Nicotine Use Disorder in Older Adults

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KEYWORDS

• Nicotine abuse • Elderly • Smoking cessation

KEY POINTS

- Nicotine use disorder is a common problem in the elderly.
- The older adult should fulfill at least 2 out the 11 criteria in the *Diagnostic and Statistical Manual of Mental Disorders* (Fifth Edition) to be considered a nicotine misuser.
- Smoking in the elderly is associated with anxiety, depression, and low socioeconomic status.
- It is mostly a habit, and some find pleasure in smoking; thus, cessation in the elderly is a difficult task.
- Smoking has a detrimental effect on several organ systems; many problems manifest in the older age group.

INTRODUCTION

"I've been enjoying cigarettes for many decades, and the damage has already been done."[1] This is one common statement made by older adults when asked about their intention to stop smoking.

Tobacco use is a worldwide problem affecting all age groups, and one of the leading causes of morbidity and mortality. Nicotine is among the most psychoactive drug used. Usually, people try it for the first time in the form of cigarettes, hubble-bubbles, e-cigarettes, pipe, or similar at a younger age; therefore, many doctors and scientists think that nicotine use disorder is a younger-generation issue.

Many older adults try to quit; some succeed, and others do not.[2] One of the main reasons for smoking cessation is that older adults are more prone to develop health problems related to the cumulative effect of smoking. Stopping smoking at any age can promote longevity and improve the quality of life.[2] However, giving up smoking is a difficult task in the older population because of several factors. First, tobacco

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use disorder is acquired since adolescence/younger adulthood; hence, it is difficult for them to quit smoking. Furthermore, some older people have poor insight about the harm of tobacco consumption. Thus, enters the role of physicians in counseling and assisting smokers in quitting by offering nicotine replacement therapy or other modalities.[2]

DEFINITION OF NICOTINE USE DISORDER

Nicotine use disorder, also known as tobacco use disorder, is defined as the problematic use of tobacco leading to a significant impairment and distress in a person's everyday life. The patient should at least fulfill 2 out of the 11 criteria defined by the *Diagnostic and Statistical Manual of Mental Disorders* (Fifth Edition) that should be occurring within a 12-month period to be considered a tobacco misuser. These criteria mainly involve the amount and time spent on smoking, the constant desire for smoking, the inability to stop, and the interference of smoking with daily life activities on the social and occupational levels[3] (**Box 1**).

In contrast to the adult population, certain considerations should be accounted for in older adults. For instance, cognitive impairment can prevent adequate self-monitoring. In addition, symptoms of nicotine use disorder can occur with a smaller amount of nicotine consumed. Also, role obligations may be reduced in older adults. Certain seniors may not be aware of the problems that they experience from tobacco use.

Older adults may experience more severe symptoms from nicotine withdrawal, such as anxiety, restlessness, poor concentration, increased appetite, and insomnia. Older adults are at higher risk of adverse functional and cognitive complications associated with smoking cessation compared with the middle-aged population. Finally, nicotine withdrawal, especially if acute, is associated with a higher risk of hyperactive delirium in patients with an underlying cognitive impairment.[3]

Prevalence

According to the 2019 Centers for Disease Control and Prevention (CDC) data, smoking is more common among young people (17%) compared with only 8.2% in the

Box 1
***Diagnostic and Statistical Manual of Mental Disorders* (Fifth Edition) criteria for tobacco use disorder**

1. Smoking in higher amounts or over a longer period of time than intended.
2. Persistent need for smoking or inability to cut down tobacco use.
3. Large amount of time spent on activities to obtain tobacco.
4. Cravings.
5. Tobacco use interfering with the ability to fulfill major obligations.
6. Continued tobacco use despite social and interpersonal problems caused by smoking.
7. Reduced social and occupational activities because of smoking.
8. Tobacco use in situations that put the person at risk.
9. Tobacco use despite having physical and psychological problems caused by smoking.
10. Tolerance defined as the need to increase the amount to obtain the same effect.
11. Withdrawal defined by withdrawal symptoms (headaches, difficulty concentrating, nervousness, insomnia) and the need to use similar products.

