Smoking and Dementia

Introduction

This fact sheet examines the association between smoking and dementia. It reviews the evidence of a causal link including the association between secondhand smoke exposure and risk of dementia. The fact sheet reviews the extent of the problem, the association between smoking, dementia and other modifiable risk factors, and key health messages arising from this research.

What is dementia?

Dementia is caused by damage to the brain and is characterised by symptoms that typically include memory loss and difficulties with thinking, problem-solving or language (cognitive function). The most common causes of dementia are neurodegenerative diseases including Alzheimer's disease, frontotemporal dementia, and dementia with Lewy bodies. With these diseases, the brain cells degenerate and die more quickly than is part of the normal ageing process.[1 2] Most dementias tend to be caused by more than one type and in most cases the different types coexist.

Dementia occurs mainly in older people (aged over 65) and is thought to be a consequence of interactions between genetic, environmental and lifestyle factors. [3] Late-onset (in people aged over 65) is the predominant form, accounting for over 90% of cases.[4]

There are two main types of dementia: Alzheimer's disease and vascular dementia. Alzheimer's disease arises when proteins build up in the brain to form structures known as 'plaques' and filaments in brain cells known as 'tangles'. These lead to the loss of connections between nerve cells and eventually to the death of nerve cells and loss of brain tissue.[1] Genetic factors may play a part in the development of Alzheimer's disease. People with a particular gene have up to a 12-fold increased risk. It is believed that ageing and the APOE genotype may interact with other potential genetic and/or modifiable environmental risk factors to further increase the risk of developing Alzheimer's disease.[3]

Alzheimer's is a progressive disease which means that over time more parts of the brain are damaged and more symptoms develop. It can take 15-20 years to develop. Although there is no cure, treatment can alleviate some symptoms.

Vascular dementia is caused by reduced blood supply to the brain due to diseased blood vessels and may occur, for example, after a stroke. About 20 per cent of people who have a stroke develop this post-stroke dementia within the following six months.[5]

Extent of the problem and why it is increasing

Globally it is estimated that 46.8 million people have dementia and that the number will almost double over the next 20 years.[6] In the UK, about 800,000 people have the condition and this figure is expected to double by 2040 if no action is taken and current trends continue.[7] The rise

in dementia is largely due to an ageing population since advanced age is the biggest single risk factor. As an editorial in The Lancet notes: *"The ageing of populations is poised to become the next global health challenge. During the next 5 years, for the first time in history, people aged 65 years and older in the world will outnumber children aged younger than 5 years."* [8] After the age of 65, a person's risk of developing Alzheimer's disease doubles approximately every 5 years. One in six people over the age of 80 have dementia.[1] However, dementia is not an inevitable part of ageing.

How smoking causes dementia

There is strong evidence that smoking increases the risk of developing dementia and it does so in several ways.[2] Smoking increases the risk of cardiovascular disease, diabetes and stroke which are also underlying risk factors for dementia. Specifically, smoking increases total plasma homocysteine (an amino acid that synthesizes proteins) and high levels of homocysteine increase the risk of stroke and cognitive impairment. Smoking also accelerates atherosclerosis - the build-up of fatty substances leading to a narrowing of the blood vessels in the heart and brain - that can deprive brain cells of oxygen.[2] Thirdly, smoking can cause oxidative stress, which arises from the body's interaction with oxygen. Oxidative stress is separately implicated as a causal factor in Alzheimer's disease and has an impact on the body's ageing process.[9]

This evidence contradicts the findings of some studies conducted in the early 1990s which had suggested that smoking had a protective effect against dementia, particularly Alzheimer's disease.[10] It was hypothesised that nicotine from cigarettes could compensate for the loss of nicotinic receptors in the brain associated with Alzheimer's disease. However, this theory has now been discredited. It also appears that the theory was perpetuated by the tobacco industry which influenced a number of studies examining smoking and mental health disorders. [11] [12] In addition it is possible that selection bias may have affected the out- come of some studies since a higher proportion of smokers die in middle-age.[13]

