



Multiple Sclerosis and Smoking

Tiffani Stroup, DO
Department of Neurology
NorthShore University HealthSystem

Introduction

Multiple sclerosis (MS) is a chronic neurologic condition that affects an estimated 400,000 people in the United States. The disease is characterized by periods of disease activity (relapse) and remission, which over time can evolve into a progressive disease course (secondary progressive multiple sclerosis) with accumulating disability. A less common form of the disease, which progresses from onset without relapses, is known as primary progressive multiple sclerosis.

To date, few modifiable risk factors have been found to influence the development or course of MS. Cigarette smoking – which can cause serious health issues including lung cancer, increased risk of infections, and heart disease, and is the primary cause of preventable death in the United States – has also been identified as a risk factor in the development and progression of MS. Overall, the research has shown that:

1. Smokers and individuals with passive smoke exposure (second-hand smoke) have an increased risk of developing MS.
2. Smokers progress to secondary progressive MS at a faster rate than non-smokers and have greater risk of increasing disability.
3. Smokers may not get the full effect of MS disease-modifying therapies.
4. Smoking cessation has a protective effect by delaying the time to transition to secondary progressive MS.

Increased Risk of Developing MS

- Compared to non-smokers, smokers are almost two times more likely to be diagnosed with MS and are more likely to be diagnosed with progressive multiple sclerosis. This has been seen in both adult smokers and children exposed to parental smoke, suggesting that second-hand smoke may also be detrimental.
- The risk of developing MS increases with the amount of cigarette smoking or second-hand smoke exposure.
- Although primary progressive multiple sclerosis is much less common, there is an increased risk of this type of multiple sclerosis in smokers compared to non-smokers.
- In people who have experienced one episode of neurologic symptoms (a clinically isolated syndrome) and smoke cigarettes, there is a higher risk of a second attack and conversion to clinically definite multiple sclerosis.
- Smoking cessation is recommended for spouses and parents of those with increased risk of developing MS (for example, those with a personal or family history of autoimmune disease).

Effect of Smoking on MS Disease Activity and Progression

- Once diagnosed with MS, smokers may experience more severe symptoms, increased relapse frequency, and greater disability compared to non-smokers.
- Smokers with MS have reported worsened symptoms after smoking, and a study verified that motor performance tested by fitting pegs into a wooden board was impaired immediately after smoking a cigarette, and for up to 10 minutes.
- Cognitive impairment is more severe in heavy cigarette smokers compared to non-smokers with MS.
- The relapse rate in smokers may be increased due to an increased risk for infection, and smokers have been found to have more enhancing lesions on MRI compared to non-smokers with MS. These findings indicate more active disease in smokers than in non-smokers with MS.
- The level of disability measured by a neurologic exam is higher in current smokers than in non-smokers with MS, and more smoking correlates with higher level of disability.

- In addition, the time to reach a higher level of disability (use of a cane, walker, or assistive device) is shorter in people who smoke than in those who have never smoked or who have stopped smoking. Further study involving MRI measures has shown more shrinkage of the brain and increased number of multiple sclerosis plaques in people who smoke compared to those who have never smoked or stopped smoking.
- The risk of converting to secondary progressive MS is higher and occurs more quickly in smokers than in non-smokers. A recent study found that for each additional year of smoking after the diagnosis of relapsing-remitting MS, the risk for transition to secondary progressive MS was increased by 4.7% per year. Smokers were also diagnosed with secondary-progressive MS at a younger age. b

Together, these findings demonstrate the many negative effects of cigarette smoking in people with MS. Not only are smokers at higher risk of developing multiple sclerosis, but they are also more likely to: 1) be diagnosed with the progressive form of the disease; 2) have higher disability scores, increased disease activity on MRI and more significant symptoms; 3) develop antibodies that make some of the multiple sclerosis medicines ineffective; and 4) transition to the secondary progressive form of the disease faster than ex-smokers or never smokers. Passive (second-hand) smoke exposure has also been associated with an increased risk of developing multiple sclerosis in adults and children. The good news is that stopping smoking can help to reduce these negative effects.

Benefits of Quitting

- Stopping smoking can have a profound effect on MS symptoms and disease activity, including motor strength and cognition, number of relapses, MRI lesions, and level of disability.
- Smoking cessation has been associated with slower disability progression and prolonged time to convert to secondary progressive MS. Although people who have ever smoked are likely to have a higher baseline disability score, those who quit smoking take longer to experience disability progression. This suggests that smokers who quit after being diagnosed with multiple sclerosis may delay the need for an assistive device for walking.
- The time to develop secondary progressive multiple sclerosis is

delayed by 8 years in people with MS who quit smoking compared to current smokers. Delaying this transition can have a significant impact on quality of life.

- Stopping smoking reduces a person's risk for cardiovascular disease, pulmonary infections, cancer, and death.
- Smoking and MS can each have a very significant financial impact and the financial burden for individuals with MS who smoke can be particularly high:
 - On average, smokers in the general population miss more days of work and visit healthcare professionals more than non-smokers. In the United States, the cost of smoking-related health care utilization and lost work productivity is nearly 321 billion dollars annually.
 - The cost of living with relapsing-remitting MS is estimated to be nearly 70,000 dollars per year, and that cost increases substantially with increased disability.
- Quitting smoking may save money through both direct and indirect routes.
 - Directly, smoking cessation means the person with MS will no longer be purchasing cigarettes, which would signify a savings of more than 1800 dollars per year for a one-pack-per-day smoker.
 - Indirectly, people who quit smoking are likely to require fewer doctor visits because of their decreased risk of infection, decreased risk of relapse, increased likelihood that their MS disease-modifying therapy (if they are taking an interferon-beta medication or natalizumab) will be effective, and lower disability level. People who quit smoking are also less likely to miss days at work.
- Reduction in amount of smoking as a person attempts to quit may lead to less disability and improved cognition compared to continued heavy smokers

Multiple interventions have proven effective for smoking cessation. A comprehensive approach, including counseling and medications, has the best likelihood for success. Different medication options, including anti-depressants (bupropion), varenicline, nicotine patches and gum exist, and people should discuss individualized therapy with their healthcare

providers. An important component to smoking cessation is a positive attitude and perseverance, as first attempts at quitting smoking may not be successful in all people. As with other aspects of MS care, a supportive network of family, friends, and healthcare providers is helpful for people who are quitting smoking.

In summary, smoking significantly impacts a person's risk of developing MS and of disease activity and progression, whether the person is smoking him- or herself or is exposed to second-hand smoke. Smoking cessation can significantly reduce the MS-associated risks as well as the risk of cardiovascular disease, pulmonary infections, cancer, and death.

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