elderly.[4] Nonetheless, contradictory data show that older people are less likely to quit smoking than their younger counterparts. Furthermore, between 1965 and 1994, smoking rates dropped less in patients aged more than 65 years (5.9% reduction) than in younger adults (18.4% reduction).[4] Also, the absolute number of older smokers is anticipated to double in 2050,[4] with the aging of baby boomers.[5] In Europe, the prevalence of smoking is high (21.9%), mainly in the age group between 25 and 54 years (83% of the smoking population). In the older age groups, the prevalence is 12.2% in men between the age of 65 and 74 years and 8.4% among women of the same age group.[6]

Risk Factors

Concerning the risk factors for smoking (**Box 2**), it was found that nicotine use disorder was more prevalent in the elderly with low socioeconomic status, alcohol use disorder, anxiety, and depression. Moreover, stress was associated with substance abuse in the elderly. In fact, at the end of life, many stressors can be found that can incite the aging patient to adhere to old habits that make them comfortable, such as smoking (**Box 3**).[7,8]

A study done in Australia in 1999 by Degenhardt and colleagues[9] showed that alcohol, cannabis, and other drug use disorders were significantly more common among current smokers, supporting the findings of previous studies. Furthermore, a study done in hospitalized patients with chronic obstructive pulmonary disease (COPD) showed that 45% of the smokers still smoked and did not understand or accept the dangerous effects of tobacco as a reason they refused to quit smoking.[10]

Pleasure and Social Interactions

Many older adults report that they started smoking in their youth, because of peer pressure and the need to be accepted socially by their friends who smoked and be part of a group, not because of pleasure in smoking. Because of the increased nicotinic receptors in the brain and the increased secretion of endorphins, the older adult will find pleasure in smoking, and reduction of anxiety and stress. However, many of long-time older smokers will state that little pleasure results from smoking compared with when they were younger.[2] For many, it has been a part of their social life, and this is observed well with the hubble-bubble, where some gather to smoke.

Habit of Smoking

Many older adults integrated smoking in their daily life routine. They smoke before going to the bathroom, after meals, with coffee, with alcohol, with stress, and with happiness.[2]

Box 2
Risk factors for smoking in the elderly

- Low socioeconomic status
- Alcohol use disorder
- Psychiatric comorbidities (anxiety, depression, and so forth)
- Life stressors

Box 3
Life stressors contributing to tobacco use in the elderly

Personal illness: 18%

Decline in the 5 senses (and decline of physical reserve)

Illness at home: 23%

Nonmedical event: 17% (familial conflicts)

Family changes

Retirement

Change in income

Communication problems

EFFECTS OF SMOKING ON HEALTH

Smoking is established as being the most preventable cause of mortality. It is considered one of the major risk factors for the development of chronic diseases, including cardiovascular, respiratory system, eyes, gums, and bones, that can have debilitating consequences on the elderly. It is also associated with increased risk of cancer. Because of the additive effect of nicotine and harmful substances found in cigarettes, deleterious health effects are more commonly seen in the elderly than in the younger population[11] (**Box 4**).

Smoking remains a strong risk factor for premature mortality in older age groups.[12]

Smoking and Cardiovascular Diseases

Cardiovascular diseases (CVD) are the leading cause of death in both men and women, especially in the elderly population. Tobacco smoking is a major preventable risk factor for CVD, mainly coronary artery diseases (CAD).

Mortality from coronary heart disease is doubled in smokers compared with nonsmokers.[9] Also, older smokers are at a higher risk of developing heart failure and its decompensation.

A study performed by Nadruz and colleagues[13] entitled, "Smoking and cardiac structure and function in the elderly," showed that smokers have a higher left ventricular mass, higher prevalence of left ventricular hypertrophy, a major risk factor for heart failure, and worse diastolic function compared with nonsmokers or former smokers. Left ventricular hypertrophy is a major risk factor for heart failure.