Risk of dementia as a result of smoking

Overall, research shows that smokers have a 50 per cent greater chance of developing dementia than those who have never smoked.[5] A meta-analysis of studies undertaken in the 1990s and early 2000s found that relative to never smokers, current smokers had a risk ratio of 1.79 for Alzheimer's disease and 1.78 for vascular dementia.[14] Another systematic review found slightly lower odds with risks of 1.59 for AD and 1.35 for vascular dementia.[15] A more recent review of 37 studies found that compared to never smokers, current smokers had an increased risk of all-cause dementia of 1.30, for Alzheimer's disease a risk ratio of 1.40 and for vascular dementia a risk of 0.97.[16]

There is some evidence of a dose-response relationship, suggesting that the more a person smokes, the greater their risk of developing dementia. A large Finnish study found that people who smoke heavily in their midlife years are more than doubling their risk of developing Alzheimer's disease or other forms of dementia two decades later.[17] Similar results were recorded in the Honolulu-Asia Aging study (odds ratio of 2.18 for medium and 2.40 for heavy smoking levels). Curiously there was a lack of association in very high consumption smokers which the authors suggest may be due to a hardy survivor effect.[18] A Chinese study also found that, compared to low consumption smokers, the adjusted risk of Alzheimer's disease was significantly increased among medium to high consumption smokers.[19]

The WHO estimates that 14% of cases of Alzheimer's disease worldwide are potentially attributable to smoking.[2]

Secondhand smoke (SHS) and dementia

The evidence of an association between secondhand smoke (SHS) and dementia is emerging.[20] A review of three cross-sectional studies showed a significant association between SHS and cognitive impairment in older adults with a relative risk of about 1.30 - 1.90.[21] Other studies suggest that there may be a dose-response risk with those exposed to tobacco smoke over many years at increased risk of dementia.[22 23 24 25]

Smoking and dementia medication

Smoking may reduce the effectiveness of some types of medication commonly prescribed to treat Alzheimer's disease.[26] Stopping smoking is not only likely to improve the effectiveness of the medication but also reduce the amount needed.

Smoking, dementia and other modifiable risk factors

People who adopt a healthy lifestyle are less likely to develop dementia. Regular physical exercise, maintaining a healthy weight, not smoking, eating a balanced diet and only drinking alcohol within NHS lower-risk guidelines all help to minimise the risk of dementia as well as reducing the risk of cancer, circulatory disease and other mental health disorders.[27] As there is no cure for dementia it is essential to identify and raise awareness of these modifiable risk factors in order to reduce the burden of the disease on society. It is estimated that about one-third of all cases of dementia would be prevented if everyone eliminated these risk factors.[27] Using computer modelling, an Australian study estimated that for each 5% fall in smoking prevalence there would be a 2% reduction in dementia risk.[28] NICE guidance recommends that in middle-aged and older people, vascular and other modifiable risk factors for dementia including smoking, should be reviewed and, if appropriate, treated.[29]

Benefits of smoking cessation

Stopping smoking at any age is beneficial and the younger a person quits, the greater the benefits in terms of life gained. Long-term smokers lose on average 10 years of life and the longitudinal study of British doctors spanning 50 years showed that people who stop smoking at age 60, 50, 40, or 30 gain, respectively, about 3, 6, 9, or 10 years of life expectancy. [30] As part of the Whitehall cohort study, compared with never smokers, middle-aged male smokers experienced faster cognitive decline. However, among former smokers who had refrained from smoking for at least 10 years, there were no adverse effects on cognitive decline. [31]

Stopping smoking in middle age and keeping other risk factors under control will reduce the risk of onset of dementia and there are also immediate health benefits such as reduced blood pressure, and improved lung function even after a person has been diagnosed with the disease.

