ash fact sheet
action on smoking and health

Smoking and Cancer

Introduction

This fact sheet reviews the risks of developing various types of cancer from smoking, other tobacco use and exposure to other people's tobacco smoke. It is estimated that more than one in three people in the UK will develop cancer at some stage in their lives and that more than one in four will die from the disease.[1,2] Smoking is the single biggest avoidable risk factor for cancer. It is estimated to be responsible for nearly one fifth of all new cancer cases – about 60,000 a year – and causes more than one quarter (28%) of all cancer deaths in the UK.[3] Globally, one in five cancer deaths (22%) are caused by tobacco.[4]

In October 2009, scientists from 10 countries met at the International Agency for Research on Cancer (IARC) to reassess the carcinogenicity of several compounds, including tobacco. The review, published by The Lancet Oncology, concludes that there is sufficient evidence to confirm that smoking is a cause of 15 types of cancer: namely: cancer of the bladder, a type of bone marrow cancer (myeloid leukaemia), cervix, colorectum (bowel), kidney, larynx (voice box), liver, lung, mouth (including lip and tongue), nose, oesophagus (gullet), ovaries, pancreas, pharynx (throat) and stomach.[5] The report also states that there is some evidence to suggest that smoking is a cause of breast cancer. The findings have been published as part E of Volume 100 of the IARC Monographs.[6]

Lung cancer

Lung cancer has been estimated to be the most common cancer in the world for a number of decades. In 2008, there were an estimated 1.61 million new cases of lung cancer worldwide, accounting for almost 13% of the total new cancer cases, and 1.38 million deaths.[7] In the UK, where lung cancer is the second most common cancer, 41,428 people were diagnosed with lung cancer in 2009 and 34,859 died of the disease in 2010.[1,3]

Lung cancer has the largest proportion of cases caused by smoking: According to a recent estimate, in the UK about 85% of lung cancer cases in men are attributable to smoking (excluding environmental tobacco smoke) and about 80% of cases in women.[3,8]

Because of its poor prognosis, lung cancer is still the most common cause of cancer death in both men and women, responsible for more than 1 in 5 of all cancer deaths in the UK. Fewer than ten per cent of people with lung cancer will survive at least five years beyond diagnosis.[9]

One in two persistent smokers will die of a smoking-related illness. Current smokers are fifteen times more likely to die from lung cancer than life-long non-smokers.[10] The risk of dying from lung cancer increases with the number of cigarettes smoked per day, although duration of smoking is the strongest determinant of lung cancer in smokers.[11]

Smokers who start when they are young are at a particularly increased risk of developing lung cancer. A study by Professor Richard Peto and colleagues found that taking up smoking before

the age of 15 doubles the risk of lung cancer compared to starting at the age of 20 or later, after taking into account the amount smoked.[12]

The study by Peto et al also examined the effects of prolonged cigarette smoking and prolonged cessation on mortality from lung cancer.[12] They found that if people who have been smoking for many years stop, even well into middle age, they avoid most of their subsequent risk of lung cancer. Also, stopping smoking before middle age avoids more than 90% of the risk attributable to smoking. Two other major studies have shown similar results.[13,14]

Despite the benefits of quitting, many smokers diagnosed with lung cancer continue to smoke even after treatment, with estimates ranging from 13% to 60%.[15]

See also: ASH Fact Sheet on: Smoking & Respiratory Disease.

Cancers of the mouth and throat

Cigarette, pipe and cigar smoking are all major risk factors for cancers associated with the larynx and oral cavity.[16,17] The risk for these cancers increases with the number of cigarettes smoked[16] and those who smoke pipes or cigars experience a risk similar to that of cigarette smokers.[18] It has been estimated that smoking is a cause of 65% of cancers of the oral cavity (including the lip, tongue and mouth) and pharynx (throat) in the UK.[18] In total, 6,539 new cases of oral cancer were recorded in the UK in 2010.[1]

Also see: ASH Research Report Tobacco and Oral Health.

