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action on smoking and health

Smoking and Multiple Sclerosis

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Introduction

There is growing evidence that smoking is a risk factor for multiple sclerosis (MS). There is also evidence that smoking can increase the rate at which the disease progresses, meaning quitting smoking could be an important step in slowing the development of disability.

This fact sheet examines the association between smoking and MS, including smoking as a risk factor, how smoking affects disability progression in people with MS and the benefits of stopping smoking.

What is Multiple Sclerosis?

MS is a neurological condition that affects the brain and spinal cord. The nerves in the brain and spinal cord are protected by substance called myelin; but in people with MS, the immune system wrongly identifies myelin as a foreign body and attacks it, causing inflammation. This damages the myelin and strips it off nerves, leaving scars known as lesions. This damage means messages travelling along nerves get disrupted, slowed down or stopped completely.

The loss of myelin leaves nerves exposed to direct damage. This direct damage to causes an increase in disability that becomes noticeable over time.[1]

The exact cause of MS remains uncertain, but combinations of genetic and environmental factors play a role.[2] Alongside smoking, other environmental risk factors include obesity, vitamin D deficiency and previous infection with Epstein-Barr virus.[3] [4]

Types of Multiple Sclerosis

There are three main types of MS:

RELAPSING REMITTING MS (RRMS)

Around 85% of people with MS are first diagnosed with RRMS, making it the most common type. People with RRMS get distinct attacks or flare ups of their symptoms for short periods of time, from which there is then partial or complete recovery. While people often fully recover from a relapse, up to half of all relapses result in some continuing symptoms.[5] MS varies from person-to-person and research has not established definite causes of relapses. Damage to myelin and nerve fibres not only occurs during attack episodes but also at

other times. People with RRMS can be treated with disease modifying therapies (DMTs) which can reduce the number of relapses and the rate at which disability occurs.

SECONDARY PROGRESSIVE MS (SPMS)

SPMS usually develops years after an original diagnosis of RRMS. With this type of MS, disability gets progressively worse without the relapses symptomatic of RRMS. This is largely due to damage directly to nerve fibres. A small number of people are first diagnosed with SPMS; this is often when previous MS activity has not resulted in noticeable symptoms, or when relapsing remitting symptoms were not recognised as such.[6] The longer someone has had relapsing remitting MS, the higher the chances become of it developing into SPMS.

PRIMARY PROGRESSIVE MS (PPMS)

Around 15% of people diagnosed with MS have PPMS, equating to around 10,000-15,000 people in the UK.[7] PPMS is usually diagnosed in people during their forties or fifties, later than RRMS, though it can be diagnosed at any age. Equal numbers of men and women have PPMS, unlike RRMS, which is more common among women. Symptoms gradually become worse over time, rather than appearing in sudden phases (relapses).

Prevalence and effects of MS

In the UK, around 110,000 people have been diagnosed with MS, and each year approximately 5,000 people are newly diagnosed with the condition.[8] Overall, women are more likely to have MS; in every 100,000 people, an estimated 237 women will have MS compared to just 94 men.[8] However, this is due to differences in prevalence of RRMS, while an equal number of men and women have PPMS. Each person's experience of how MS affects them will vary depending on nerve damage, and while there are many MS symptoms, it is unlikely people will experience them all.

A 2017 study found that life expectancy for people with MS is increasing at the same rate as for the general population, but with an average reduction in life expectancy of around 7 years compared to those without MS.[9]

Smoking and the risk of developing MS

Increasing evidence shows that smoking is a risk factor for developing MS, and evidence suggests smoking rates are higher among people with MS than the general population.[10]

Recent studies have suggested smoking can increase risks of developing MS by as much as 50%. A 2016 meta-analysis including nearly 20,000 cases of MS found that both current and former smokers had an elevated risk of developing MS.[11] Further research has identified an increased risk for male smokers of developing MS compared with female smokers.[11] These findings are consistent with previous research suggesting links between smoking and MS,[13] and are supported by a 2017 systematic review and meta-analysis which found strong evidence of a causal role for smoking in development of MS.[14]

The exact interactions between smoking and MS are somewhat unclear, but it is the toxic chemicals in tobacco smoke rather than the nicotine that seem to be responsible for this relationship.[15] [16] [17] One possibility is that exposure to cigarette smoke damages the endothelial cells lining the lungs. These damaged cells produce a different balance of proteins. It is possible that this imbalance makes the Blood-Brain Barrier weaker,

allowing immune cells to pass into the central nervous system, attacking the nerves. This could explain the dose-response relationship, where the more someone smokes, the more pronounced the effect becomes.[18]

Smoking is also linked to inflammation within the body, and relapses occur when there is an inflammatory attack of the myelin substance surrounding the nerves.