In addition, smoking increases baseline blood pressure and heart rate and reduces blood flow to the heart and oxygen delivery to the vital organs. It damages blood vessels, increases the risk of thrombosis, and doubles the risk of stroke.[14]

Furthermore, older smokers are at higher risk of developing arrhythmias, including atrial fibrillation. Smoking is also a major cause for the development of abdominal aortic aneurysms; according to the CDC, almost all deaths from abdominal aortic aneurysms are caused by smoking.[15]

Smoking is a known risk factor for strokes, both ischemic and hemorrhagic. Several studies showed that smokers have two- to fourfold increased risk of stroke compared with nonsmokers and former smokers. Stroke has a dose-dependent relationship with smoking.[11]

Box 4
Effects of smoking on health[2]

Cardiovascular diseases
Stroke
Coronary artery disease and congestive heart failure
Peripheral artery disease
Arrhythmias
Aortic aneurysms and dissection
Pulmonary and respiratory diseases
Chronic obstructive lung disease
Uncontrolled asthma
Lung fibrosis
Postoperative lung problems
Pulmonary hypertension
Pulmonary embolisms and deep vein thrombosis
Sinusitis
Cancer
Lung
Gastric
Head and neck
Bladder and kidney
Gastrointestinal
Peptic ulcer disease and gastroesophageal reflux
Bone: Osteoporosis
Skin
Poor wound healing
Skin aging and wrinkles

THE PATHOPHYSIOLOGY OF CIGARETTE SMOKING AND CARDIOVASCULAR DISEASE

Smoking affects all phases of atherosclerosis by increasing inflammation and decreasing nitric oxide and the low-density lipoproteins (LDL) oxidation. In fact, cigarette smoking decreases the vasodilation ability of the vessels by lowering the amount of nitric oxide, which is one of the early manifestations of atherosclerotic changes. In addition, smoking increases the peripheral blood leukocytes count and other inflammatory markers that deposit on the surface of endothelial cells and promotes atherosclerosis. Likewise, cigarette smoking increases serum lipid profile, mainly LDL, and leads to its oxidation, which promotes atherosclerosis and therefore increases the risk of CAD.[16] To note, smoking has a prothrombotic effect: it alters platelet functions and thrombotic and fibrinolytic factors. The atherosclerotic and prothrombotic effects of smoking increase the risk of acute cardiovascular events.[17]

Smoking and Respiratory Diseases

Smoking is responsible for 90% of cases of COPD and lung cancer deaths.[18]

In fact, it leads to the activation of epithelial cells, macrophages, and lymphocytes and to the loss of fibroblasts, which promotes the release of cytokines, growth factors, and matrix metalloproteinases, leading to lung remodeling.[13]

Also, smokers have a higher prevalence of COPD and a higher mortality. Besides knowing that aging is a risk factor for COPD, as lung capacity and function start to decline naturally within the fourth decade of life, smoking accelerates their destruction and predisposes them to more severe consequences.[13]

Tobacco is also an important risk factor for community-acquired pneumonia; it interferes with the ability of the respiratory system to clear bacteria by damaging the mucociliary clearance mechanism and modifying the buccal epithelial surfaces, making them at a higher risk for pneumococcal diseases. Smoking also increases the incidence, duration, and severity of respiratory infections caused by bacteria and viruses.[13]

Smoking is a major risk factor for postoperative pulmonary complications. A patient more than 60 years of age is already at risk for complications; smoking increases their risk for atelectasis and pneumonia.[13]

Smoking and Sinusitis

Sinusitis is one of the most prevalent health conditions worldwide, and a common complaint in the primary care clinics. The incidence of sinusitis increases in a dose-dependent manner with smoking. Sinonasal epithelial cells depend on the mucociliary clearance mechanism to clear potentially toxic substances, and that is inhibited by chemicals emitted from smoking, leading to stasis of these materials, increasing the risk of bacterial infections and subsequently sinusitis.[19]

Smoking and Cancer

According to the American Cancer Society,[20] smoking is responsible for about 20% of all cancers and 30% of all cancer deaths in the United States. It increases the risk mainly of mouth, larynx, pharynx, lungs, esophagus, kidney, cervix, liver, bladder, pancreas, stomach, and colon cancers. Lung cancer is among the most common cancers worldwide and the major cause of cancer deaths in developed countries. According to the CDC,[21] patients who smoke are 15 to 30 times more likely to have or to die from lung cancer than the nonsmoker. In fact, 80% of lung cancer cases are due to smoking. Oral cavity and oropharyngeal cancers are more common in smokers. The amount and the duration of smoking determine the risk of the development of such types of cancers.

