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Smoking and diabetes

www.ash.org.uk

enquiries@ash.org.uk

Telephone: 020 7739 5902

What is diabetes?

Diabetes mellitus is a condition that occurs when the glucose level in the blood is too high because the body cannot use it properly. Glucose is a sugar that the body makes mainly from the digestion of carbohydrates in food. Glucose is also produced by the liver. Glucose levels are controlled by the hormone insulin which is made and stored in the pancreas. Insulin helps glucose to enter the cells where it is used as fuel by the body.

Types of diabetes

There are two types of diabetes: People with Type 1 diabetes (insulin-dependent) do not produce any insulin. People with Type 2 (non-insulin dependent) diabetes do not produce enough insulin, or the insulin that the body does produce doesn't work properly (insulin resistance).

Type 1 diabetes is the less common form accounting for about 15 per cent of people with diabetes. This type usually develops in children and young adults but can occur at any age. It is thought that Type 1 diabetes occurs when the body's immune system destroys the cells that produce insulin but it's not known what causes this to happen.

About 85% of people with diabetes have Type 2 diabetes. This condition tends to develop gradually after the age of 40. However, increasingly, Type 2 diabetes is being diagnosed in younger people, including children. It appears that this is largely due to the fact that individuals have less active lifestyles and an increasing number are overweight. Both genetic and environmental factors contribute to the development of diabetes but the development of Type 2 diabetes is more likely if some or all of the following factors are also present: physical inactivity; being overweight; family history of Type 2 diabetes; previous diabetes in pregnancy. The condition is also more common in people of Asian and African-Caribbean origin.¹

Prevalence and health consequences of diabetes

In the UK, there are more than 2.5 million people diagnosed with diabetes and an estimated half a million are believed to be undiagnosed.² In 2006, there were 6,431 deaths in the UK attributable to diabetes.³

People with diabetes are at greater risk of raised blood pressure, heart disease, stroke, kidney disease, nerve damage and eye complications such as retinopathy (disorders of the retina).¹

Links between smoking and diabetes

There is a growing body of evidence to suggest that smoking is an independent risk factor for diabetes.⁴ Several hypotheses have been proposed to explain this link. Smoking has been identified as a risk factor for insulin resistance (see below), a precursor for diabetes. Smoking has also been associated with a risk of chronic pancreatitis and pancreatic cancer, suggesting that tobacco smoke maybe toxic to the pancreas.⁵

People with diabetes already have an increased risk of heart disease, which is further elevated if they smoke. Diabetes acts in several ways to damage the heart: high glucose levels affect the walls of the arteries making them more likely to develop fatty deposits which in turn makes it more difficult for the blood to circulate. People with diabetes are more likely to have high blood pressure and high levels of fats such as triglycerides. They are also more likely to have lower levels of the protective HDL cholesterol.¹

A systematic review of 25 studies found that all but one revealed an association between active smoking and an increased risk of diabetes.⁶ On the basis of this review, it is estimated that 12% of all type 2 diabetes in the United States may be attributable to smoking.⁷ If the same proportion is applied to the UK, smoking may account for as many as 360,000 cases of diabetes.

There is some evidence to suggest that exposure to secondhand smoke also raises the risk of glucose intolerance and the development of diabetes.^{8 9}

Smoking diabetes and pregnancy

Women who smoke during pregnancy are at increased risk of developing gestational diabetes and also increase the risk of their offspring developing diabetes later in life.¹⁰ Gestational diabetes mellitus is defined as any carbohydrate intolerance that begins during pregnancy. Women who develop diabetes during pregnancy have a seven-fold increased risk of subsequently developing type 2 diabetes compared with women who have normal levels of glucose in pregnancy.¹¹

Insulin Resistance and metabolic syndrome

Smoking has also been identified as a risk factor for insulin resistance which can lead to diabetes. People with insulin resistance cannot properly use insulin and such people may initially have higher than normal amounts of insulin circulating in their blood, a condition known as hyperinsulinemia.

Smoking can induce changes in blood vessels which impairs insulin sensitivity by reducing the flow of blood in muscle tissue. A study of 40 patients with Type 2 diabetes found insulin resistance was markedly aggravated among those who smoked.¹²

Metabolic syndrome is a condition in which a person has a number of different medical problems, all related to the body's metabolism, which together increase their risk of developing coronary heart disease and diabetes. These medical problems include: Type 2 diabetes, high blood pressure, high blood triglyceride levels, and low levels of HDL cholesterol (the protective type of cholesterol) in the blood.