Overall, smokers have laryngeal cancer risks 10 times greater than non-smokers.[17] People who combine alcohol and tobacco use have a much higher risk of oral and pharyngeal cancers than those using tobacco or alcohol individually.[19,20,21]

Smokeless tobacco, including chewing tobacco and snuff, is an established risk factor for cancers of the oral cavity, oesophagus and pancreas.[17,22] A US study comparing mortality rates among former smokers who switched to smokeless tobacco with those who stopped using tobacco altogether found that risks of dying from major tobacco-related diseases were higher among former cigarette smokers who switched to smokeless tobacco after they stopped smoking than among those who stopped using tobacco entirely.[23]

Bladder cancer

Tobacco smoking is the principal preventable risk factor for bladder cancer in both men and women.[24,25] The risk of developing bladder cancer is up to four–six times higher in long-term smokers than in people who have never smoked.[26,27] As with lung cancer, the risk is associated with both the dose and duration of smoking. People who stop smoking reduce their risk, although they remain at higher risk than never-smokers for over 25 years after they quit.[26,27]

Breast cancer

Most older studies found no association between smoking and breast cancer but some studies published since 2000 suggest that there may be a link.[28] An expert panel in Canada reviewed the results of nine cohort studies which showed that early age of smoking commencement, heavy smoking and long duration of smoking increased breast cancer risk by 15% to 40%.[29] Other studies suggest that the increase in breast cancer risk mostly affects pre-menopausal women[30,31,32] although a British study of middle-aged women found no evidence of an association between either active or passive smoking.[33] IARC considers the evidence for smoking as a causal factor for breast cancer to be limited.[6]

Cervical cancer

Smoking increases the risk of cervical cancer, a risk that is increased by the amount of cigarettes smoked.[34] One meta-analysis showed that risk of squamous cell cervical cancer is increased by 50% in current smokers[35] although another review found inadequate data to report the effect of smoking duration.[36] In the UK, it is estimated that around 7% of cervical cancer cases in 2010 (around 200 cases) were linked to smoking.[3]

As with other cancers, stopping smoking can halt the growth of the cancer and a reduction in early cervical lesion size in women who gave up smoking after diagnosis has been reported.[37]

Colorectal cancer (bowel)

The IARC update (2010) concludes that smoking is a cause of colorectal (bowel) cancer.[38,39] These findings are echoed by the World Health Organization[40] and other studies.[41,42] There is some disagreement about the degree of risk and further research is needed to clarify the relative risk of smoking and bowel cancer.

Kidney cancer

Kidney cancer accounts for more than 3% of all cancers in men and more than 2% in women in the UK. Although comparatively rare, kidney cancer has consistently been found to be more common in smokers than in non-smokers and there is sufficient evidence to show that smoking is a risk factor for the three principal types of kidney cancer, namely renal cell carcinoma, cancers of the renal pelvis and cancers of the ureter.[43]

Smokers are up to twice as likely to develop kidney cancer as non-smokers.[44] There is a dose-response relationship, with higher risk with a greater number of cigarettes smoked per day. Risk appears to drop after smoking cessation.[44] Approximately 29% of kidney cancer cases in men and 15% in women in the UK can be attributed to smoking.[45,46]

Leukaemia and lymphomas

Leukaemia is a cancer of the white blood cells and bone marrow. There are four main types of leukaemia: acute myeloid (AML), acute lymphoblastic (ALL), chronic myeloid (CML) and chronic lymphocytic (CLL). Smoking increases the risk of myeloid leukaemia and causes around 6% of all leukaemia cases in the UK.[45,47] There is some evidence to suggest that parental smoking can increase the risk of ALL in children (see section on passive smoking below). ALL is the most common form of leukaemia in children.

Recent research from the UK Million Women Study has revealed that the risks of Hodgkin's lymphoma and mature T-cell lymphomas were doubled in women who smoked around 15 or more cigarettes a day. The risks of other types of haematological (blood) cancer were also increased among smokers, but to a lesser extent.[48]

Liver cancer

Large studies have demonstrated an association between smoking and risk of liver cancer.[49,50] In many studies, the risk increases with duration of smoking or number of cigarettes smoked daily.[51,52] Confounding from alcohol can be ruled out in the best case-control studies by means of careful adjustment for drinking habits.[52] Since 2004, IARC has stated that there is sufficient evidence to judge the association between tobacco smoking and liver cancer as causal.[11]

In the UK, it is estimated that almost a quarter (23%) of liver cancers are caused by smoking, with a higher proportion in men (27% than in women (15%).[45] People who have a Hepatitis B or C infection have a higher risk of liver cancer, and it is increased even further if they smoke, with greater than 20-fold increases in risk shown for people who smoke and are also infected with hepatitis viruses.[50,53]

A separate study found a three-fold increase in risk of liver cancer death for current cigar or pipe smokers.