Smoking and Osteoporosis

Smoking is a known risk factor for the development of osteoporosis, and several studies showed a direct association between smoking and low bone density. The National Institute of Osteoporosis reports that smoking increases the risk of fractures and has a bad impact on bone healing after fracture. Smoking also induces a faster menopause, which in turn may lead to a higher risk of osteoporosis.[22]

Smoking and Ophthalmic Diseases

With the aging population, the incidence of cataracts is increasing. Smoking is one of the risk factors that augments cataract development by threefold compared with nonsmokers.[23]

Furthermore, age-related macular degeneration, a major cause of blindness in developed countries in the elderly, is also affected by smoking.[24]

Smoking and Dermatologic Diseases

Several studies have showed the relationship between smoking and facial wrinkles, which are signs of aging. For instance, a study conducted by Leung and colleagues[25] showed that the skin's age is proportional to the time and duration of smoking. In older age, smoking a pack of cigarettes per day is the equivalent of several years of skin aging.

Smoking and Neuropsychiatric Disorders

Nicotine receptors in the brain

Nicotine binds mainly to nicotinic cholinergic receptors in the brain. This process leads to an increase in the activity of several brain regions, including the prefrontal cortex and the thalamus, and secretion of several neurotransmitters, including dopamine. This release is responsible for the pleasurable experience of cigarette smoking. With the continuous use of nicotine, an increased amount of nicotine is needed to exert the same effect. This is mainly explained by the process of tolerance caused by the desensitization of the receptors and the increase in the number of nicotine receptors in the brain. Smokers have a larger number of nicotine receptors in their brain than nonsmokers. Certain studies showed that smokers with a higher amount of nicotine receptors in their brain face more difficulty quitting because of cravings and more severe withdrawal symptoms.[26]

Effect on cognition

Smoking increases the risk of dementia, especially Alzheimer disease and vascular dementia, mainly because of vascular events, such as silent strokes, oxidative stress atherosclerosis, and inflammation.[27] The association with cognitive impairment might be due to the link between smoking and cardiovascular pathologic condition, but cigarette smoke also contains neurotoxins, which heighten the risk.[28] In fact, a study has shown that smoking is associated with decreased gray matter in regions associated with Alzheimer disease (medial temporal lobe structures, posterior cingulum, and precuneus).[29] Smoking is a modifiable risk factor for Alzheimer disease[30]; thus, smoking cessation might delay the development of Alzheimer disease.[31] Smoking in later life is also associated with 1.6 relative risk for dementia, with a weighed population attributable fraction risk of 5.5%.[32]

The British National Birth Cohort Study found that smokers had a greater decline in global memory, whereas their visual memory was preserved. The Doetinchem Study added that smokers have decreased cognitive flexibility, speed, and function. This study shows that the decline among smokers was 1.9 times higher in the memory function, 2.4 times higher in cognitive flexibility, and 1.7 times greater for global cognitive function compared with nonsmokers.[33] Nonetheless, the executive function is the most affected cognitive domain possibly because of vascular pathways involvement in this domain.[34]

To note, people with dementia are thought to have low rates of smoking; however, the main reason is not clear.[35]

Effect on mental health

Smoking might modulate the activity of some psychotropic medications. It induces cytochrome P450, mainly the CYP1A2, thus, interfering with the metabolism of antipsychotics like clozapine and olanzapine. A study showed that the plasma concentration of clozapine in smokers is 81.8% of that of nonsmokers.[36] Smokers experience less

sedation and drowsiness with certain benzodiazepines, mainly diazepam and chlordiazepoxide.[24]