There is a perception that people with mental illness are less able or less willing to quit smoking.[32] Evidence suggests that this myth is now being challenged, and health professionals can and do offer stop smoking support to patients with mental health problems who can quit if they are given the appropriate support.[33] Whilst there is little specific evidence of the outcome of smoking cessation amongst people with dementia, a number of studies have demonstrated clear benefits to quitting among people with other mental health disorders.[34 35] The local stop smoking services which offer both behavioural support as well as appropriate pharmacotherapy provide the best way of stopping smoking and remaining smokefree.[36]

People with early stages of dementia who smoke and are reluctant, or find stopping difficult, may benefit from using electronic cigarettes to reduce the harm from smoking. An Australian study examined the effectiveness of e-cigarettes compared with nicotine replacement therapy (NRT) as a means of smoking reduction or cessation in people with mental illness. The study found no statistically significant difference between treatments for cessation, adverse events

or relapse. However, e-cigarette users had higher levels of smoking reduction, treatment compliance and acceptability.[37] The recent Public Health England evidence review of electronic cigarettes showed that electronic cigarette use is significantly less harmful than smoking tobacco.[38] Use of e-cigarettes is therefore likely to be a safer alternative to smoking for people with dementia from a health perspective as well as in terms of reduced fire risk.

Reduced fire risk

If people with dementia wish to continue to smoke they should be supported to do so safely. Stopping smoking abruptly may result in withdrawal symptoms and possibly interfere with medication. In order to reduce the risk of fire, it is clearly advantageous to help people with dementia to stop smoking as soon as possible. They may be assisted by the adoption of smokefree policies in residential care homes. (There is some anecdotal evidence that if smoking materials are removed from their immediate environment people with dementia may forget that they ever smoked). Although bedrooms and designated smoking rooms in care homes are exempt from the smokefree workplace law, the providers of sheltered accommodation may choose to make the whole premises smokefree.[39] Provided that this policy is communicated to residents and their relatives, as well as being properly enforced, going smokefree can lead to a safer, more pleasant environment for both staff, residents and visitors.

Recommendations

Further research is needed on the best ways to help people with dementia to stop smoking or reduce the harm from tobacco use.

Health professionals should be trained to deliver appropriate health advice on smoking cessation and harm reduction.

Further Information and resources

For details of Local Stop Smoking Services see:
www.nhs.uk/smokefree/help-and-advice/local-support-services-helplines

Alzheimer's Society.

National Dementia Helpline 0300 222 11 22

ASH Fact sheet: Smoking and mental health

Smoking and mental health. A joint report by the Royal College of Physicians and the Royal College of Psychiatrists. London, RCP, 2013