Most commonly, patients suffering from metabolic syndrome will be overweight, particularly around the waist, and have resistance to insulin. Recent evidence suggests a strong association between cigarette smoking, insulin resistance and metabolic syndrome.¹³

Smoking, diabetes and premature death

Compared to non-smokers with diabetes, people with diabetes who smoke have twice the risk of premature death. Furthermore, the risk of complications associated with tobacco use and diabetes in combination is nearly 14 times higher than the risk of either smoking or diabetes alone.¹⁴

A large prospective study of US nurses found that among those with diabetes the relative risks of mortality were 1.31 for past smokers, 1.43 for current smokers of 1-14 cigarettes per day, 1.64 for smokers of 15-34 cigarettes per day, and 2.19 for current smokers of 35 or more cigarettes per day.¹⁵

The effect of smoking on

Smoking is associated with multiple complications of diabetes. Nephropathy (kidney disease) has been shown to be common in Type 1 diabetic patients who smoke¹⁶ and smoking increases the risk of albuminuria in both types of diabetes.^{17 18} (Albuminuria refers to the presence of protein in the urine and can indicate signs of

complications of diabetes

kidney disease.) Another small study of 33 people with Type 2 diabetes with kidney disease found that smokers' kidney function declined more rapidly than that of non-smokers, despite drug treatment, suggesting that smoking cessation could slow the progression of kidney disease in people with diabetes who use ACE inhibitors.¹⁹

The relationship between cigarette smoking and retinopathy (disorders of the retina) is less well defined than that of other microvascular complications of diabetes.²⁰ However, some studies have found an association between smoking and diabetic retinopathy.^{21 16}

Smoking is also a documented risk factor for both the development and progression of various types of neuropathy (damage to the peripheral nervous system). A retrospective case control study of type 1 and type 2 diabetic patients found that current or ex-smokers were significantly more likely to have neuropathy than individuals who never smoked (64.8% vs. 42.8%).²² A more recent prospective study found that cigarette smoking was associated with a 2-fold increase in risk.²³

Benefits of stopping smoking

There is overwhelming evidence that stopping smoking reduces the risk of cardiovascular disease, lung disease, cancer and stroke.²⁴ (See also ASH Essential Information on: the benefits and aids to quitting.) As diabetes increases the risk for heart disease and stroke, it follows that stopping smoking will reduce the risk of complications from diabetes such as heart disease. Few studies have evaluated smoking cessation treatment specifically for people with diabetes but the limited research available suggests that smokers with diabetes may be less successful in quitting than smokers without diabetes and those intensive strategies should be considered to optimise successful cessation.²⁰

One possible explanation for the lower quitting rates among people with diabetes is the fact that stopping smoking is associated with weight gain and this is likely to be of concern in people who have diabetes and are already overweight. One US study found that concerns about weight gain among smokers with Type 1 diabetes were particularly prevalent among women, obese smokers, and those in poor metabolic control.²⁵ Fear of weight gain was cited by 49% of smokers.

A British prospective study of 7,735 men aged 40-59 years found that cigarette smoking was associated with a significant increase in risk of diabetes, even after adjustment for age, body mass index, and other potential confounding factors. The benefit of giving up smoking was only apparent after 5 years of smoking cessation and risk reverted to that of never-smokers only after 20 years. Men who gave up smoking during the first 5 years of follow-up showed significant weight gain and subsequently higher risk of diabetes than continuing smokers. However, the authors concluded that in the long term, the benefits of giving up smoking outweigh the adverse effects of early weight gain.²⁶ The US Cancer Prevention Study also provided evidence that stopping smoking for 10 years in men and five years in women could reduce the risk of diabetes to that of nonsmokers.

Stopping smoking also reduces the risk of premature death. The US Nurses' Study found that among women with Type 2 diabetes who had stopped smoking for 10 or more years had a mortality relative risk of 1.11 compared with diabetic women who were never smokers.¹⁵

In the light of evidence demonstrating that smoking is an independent risk factor for diabetes and that it is also an aggravating factor for diabetes complications, smoking cessation advice should be a routine component of diabetic care. Concerns about weight gain should be addressed by health care providers whilst emphasising the fact that the health benefits of smoking cessation far outweigh post cessation weight gain, even in people who are focused on weight management.²⁷

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