In addition, smokers have a high level of CYP2B6, the enzyme responsible for serotonin and testosterone metabolism, as well as nicotine, cocaine, amphetamines, and bupropion.[37]

Some hypothesized that smoking may be incriminated in the onset and maintenance of anxiety and bipolar disorders.[23]

In addition, people with psychiatric disorders are at double the risk of smoking and have 25% less chance of quitting smoking.[38,39]

Benefits of smoking

Smoking may provide some benefits in certain health conditions. In fact, it was found that smoking may delay and protect people from having ulcerative colitis; however, smoking cessation should be advocated in this population, knowing that it can cause many deadly smoking-related diseases.[40] Furthermore, smoking was found to have a positive effect on endometrial cancer[41] and Parkinson disease. In fact, there is a reduction in the prevalence of Parkinson disease between smokers and nonsmokers, and ex-smokers and nonsmokers. A study performed showed that the risk of Parkinson disease was 41% lower in smokers compared with nonsmokers.[42] Smoking is beneficial for Parkinson through several mechanisms. First, nicotine stimulates dopaminergic neurons in the brain, which relieves Parkinson disease symptoms and has a neuroprotective effect. Second, nicotine inactivates monoamine oxidase B enzyme, which is responsible for the activation of the parkinsonian-inducing neurotoxins.[31]

In addition, smoking has a positive effect on multiple cognitive domains. A meta-analysis done in 2010 shows a significant positive effect of nicotine on fine motor abilities, attention, and memory.[43]

Smoking Cessation

Counseling

Encouraging smoking cessation and promoting health should be a major part of the physician-patient encounter. It is very important for the patient to understand the disadvantages of smoking and their health-related consequences. A critical component is to educate the patient about the advantages and the benefits of smoking cessation at any age, especially in the elderly population. The topic of smoking cessation should be discussed during every patient-physician encounter even if the patient is not ready. The clinician should also motivate the patient by offering assistance, advice, and encouragement. The physician should reassure the patient that he will guide him through the process and offer him replacement therapies, group therapies, exercises, and time-management strategies to relieve the stressful period.[44,45]

According to the United States Prevention Services Task Force,[46] physicians should regularly ask about tobacco use and should encourage stopping. They recommend the 5 A's approach for counseling:

1. Ask about tobacco
2. Advise to quit
3. Assess willingness to quit
4. Assist in quitting
5. Arrange a follow-up and support

However, some investigators considered that smoking cessation might reduce the coping ability of the elderly and their quality of life; thus, the risk for stopping smoking might outweigh the benefits.[43]

Older adults exhibit low interest in attempting quitting because of their low ability to understand the harms and risk of smoking, notably among the cognitively impaired.[36]

Medical Therapy

Several pharmacologic therapies can help in smoking cessation.

Nicotine replacement therapy

Nicotine replacement therapy, such as lozenges, transdermal patches, sprays, and gums, can be used as first-line treatment. Many studies found the positive effect of replacement therapies, prescribed in optimal and effective dosages, with or without behavioral therapies on smoking cessation.[2]

Pharmacodynamics of nicotine do not differ between elderly and young; thus, dosage modification is not necessary, and nicotine therapy will not have an enhanced effect in the elderly. To note, nicotine is excreted through the kidneys, so cautious usage of replacement should be done in the case of renal impairment.[2]

Bupropion

Bupropion, an antidepressant, is effective for smoking cessation, alone or in combination with nicotine replacement therapy. It should be prescribed at a dose of 150 mg/d the first 3 days and then 150 mg twice daily for 8 to 10 weeks. Studies have shown noninferiority and sometimes superiority in the quitting rates between bupropion and replacement therapies. However, bupropion has many adverse effects, and the noncompliance rates are higher than in the nicotine replacement therapy.[2] Bupropion is contraindicated in those with seizures or a history of anorexia or bulimia. It can cause cognitive impairment and motor impairment, so it should be used cautiously in the elderly at the risk of delirium. It can cause weight loss that is detrimental in the elderly population and can be one of the main events promoting frailty. Furthermore, it can accumulate in the elderly because of chronic dosing, so low doses should be used in frail older people.[47]

