

Tobacco- You are never too old to quitKumar M¹, Kumari S²

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ABSTRACT

Tobacco has been a part of affluent society since centuries, and now this social status has gradually become a stigma. The awareness about the harmful effects of tobacco use has drastically increased in recent decades. Quitting though obstacle by dependence has never been a challenge with a self determination, good counseling and medication. Though the health benefits are greater for people who stop at earlier ages, there are benefits at any age.

Keywords: Tobacco, nicotine, dependence, quit, health benefit

Introduction

Tobacco is obtained from the plant, *Nicotiana tabacum*,^[1] and is a preventable cause of disease, disability, and death.^[2,3,4,5] Although historically, tobacco use was linked to affluence, today, continuing tobacco consumption is associated with societal disadvantage.^[6,7] There are more than 7,000 chemicals found in the smoke of tobacco products. Of these, nicotine, first identified in the early 1800s, is the primary reinforcing component of tobacco.^[5,8,9] Nicotine is said to have mood-altering effects. Smoking is the most popular method of using tobacco worldwide; however, many people use smokeless tobacco. It is estimated that 29% of the world's population over the age of 15 smokes¹ and is more common in adults. Despite overall declines in smoking among general population, people with mental illness smoke more. Recently, Potentially Reduced Exposure Products (PREPs)^[10] and Nicotine Replacement Therapies (NRTs),^[11] are marketed as an option to quit smoking, but the actual health benefits and if any, long term hazard of such products is still questionable. Researchers have

shown a positive correlation between specific genes and nicotine addiction.^[3,12] A never ending positive effort of various government and non government organizations, always works towards the awareness about the ill effects of tobacco. Policies towards smoke free public places, reduce exposure to second hand smoke and help smokers quit.^[2,4]

Nicotine Addiction

Nicotine the main addictive component of tobacco is a tertiary amine,^[3,5,9] affecting the nervous system to produce a number of effects.^[13,14] Of primary importance to its addictive nature is that nicotine activates nicotine-induced mesolimbic reward pathways—the brain circuitry that regulates feelings of pleasure, mild euphoria, increased arousal, decreased fatigue, and relaxation.^[3,13] A key brain chemical involved in mediating the desire to consume tobacco is the dopaminergic neurotransmitter, and research has shown that nicotine increases levels of dopamine in the reward circuits.^[7] However, the acute effects

of nicotine dissipate quickly, as do the associated feelings of reward, which causes the smoker to continue dosing to maintain the drug's pleasurable effects and prevent withdrawal.^[13,15]

Nicotine Kick

Nicotine is rapidly absorbed into the bloodstream when administered.^[3] Cigarette is a very efficient and highly engineered drug delivery system.^[16] Smoked tobacco releases nicotine rapidly in the bloodstream via alveolar spaces, reaches peak levels and penetrates the blood brain barrier, thereby achieving access to central nervous system.^[3,13] Immediately after exposure to nicotine, there is a "kick" caused in part by the drug's stimulation of the adrenal glands and resulting discharge of epinephrine. The rush of adrenaline stimulates the body and causes an increase in blood pressure, respiration, and heart rate.^[16,17] This rush that occurs with cigarette smoking contributes to the positive reinforcement of nicotine use.^[3]

Effect of MAO

Cigarette smoking causes marked decrease in the levels of monoamine oxidase (MAO), an important enzyme that is responsible for the breakdown of dopamine. The decrease in two forms of MAO (A and B) results in higher dopamine levels and may be another reason that smokers continue to smoke.^[18] Animal studies have shown that acetaldehyde, another chemical found in tobacco smoke, dramatically increases the reinforcing properties of nicotine and may also contribute to tobacco addiction.^[18,19]

Nicotine dependence

Tobacco use causes addiction to nicotine. Chronic nicotine use causes changes in the mesolimbic reward system (neuroadaptations) that ultimately lead to tolerance and nicotine dependence.^[3,20] Research suggests that nicotine may be as addictive as heroin, cocaine, or alcohol.^[15,21] Acetaldehyde increases nicotine's addictive properties in adolescent, but not adult,

animals. Studies also suggests that specific genes may increase risk for addiction among people who begin smoking during adolescence.^[19,22] And it play an important role in both the severity of an individual's nicotine addiction as well as in the variability of that individual' response to different smoking cessation agents.^[3,13] People who stop smoking often start again because of withdrawal symptoms, Nicotine withdrawal symptoms may include:

- Feeling irritable, anxious, stress, and weight gain
- Having trouble thinking
- Craving tobacco products
- Feeling hungrier than usual
- Depression, anxiety, cognitive and attention deficits, sleep disturbances, and increased appetite.

Effects of Tobacco

Cigarette smoking harms nearly every organ in the body also affecting short-term memory , which in return affects attention^[1,14] It has been conclusively linked to cataracts and pneumonia, and accounts for about one-third of all cancer deaths.^[1,4,11,13,17,22-24] Smoking is also associated with cancers of the mouth, pharynx, larynx, esophagus, stomach, pancreas, cervix, kidney, bladder, and acute myeloid leukemia.^[1,24] People may differ in their susceptibility or resistance to tobacco carcinogen.^[23] Smoking substantially increases the risk of heart disease, including stroke, heart attack, vascular disease, and aneurysm. Smoking causes coronary heart disease, the leading cause of death.^[25]