Nasal cancer

Smoking has been found to increase the risk of cancer of the nose and sinuses, particularly for squamous cell carcinoma.[11] Even though nasal cancer is rare, smoking significantly increases the risk of developing the disease.[55]

A case-control study carried out in the United States found that heavy smokers had a two-to-three fold increased risk of nasal cancer and that there was an increased risk associated with snuff use.[56]

Oesophageal cancer (gullet)

Tobacco smoking is a cause of cancer of the oesophagus (gullet).[57] Tobacco and alcohol, acting independently and together, are the main risk factors for squamous cell carcinoma of the oesophagus in Western countries. The risk increases with the number of cigarettes smoked and duration of smoking and also remains elevated many years after smoking cessation.[58,59]

Ovarian cancer

Ovarian cancer is the fifth most common cancer in women in the UK and the second most common gynaecological cancer (after uterus).[1] It has been included in the IARC list of cancers caused by smoking.[5]

Smoking doubles a woman's risk of a particular sub-type of the disease: mucinous ovarian cancer. Stopping smoking returns the risk to that of non-smokers in the long term.[60]

Pancreatic cancer

Cancer of the pancreas is a rapidly fatal disease with a five year survival rate of around 4%. Smoking a significant risk factor.[61] Cigarette smoking is estimated to cause 29% of cases of pancreatic cancer in the UK.[45]

Risk of the disease is related to amount and duration of smoking. People smoking up to 25 cigarettes per day have about twice as high a risk for pancreatic cancer mortality as non-smokers, whereas people smoking more than 25 cigarettes per day have three times the risk. The risk diminishes after cessation, although results of studies are inconsistent regarding how long it takes for risk of an ex-smoker to fall to the level of someone who has never smoked.[62,63] Current pipe and/or cigar smokers have a 50% increased risk[64,65] and the use of smokeless tobacco also carries an increased risk.[66]

Stomach cancer

Stomach cancer rates have been in decline in recent years but it remains the fourth most common cancer in the world and the second most common cause of cancer death.[67] Studies have shown a consistent association between cigarette smoking and cancer of the stomach in both men and women. More than 20% of stomach cancers in the UK are caused by smoking, according to estimates made for 2010.[68] Current smokers have almost double the risk of stomach cancer compared to non-smokers and risk remains higher for 10-20 years after quitting smoking.[69,70] Risk increases with duration of smoking and number of cigarettes smoked.[69,71]

Vulva and vagina cancers

Although not included in the latest IARC review of cancers caused by smoking, there may be an association between smoking and cancer of the vulva, with reported three-fold increases in risk shown for invasive vulval cancer in women who smoke. Risk has been shown to increase with

the number of cigarettes smoked and duration of smoking, and remains elevated more than five years after quitting.[72,73] There is some evidence that smoking raises the risk of cancer of the vagina although this association remains uncertain.[74,75]

Passive smoking

Adults

Non-smokers are at risk of contracting lung cancer from exposure to other people's smoke. The UK's Scientific Committee on Tobacco and Health (SCOTH) reported an increased risk of lung cancer in non-smokers of between 20% and 30%.[76] A subsequent review of the evidence by SCOTH in 2004 confirmed that the increased risk was in the order of 24%.[77] It is estimated that in 2010 there were around 1,000 cases of lung cancer in lifelong nonsmokers caused by passive smoking.[3]

Since 2004, IARC has stated that "the evidence is sufficient to conclude that involuntary smoking is a cause of lung cancer in never smokers."[11] The 2010 IARC update reports limited evidence showing an association between exposure to secondhand smoke and cancers of the larynx and pharynx.[5]

Children

Exposure to parental smoking is a cause of hepatoblastoma (a type of liver cancer) in offspring, and there is limited evidence that children of smokers have an increased risk of childhood leukaemia, according to IARC.[5]

One study suggests that children who are exposed to tobacco smoke on a daily basis grow up with more than triple the risk of lung cancer later in life compared to those who grow up in smokefree environments.[78]

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