Clonidine and nortriptyline

Clonidine and nortriptyline are considered second-line agents. Clonidine might decrease the craving for cigarettes.[2] It can be given either orally or transdermally. Studies have shown that the chances of quitting were increased by 90% with clonidine. However, it should be used cautiously in the elderly because it can cause hypotension, bradycardia, central nervous system depression, respiratory depression, and xerostomia.[48]

Nortriptyline was shown to double the quitting rates in 6 placebo-controlled trials. The doses used in trials were 75 mg to 100 mg. Data are lacking about the dose-dependent side effects in smokers, because small trials were performed. The fact that nortriptyline and bupropion help in smoking cessation, but not selective serotonin reuptake inhibitors, may be due to the important role of dopaminergic and noradrenergic but not serotonergic receptors in cessation.[49]

Although nortriptyline is a secondary amine, having the lowest side effects among other tricyclic antidepressants, it can cause anticholinergic side effects: xerostomia, constipation, blurry vision, urinary retention, and cognitive impairment. Previous studies have shown that 30% of patients over the age of 40 years develops delirium while being treated with tricyclics. Thus, it should be avoided in the elderly.[50]

Varenicline

Varenicline is an alpha4-beta2 neuronal nicotinic acetylcholine receptor partial agonist approved for smoking cessation. It is started at low doses and incrementally increased

each 3 days to reach a 1-mg twice-daily dose after day 7, and this maintenance dose is taken over 11 weeks. The pharmacokinetics of this medication do not differ between gender, age, or ethnicities; however, it is renally cleared so it should be used cautiously in renal impairment.[51] This medication should be used cautiously, because it can cause a wide spectrum of neuropsychiatric effects, notably depression and suicidality.[52] In 1 retrospective study in older adults, patients who received varenicline were 3.22 times more likely to quit smoking than those who received Nicotine replacement therapy (NRT).[53]

Alternative Medicine Options

Some patients are referred to hypnosis or acupuncture as an alternative treatment to traditional medicine.[2] Cognitive behavioral therapy is also an important method for smoking cessation mainly in the elderly. Cognitive behavioral therapy can lead to high rates of stopping cigarettes and maintaining smoking cessation in both men and women.[54]

Electronic Cigarettes

Electronic cigarettes have recently been used as a means for smoking cessation (35.5% of adults and 25.3% in the last 3 months)[55] as a transitory phase. However, they can push people, especially the young generation, aged 18 to 24 (24.5%) and 25 to 44 years (49.3%),[56] to start tobacco products. Data from 2018 estimate that around 1% of persons aged more than 65 years old use e-cigarettes and vaping.[57] The long-term health effect of electronic cigarettes is currently unknown: they still contain tobacco, and they also burn chemicals.[58]

SUMMARY

In summary, nicotine use disorder is common among the elderly, and many succeed quitting smoking for personal reasons or for health-related issues. Smoking causes many health problems, attacking all the systems in the body and shortening lifespan. However, other people either fail to or refuse to quit smoking because of their possible poor knowledge and insight about its side effects, or because they find it a pleasure or a stress reliever. Therefore, an appropriate counseling and smoking cessation approach is required at every visit, and several methods of cessation can be proposed, from nicotine replacement to medications to alternative medicine. Anyone at any age can stop smoking! Age is not an excuse!

CLINICS CARE POINTS

- Smoking is a major risk factor for the development of chronic diseases, including cardiovascular, respiratory system, eyes, gums, and bones, that can have debilitating consequences on the elderly. It is also associated with increased risk of cancer.
- Smoking cessation in older adults should be prioritized. The primary care physician/geriatrician should assess and advise quitting at each encounter.
- Several treatment strategies pharmacologic and nonpharmacologic can be used and should be tailored for each patient while taking into account the adverse events and the comorbidities.

DISCLOSURE

The authors have nothing to disclose.

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