



# Health Impacts of Tobacco in Human Body

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**ABSTRACT:** Tobacco products, especially when smoked or used orally, have negative effects on human health, and concerns about these effects have existed for a long time. Research has focused primarily on cigarette smoking.<sup>[1][2]</sup>

Tobacco smoke contains more than 70 chemicals that cause cancer.<sup>[3]</sup> It also contains nicotine, which is a highly addictive psychoactive drug. When tobacco is smoked, nicotine causes physical and psychological dependency. Cigarettes sold in underdeveloped countries tend to have higher tar content, and are less likely to be filtered, potentially increasing vulnerability to tobacco smoking-related diseases in these regions.<sup>[4]</sup>

According to the World Health Organization (WHO), "[Smoking and oral] Tobacco use is the single greatest cause of preventable death globally."<sup>[5]</sup> As many as half of people who smoke tobacco or use the substance orally, die from complications related to such use.<sup>[3]</sup> The WHO estimates that each year in total about 6 million people die from tobacco-related causes (about 10% of all deaths) with 600,000 of these occurring in non-smokers due to second-hand smoke.<sup>[3][6]</sup> It is estimated to have caused 100 million deaths in the 20th century.<sup>[3]</sup> Similarly, the United States Centers for Disease Control and Prevention describes smoking tobacco and oral use of tobacco as "the single most important preventable risk to human health in developed countries and an important cause of premature death worldwide."<sup>[7]</sup> Currently, the number of premature deaths in the U.S. from tobacco use per year outnumber the number of workers employed in the tobacco industry by 4 to 1.<sup>[8]</sup> According to a 2014 review in *The New England Journal of Medicine*, tobacco smoking will kill about 1 billion people in the 21st century if current smoking patterns persist, half of them before the age of 70.<sup>[9]</sup>

**KEYWORDS:** tobacco, smoke, cancer, psychological, WHO, second hand smoke, premature death

## I. INTRODUCTION

China has the largest tobacco smoking population, followed by India. India has highest tobacco chewing population in the world. 154 people die every hour in India due to chewing and smoking tobacco.<sup>[10][11]</sup>

Tobacco use most commonly leads to diseases affecting the heart, liver and lungs. Smoking is a major risk factor for infections like pneumonia, heart attacks, strokes, chronic obstructive pulmonary disease (COPD) (including emphysema and chronic bronchitis), and multiple cancers (particularly lung cancer, cancers of the larynx and mouth, bladder cancer, and pancreatic cancer). It also causes peripheral arterial disease and high blood pressure. The effects depend on the number of years that a person smokes and on how much the person smokes. Starting smoking earlier in life and smoking cigarettes higher in tar increases the risk of these diseases. Also, environmental tobacco smoke, or second-hand smoke, has been shown to cause adverse health effects in people of all ages.<sup>[12]</sup> Tobacco use is a significant factor in miscarriages among pregnant smokers, and it contributes to a number of other health problems of the fetus such as premature birth, low birth weight, and increases by 1.4 to 3 times the chance of sudden infant death syndrome (SIDS).<sup>[13]</sup> Incidence of erectile dysfunction is approximately 85 percent higher in male smokers compared to non-smokers.<sup>[14][15]</sup>

Several countries have taken measures to control the consumption of tobacco (smoking) with usage and sales restrictions as well as warning messages printed on packaging. Additionally, smoke-free laws that ban smoking in public places such as workplaces, theaters, and bars and restaurants have been enacted to reduce exposure to second-hand smoke.<sup>[3]</sup> Tobacco taxes that increase the price of tobacco products have also been enacted.<sup>[3]</sup>

In the late 1700s and the 1800s, the idea that tobacco use caused some diseases, including mouth cancers, was initially widely accepted by the medical community.<sup>[16]</sup> In the 1880s, automation dramatically reduced the cost of cigarettes, cigarette companies greatly increased their marketing, and use expanded.<sup>[17][18]</sup> From the 1890s onwards, associations of tobacco use with cancers and vascular disease were regularly reported; a meta-analysis citing 167 other works was published in 1930, and concluded that tobacco use caused cancer.<sup>[19][20]</sup> Increasingly solid observational evidence was published throughout the 1930s, and in 1938, *Science* published a paper showing that tobacco users live substantially shorter lives. Case-control studies were published in Nazi Germany in 1939 and 1943, and one in the Netherlands in 1948, but widespread attention was first drawn by five case-control studies published in 1950 by researchers from the US and UK. These studies were widely criticized as showing correlation, not causality. Follow-up prospective cohort studies in the early 1950s clearly found that smokers died faster, and were more likely to die of lung



cancer and cardiovascular disease.<sup>[16]</sup> These results were first widely accepted in the medical community, and publicized among the general public, in the mid-1960s.<sup>[16]</sup>