References

1 Causes of dementia. NHS Choices.
2 What is Alzheimer's disease? Factsheet 401. Alzheimer's Society, 2014
3 McKenzie J, Bhatti L, Tursan d'Espaignet E. Tobacco use knowledge summaries: Tobacco use & dementia. WHO, 2014.
4 Durazzo T et al. Smoking and increased Alzheimer's risk: A review of potential mechanisms. Alzheimer's & Dementia. 2014; 10(3): S122-S145
5 What is vascular dementia? Factsheet 402. Alzheimer's Society 2014.
6 World Alzheimer Report 2015. The Global Impact of Dementia. An analysis of prevalence, incidence, cost and trends. Alzheimer's Disease International 2015
7 Policy paper: 2010-2015 government policy – dementia. Department of Health, 2015
8 Suzman R, Beard J, Boerma T & Chatterji S. Health in an ageing world - what do we know? The Lancet 2015; 385: 484-486
9 Antioxidants and oxidative stress Netdoctor
10 Duijn C.M et al. Apolipoprotein E genotype and association between smoking and early onset Alzheimer's disease. BMJ 1995; 310: 627-631
11 US Dept of Health and Human services. The health consequences of smoking - 50 years of progress. A report of the Surgeon General. Atlanta, GA., Office on Smoking and Health, 2014
12 Cataldo J, Prochaska JJ & Glantaz SA. Cigarette smoking is a risk factor for Alzheimer's Disease: An analysis controlling for tobacco industry affiliation. Journal of Alzheimer's Disease. 2010; 19(2).
13 Hernan MA, Alvarob A, Logroscino G. Cigarette smoking and dementia: Potential selection bias in the elderly. Epidemiology 2008; 19 (3): 448-450
14 Anstey K et al. Smoking as a risk factor for dementia and cognitive decline: a meta-analysis of prospective studies. American J Epidemiol 2007; 166(4):367-378
15 Peters R et al. Smoking, dementia and cognitive decline in the elderly - a systematic review. BMC Geriatrics 2008; 8(36).
16 Zhong G et al. Smoking is associated with an increased risk of dementia: A meta-analysis of prospective cohort studies with investigation of potential effect modifiers. PLoS One Published online 12 March 2015 doi: 10.1371/journal.pone.0118333
17 Rusanen,M et al. Heavy Smoking in Midlife and Long-term Risk of Alzheimer Disease and Vascular Dementia. Jama Arch Intern Med. 2011; 171(4): 333-339.
18 Tyasa SL et al. Mid-life smoking and late-life dementia: the Honolulu-Asia Aging Study. Neurobiology of Aging. 2003; 24(4): 589-596
19 Juan D et al. A 2-year follow-up study of cigarette smoking and risk of dementia. European Journal of Neurology 2004; 11(4): 277-282
20 Chen R et al. Association between environmental tobacco smoke exposure and dementia syndromes. Occupational & Environmental Medicine 2013; 70(1):63-69
21 Chen R et al. Association of passive smoking with cognitive impairment in nonsmoking older adults. A systematic literature review and a new study of Chinese cohort. J Geriatr Psychiatry Neurol 2013; 26 (4) 199-208
22 Barnes D et al. Secondhand smoke, vascular disease, and dementia incidence: Findings from the cardiovascular health cognition study. Am J Epidemiol 2010; DOI: 10.1093/aje/kwp376
23 Llewellyn D et al. Exposure to secondhand smoke and cognitive impairment in non-smokers: national cross sectional study with cotinine measurement. BMJ 2009; 338: b462
24 Barrett JR. Dementia and secondhand smoke. Environmental Health Perspectives 2007; 115(8):A401
25 Chen R et al. Second-hand smoke and dementia. Epidemiology 2013; 24(4): 623-624
26 Connelly, PJ & Prentice NP. Current smoking and response to cholinesterase inhibitor

therapy in Alzheimer's Disease. Dementia and Geriatric Cognitive Disorders. 2005; 19(1): 11-14
27 Prevention. Alzheimer's Society, 2015
28 Nepal B, Brown L, Ranmuthugala G. Modelling the impact of modifying lifestyle risk factors on dementia prevalence in Australian population aged 45 years and over, 2006-2051. Australasian J Aging 2011; 29: 111-116.
29 NICE. Dementia: Supporting people with dementia and their carers in health and social care. NICE guidelines CG42, Nov. 2006.
30 Doll R et al. Mortality in relation to smoking: 50 years' observations on male British doctors. British Medical Journal, 2004; 328: 1519
31 Sabia S et al. Impact of smoking on cognitive decline in early old age: The Whitehall II cohort study. Arch Gen. Psychiatry. 2012; 69(6): 627-635.
32 Prochaska JJ. Smoking and Mental Illness: Breaking the Link. NEJM 2011; 365:196-8.
33 The Royal College of Physicians. Smoking and Mental Health. London, RCP, 2013
34 West R et al. How much improvement in mental health can be expected when people stop smoking? Findings from a national survey. Smoking in Britain, 2015; 3,6. (The Smoking Toolkit Study) .
35 Taylor, G. Change in mental health after smoking cessation: systematic review and meta-analysis. BMJ 2014; 348:g1151 doi: 10.1136/bmj.g1151
36 West, R. et al. Performance of English stop smoking services in first 10 years: analysis of service monitoring data. BMJ 2013;347:f4921 doi: 10.1136/bmj.f4921
37 O'Brien B et al. E-cigarettes versus NRT for smoking reduction or cessation in people with mental illness: secondary analysis of data from the ASCEND trial. Tobacco Induced Diseases. 2015; 13:5 doi:10.1186/s12971-015-0030-2
38 McNeill A et al. E-cigarettes: an evidence update Public Health England, 2015
39 Regulation 5 of The Smoke-free (Exemptions and Vehicles) Regulations 2007