While literature shows clear evidence for a relationship between smoking and development of MS, the evidence around passive smoke exposure is less certain. The above meta-analysis from 2016, indicated a 24% increase in risk of developing MS among people exposed to passive smoke.[19] Other studies have suggested a dose-response relationship between MS risk and exposure to passive smoking.[20 21 22] However, an alternative meta-analysis did not show a statistically significant relationship between passive smoke exposure and development of MS.[23] Further research has failed to replicate study findings, which researchers suggest may be due to the diversity of definitions used to categorise passive smoking.[24] These definitions vary from repeated indoor exposure, to broader definitions including any lifetime exposure to secondhand smoke.[20 21] This suggests that further research is needed with greater consistency in the categorisation of exposure to secondhand smoke.

For more information about risk factors for MS:

- MS Society: Causes of MS
- MS Trust: Causes of MS

Smoking and the progression of disability

Alongside being a risk factor for the development of MS, there is evidence that smoking can worsen the disability progression associated with MS and decrease the time it takes to transition from RRMS to SPMS.

A systematic review of the association between smoking and MS, looking at papers published between 1965 and 2018, found that: “patients with MS who smoke have higher rates of disease activity, faster rates of brain atrophy, and a greater disability burden.”[25]

Studies using the Expanded Disability Status Scale (EDSS)[26] have also found faster disease progression in ever-smokers (someone who has ever smoked, either currently or formerly) than in non-smokers.[27] This research base illustrates that smoking is associated with an increase in lesions – scar damage to nerve fibres leading to greater disability – in current or former smokers than in non-smokers.[28]

Research has shown a statistically significant relationship between smoking and transition from RRMS to SPMS,[29 30] with some studies suggesting that there could be a dose-response relationship between smoking and the transition, suggesting that the more someone smokes, the more likely they are to transition to SPMS.[31] One study, which looked at what happened to those with RRMS who continued to smoke after diagnosis compared to smokers who quit, found that continuing smokers transitioned to SPMS at an average of 48 years old, compared to 56 years for those who quit.[32]

Smoking and disease modifying therapies

Disease modifying therapies (DMTs) can be used to reduce the number and severity of relapses experienced by people with RRMS. They are not a cure but can slow down the progression of disability.

There is some evidence that smoking can have an impact on the effectiveness of some disease modifying therapies. Two recent studies found a significant association between smoking and increased relapse activity for RRMS patients undergoing two types of DMTs – interferon beta and natalizumab treatments – compared to non-smoking patients.[33] [34] This reinforces the importance of supporting people with RRMS to quit smoking.

Comorbidities among people with MS

People with MS can experience other comorbidities. Research suggests that the most common comorbidities among people with MS include psychiatric conditions, notably depression and anxiety,[35] high blood pressure, high cholesterol and chronic lung disease.[36] This work comes from an international collaboration; the first phase of which conducted a systematic review and published their findings in a seven article edition of the MS Journal.[36]

The increased incidence of chronic lung disease among people with MS is particularly relevant in relation to smoking, as smoking is the leading risk factor for the development of respiratory conditions; in 2016, 37% of respiratory deaths in England could be attributed to smoking.[37] This makes it important for people with MS to quit smoking and reduce their risk of lung disease. Similarly, smoking can also raise blood pressure meaning that smokers' hearts often have to work harder than non-smokers' hearts, resulting in an increased risk of heart disease or stroke.[38]

Given smoking has severe implications on nearly every bodily system, smoking can also exacerbate comorbidities. Research has seen that people with MS who smoked were more likely to develop another autoimmune disease compared to non-smokers.[39]

Mortality rates are increased in smokers with MS, which may partially be due to the increased comorbidity burden in smokers.[40] [41] [42] It is important that people with MS are informed of these additional risks associated with smoking and are supported to quit.

Benefits of stopping smoking

Stopping smoking confers a range of health benefits. Among people with RRMS, quitting smoking can reduce the frequency of relapses and slow the transition to SPMS. One study showed that people who quit smoking after their MS diagnosis, who then went onto develop secondary progressive MS, did so 8 years later than those who continued to smoke.[43]

Research has also shown that ex-smokers have a lower risk of reaching a significant level of disability – milestones 4 and 6 on the EDSS – compared with current smokers. Notably, this risk reduction was similar for smokers who had quit both before and after diagnosis of MS, showing the value of quitting smoking even after a MS diagnosis.[44]

What to expect from healthcare professionals

Research suggests that unsuccessful quit attempts can lead to increased stress levels, and a failure to quit smoking has been associated with depression in patients with MS.[45] [46] It is therefore very important that all smokers with MS are receiving appropriate support and guidance on quitting from healthcare professionals.

However, evidence currently suggests that around a quarter of smokers in secondary care are not being asked about their smoking status, while three quarters of smokers are not advised to quit.[47] Given the relationship between smoking and progression of MS, healthcare staff should encourage people with MS to quit smoking.

Guidance from the National Institute of Health and Care Excellence (NICE) says that healthcare professionals should explain the relationship between smoking and progression of MS to patients and advise them to quit.[48] This should include the offer of support to quit with nicotine replacement therapies (NRTs), stop smoking medications and behavioural support.

See also:
ASH - Stopping Smoking: Guide

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