Gender differences

Smoking cessation trials show that women are less likely to initiate quitting and may be more likely to relapse if they do quit. Men and women differ in their smoking behaviors. Women smoke fewer cigarettes per day, tend to use cigarettes with lower nicotine content, and do not inhale as deeply as men. This could be due to differences in sensitivity to nicotine.^[26]

Low nicotine tobacco product

The adverse health effects of tobacco use are well known, yet many people do not want to quit or have difficulty quitting. As a result, there has been a recent surge in the development of tobacco products that claim to reduce exposure to harmful tobacco constituents or to have fewer health risks than conventional products. These "potentially reduced exposure products" (PREPs), which include cigarettes and smokeless tobacco (e.g., snuff, tobacco lozenges), have not yet been evaluated sufficiently to determine whether they are indeed associated with reduced risk of disease. Studies indicate that the levels of carcinogens in these PREPs range from relatively low to comparable to conventional tobacco products.^[10]

Nicotine replacement therapy

Nicotine Replacement Therapy (NRT) is a pharmacological aid for smoking-cessation treatment.^[5,14,27] NRTs doubles successful smoking cessation rates.^[20] Adequate dosing and or combination therapy is of prime importance along with an excellent patient counselling.^[28] Nicotine gum and the transdermal nicotine patch, are the first pharmacological treatments (NRTs) for use in tobacco cessation therapy. An added benefit NRT is low or no potential of abuse since they do not produce the pleasurable effects of tobacco products, nor do they contain the carcinogens and gases associated with tobacco smoke.^[11,5,28] Potential adverse effects of NRTs includes slight throat irritation, sore mouth, increased salivation and hiccups due to excessive swallowing of dissolved nicotine.^[5] Another possible mechanism for de-addiction is to desensitize ALPHA-4,BETA-2 Nicotinic Acetylcholine Receptors ($\alpha 4 \beta 2$ nAChRs). Such desensitization would result in reduced effect of nicotine from cigarettes, such that if a person relapses to smoking while taking NRT, the cigarette would be less satisfying and the person less likely to resume.^[14]

Nicotine excretion

Nicotine is metabolized by a number of pathways that are primarily housed in the liver, and nicotine and its metabolites are almost entirely excreted by the kidneys. Due to its rapid distribution and metabolism, the plasma half-life of nicotine is approximately two hour.^[3]

De-addiction medications

Although the primary focus of pharmacological treatments for tobacco addiction has been nicotine replacement, other treatments are also available e.g; antidepressant. This medication, which acts at the sites in the brain affected by nicotine, may help people quit by easing withdrawal symptoms and blocking the effects of nicotine if people resume smoking. The potential of a vaccine that targets nicotine for use in relapse prevention is under evaluation. The nicotine vaccine is designed to stimulate the production of antibodies that would block access of nicotine to the brain and prevent nicotine's reinforcing effects.^[11]

Quit tobacco

More attention is needed to help people quit smoking.^[2,17,29] This includes:

- Preparing and implementing action plans to reduce smoking.
- Tobacco-free campus policies
- Counseling, rewards and behavioral therapies.
- Nicotine replacement products/ therapy to help quit.
- Funding to stop-smoking treatment.
- Encouraging mental health and de-addiction agencies.
- Conducting research focused on the health and longevity.
- Supporting friends who are trying to quit.
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Benefits of quitting

Tobacco smoke contains a deadly mix of chemicals; of which hundreds are harmful, and about 70 can cause cancer. People who stop smoking greatly^[11,26]

- Decreases blood pressure and chances of heart attack within 24 hours.

- Reduced risk for disease and early death.
- Lowered risk for cancer.
- Reduced risk for heart disease, stroke, and peripheral vascular disease.
- Reduced risk of developing respiratory symptoms.
- Reduced risk for infertility in women of childbearing age.
- During pregnancy also reduce their risk of having a low birth weight baby.

Pharmacogenomics

Genetic variation is associated with nicotine metabolism. Slow metabolizers smoke fewer cigarettes per day and have a higher likelihood of quitting, and that there is greater abstinence among individuals receiving nicotine patch therapy. Approximately 70–80% of smokers relapse following drug treatment; thus, genetic information can potentially be used to personalize drug treatments for smoking cessation to increase their efficacy.^[13] Genetics has linked the causal relation between cigarette smoking and lung cancer.^[12] Glutathione S-transferase, GST, is a drug-metabolizing enzymes that detoxifies or activates several drugs and also chemicals in cigarette smoke. The gene exists as two different main forms, GST M1 and GST T1 with different capacities to detoxify tobacco compounds. GST M1-0 is associated with increased risk of smoking-related cancers, GSTT1-0 with bladder cancer among smokers and GST T1-1 with kidney cancer in workers with long-term exposure to trichlorethene.^[30] In the future, genetic screening could help clinicians select treatments, adjust dosages, and avoid or minimize adverse reactions, tailoring smoking cessation therapies to an individual's unique genetic inheritance.^[22]

Conclusion

Nicotine from the various forms of tobacco has ever been the social addiction and the ill effects of tobacco use are also well known. While nicotine itself is not a carcinogenic, it leads to addiction and possible facilitation to other carcinogenic mechanisms. It is never challenging to quit, if given

a very strong socio-psychological support empowered with a self control. The immediate health benefits of quitting tobacco includes-increased social acceptance, increased confidence, and decreased halitosis, reduced chances of cardiac arrest, with reducing the chances of carcinoma as a long term benefit. The emerging knowledge about the specifically related genes will help customize the de-addiction protocols in future. Although the health benefits are greater for people who stop at earlier ages, there are benefits at any age.

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