Smoking most commonly leads to diseases affecting the heart and lungs and will commonly affect areas such as hands or feet. First signs of smoking-related health issues often show up as numbness in the extremities, with smoking being a major risk factor for heart attacks, chronic obstructive pulmonary disease (COPD), emphysema, and cancer, particularly lung cancer, cancers of the larynx and mouth, and pancreatic cancer.<sup>[43]</sup> Overall life expectancy is also reduced in long term smokers, with estimates ranging from 10<sup>[35]</sup> to 17.9<sup>[44]</sup> years fewer than nonsmokers.<sup>[45]</sup> About one half of long term male smokers will die of illness due to smoking.<sup>[46]</sup> The association of smoking with lung cancer is strongest, both in the public perception and etiologically. Among male smokers, the lifetime risk of developing lung cancer is 17.2%; among female smokers, the risk is 11.6%. This risk is significantly lower in nonsmokers: 1.3% in men and 1.4% in women.<sup>[47]</sup>

A person's increased risk of contracting disease is related to the length of time that a person continues to smoke as well as the amount smoked. However, even smoking one cigarette a day raises the risk of coronary heart disease by about 50% or more, and for stroke by about 30%. Smoking 20 cigarettes a day entails a higher risk, but not proportionately.<sup>[48][49]</sup>

If someone stops smoking, then these chances gradually decrease as the damage to their body is repaired. A year after quitting, the risk of contracting heart disease is half that of a continuing smoker.<sup>[50]</sup> The health risks of smoking are not uniform across all smokers. Risks vary according to the amount of tobacco smoked, with those who smoke more at greater risk. Smoking so-called "light" cigarettes does not reduce the risk.<sup>[51]</sup>

Smoking is the cause of about 5 million deaths per year.<sup>[52]</sup> This makes it the most common cause of preventable early death.<sup>[53]</sup> One study found that male and female smokers lose an average of 13.2 and 14.5 years of life, respectively.<sup>[54]</sup> Another measured a loss of life of 6.8 years.<sup>[55]</sup> Each cigarette that is smoked is estimated to shorten life by an average of 11 minutes, though this may vary slightly on the contents and brand.<sup>[56][57][58]</sup> At least half of all lifelong smokers die early as a result of smoking.<sup>[35]</sup> Smokers are three times more likely to die before the age of 60 or 70 than non-smokers.<sup>[35][59][60]</sup>

In the United States, cigarette smoking and exposure to tobacco smoke accounts for roughly one in five,<sup>[61]</sup> or at least 443,000 premature deaths annually.<sup>[62]</sup> To put this into context, ABC's Peter Jennings (who would later die at 67 from complications of lung cancer caused by life-long smoking) famously reported that in the US alone, smoking tobacco kills the equivalent of three jumbo jets full of people crashing every day, with no survivors.<sup>[63]</sup> On a worldwide basis, this equates to a single jumbo jet every hour.<sup>[64]</sup>

A 2015 study found that about 17% of mortality due to cigarette smoking in the United States is due to diseases other than those usually believed to be related.<sup>[65]</sup>

It is estimated that there are between 1 and 1.4 deaths per million cigarettes smoked. In fact, cigarette factories are the most deadly factories in the history of the world.<sup>[66][67]</sup> The primary risks of tobacco usage include many forms of cancer, particularly lung cancer,<sup>[71]</sup> kidney cancer,<sup>[72]</sup> cancer of the larynx<sup>[73]</sup> and head and neck,<sup>[74]</sup> bladder cancer,<sup>[75]</sup> cancer of the esophagus,<sup>[76]</sup> cancer of the pancreas<sup>[77]</sup> and stomach cancer.<sup>[78]</sup> Studies have established a firm relationship between tobacco smoke, including second-hand smoke, and cervical cancer in women.<sup>[79]</sup> There is some evidence suggesting a small increased risk of myeloid leukemia,<sup>[80]</sup> squamous cell sinonasal cancer, liver cancer, colorectal cancer, cancers of the gallbladder, the adrenal gland, the small intestine, and various childhood cancers.<sup>[78]</sup> The possible connection between breast cancer and tobacco is still uncertain.<sup>[81][82]</sup>

