change in glucose resulting from illness, medication or lifestyle changes.

Patients who are obese and whose blood glucose is inadequately controlled by diet and exercise alone are prescribed the oral glucose-lowering secretalogues, such as sulphonylurea drugs, may be prescribed. Acarbose may be used as an alternative if there is intolerance to other glucose-reducing medications, while thiazolidinediones such as pioglitazone may be used as a secondary glucose-lowering medication to first-line metformin when HbA1c remains elevated. Insulin therapy may be combined with metformin when glucose control is inadequate (HbA1c >7.5%), although patients must be made aware of potential hypoglycaemia and how to treat it.

Management of type 2 diabetes also involves the annual measurement of blood pressure for those without hypertension or renal disease, especially where there is poor glucose control. Other risk factor evaluations include cardiovascular function, management of blood lipids, the introduction of anti-thrombotic therapy, and assessment of the development of diabetes complications, such as retinopathy, neuropathy and nephropathy.

**Dietary change and weight loss**

Although there is little evidence that dietary modification alone can provide a cure for type 2 diabetes, clinical trials show that a combination of lifestyle change and weight loss for obese patients is highly effective in reversing glucose impairment (Ahmad and Crandall, 2010).

The benefit of adopting a low-carbohydrate diet to achieve weight loss has been shown for over 10 years for those with type 2 diabetes (Harder et al, 2004; Yip et al, 2001). In the US, an intensive lifestyle change programme comprising a calorie, carbohydrate and fat restricted diet prevented type 2 diabetes in at-risk obese individuals (Mayer-Davis et al, 2004).

In my work I have seen five obese patients with type 2 diabetes achieve type 2 diabetes reversal via dietary modification and regular cardiovascular exercise taken three times a week. The patients avoided refined carbohydrates and incorporated regular exercise into their routines, achieving an average weight loss of two stone (under medical supervision), and an HbA1c within the non-diabetic range (20-41mmol/L). They maintained this status without the use of metformin or insulin for an average of four years, with varied reasons for ceasing to maintain the behavioural change, such as personal choice and change in circumstances. However, this demonstrates that those with obesity-related type 2 diabetes may, with medical guidance, reverse the condition, reducing their risk of life-threatening secondary complications. Reduction in body weight, however, must be maintained; if weight is regained, type 2 diabetes returns.

Previous studies support the experiences of the patients discussed above. Westman et al (2008) found that with a sustained low-carbohydrate diet (<20g per day for 24 weeks) but no calorific restriction, 85 volunteers with type 2 diabetes achieved reduced glucose levels and improved glycaemic control. Low carbohydrate diets are also low glycaemic-index diets because carbohydrates (starch) convert to glucose, raising blood glucose levels. Carbohydrate reduction eliminated or reduced the need for glucose-reducing medication in motivated subjects, leading to the conclusion lifestyle change improves type 2 diabetes. Other studies have shown similar results (Boden et al, 2005; Vernon et al, 2003).

Healthy eating with a reduced carbohydrate intake is not the same as adopting a very low-calorie diet (VLCD) as low-carbohydrate diets may allow a normal fat intake and are, therefore, not low in calories. For some who have a clinical need to lose weight quickly, such as obese patients awaiting joint replacement surgery, VLCDs (>800 calories/day) may be necessary. However, patients should maintain these diets for a maximum of 12 weeks and under medical supervision (NICE, 2014b), or complications such as vitamin and mineral deficiency are likely.

Some patients with type 2 diabetes and secondary complications would not be suitable for a restricted diet, such as those with reduced kidney or liver function, cardiac impairment, eating disorders or other psychopathology.

Updated guidance on management of obesity recommends that gastric band surgery be offered to more people with type 2 diabetes.

**Box 1. Complications of Type 2 Diabetes**

- Cardiovascular disease
- Nephropathy
- Retinopathy
- Neuropathy
- Amputations
- Depression
- Sexual dysfunction
- Complications in pregnancy

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diabetes. This should mean the long-term cost to the NHS of treating diabetes is reduced (National Institute for Health and Care Excellence, 2014b). However, lifestyle change and steady weight loss are cheaper than surgery, and avoid the risk of surgical complications. The ideal strategy, therefore, is to motivate and support patients with type 2 diabetes to lose weight through diet and lifestyle changes where possible, and to address the underlying issues that cause them to overeat.

Conclusion
Excess body fat impedes the action of insulin on cells, resulting in insulin resistance and high blood glucose levels, so weight loss can improve glycaemic control in obese individuals. Achieving a normal body weight allows insulin to function correctly, which can eliminate the need for blood glucose-lowering medication.

Dietary modification and exercise recommendations have the potential to reverse type 2 diabetes without the risks associated with weight-loss surgery, but regimes must be tailored to individual patients’ needs by appropriately trained clinicians. Lifestyle change requires a high degree of motivation, so patients need ongoing support to achieve and maintain weight loss, and to address the underlying issues that have caused obesity.

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