The risk of lung cancer risk is highly influenced by smoking, with up to 90% of diagnoses being attributed to tobacco smoking.<sup>[83]</sup> The risk of developing lung cancer increases with the number of years smoking and number of cigarettes smoked per day.<sup>[84]</sup> Smoking can be linked to all subtypes of lung cancer. Small-cell carcinoma (SCLC) is the most closely associated with almost 100% of cases occurring in smokers.<sup>[85]</sup> This form of cancer has been identified with autocrine growth loops, proto-oncogene activation and inhibition of tumour suppressor genes. SCLC may originate from neuroendocrine cells located in the bronchus called Feyrter cells.<sup>[86]</sup>

The risk of dying from lung cancer before age 85 is 22.1% for a male smoker and 11.9% for a female smoker, in the absence of competing causes of death. The corresponding estimates for lifelong nonsmokers are a 1.1% probability of dying from lung cancer before age 85 for a man of European descent, and a 0.8% probability for a woman.<sup>[87]</sup>

## II. DISCUSSION

In smoking, long term exposure to compounds found in the smoke (e.g., carbon monoxide and cyanide) are believed to be responsible for pulmonary damage and for loss of elasticity in the alveoli, leading to emphysema and chronic



obstructive pulmonary disease (COPD).<sup>[88]</sup> COPD caused by smoking is a permanent, incurable (often terminal) reduction of pulmonary capacity characterised by shortness of breath, wheezing, persistent cough with sputum, and damage to the lungs, including emphysema and chronic bronchitis.<sup>[89]</sup> The carcinogen acrolein and its derivatives also contribute to the chronic inflammation present in COPD.<sup>[90]</sup> Inhalation of tobacco smoke causes several immediate responses within the heart and blood vessels. Within one minute the heart rate begins to rise, increasing by as much as 30 percent during the first 10 minutes of smoking. Carbon monoxide in tobacco smoke exerts negative effects by reducing the blood's ability to carry oxygen.<sup>[91]</sup>

Smoking also increases the chance of heart disease, stroke, atherosclerosis, and peripheral vascular disease.<sup>[92][93]</sup> Several ingredients of tobacco lead to the narrowing of blood vessels, increasing the likelihood of a blockage, and thus a heart attack or stroke. According to a study by an international team of researchers, people under 40 are five times more likely to have a heart attack if they are smokers.<sup>[94][95]</sup>

Exposure to tobacco smoke is known to increase oxidative stress in the body by various mechanisms, including depletion of plasma antioxidants such as vitamin C.<sup>[96]</sup>

Research by American biologists has shown that cigarette smoke also influences the process of cell division in the cardiac muscle and changes the heart's shape.<sup>[97]</sup>

Smoking tobacco has also been linked to Buerger's disease (thromboangiitis obliterans), the acute inflammation and thrombosis (clotting) of arteries and veins of the hands and feet.<sup>[98]</sup>

Although cigarette smoking causes a greater increase in the risk of cancer than cigar smoking, cigar smokers still have an increased risk for many health problems, including cancer, when compared to non-smokers.<sup>[99][100]</sup> As for second-hand smoke, the NIH study points to the large amount of smoke generated by one cigar, saying "cigars can contribute substantial amounts of tobacco smoke to the indoor environment; and, when large numbers of cigar smokers congregate in a cigar smoking event, the amount of ETS (i.e. second-hand smoke) produced is sufficient to be a health concern for those regularly required to work in those environments."<sup>[101]</sup>

Smoking also tends to increase blood cholesterol levels. Furthermore, the ratio of high-density lipoprotein (HDL, also known as the "good" cholesterol) to low-density lipoprotein (LDL, also known as the "bad" cholesterol) tends to be lower in smokers compared to non-smokers. Smoking also raises the levels of fibrinogen and increases platelet production (both involved in blood clotting) which makes the blood thicker and more likely to clot. Carbon monoxide binds to hemoglobin (the oxygen-carrying component in red blood cells), resulting in a much stabler complex than hemoglobin bound with oxygen or carbon dioxide—the result is permanent loss of blood cell functionality. Blood cells are naturally recycled after a certain period of time, allowing for the creation of new, functional red blood cells. However, if carbon monoxide exposure reaches a certain point before they can be recycled, hypoxia (and later death) occurs. All these factors make smokers more at risk of developing various forms of arteriosclerosis (hardening of the arteries). As the arteriosclerosis progresses, blood flows less easily through rigid and narrowed blood vessels, making the blood more likely to form a thrombosis (clot). Sudden blockage of a blood vessel may lead to an infarction (stroke or heart attack). However, it is also worth noting that the effects of smoking on the heart may be more subtle. These conditions may develop gradually given the smoking-healing cycle (the human body heals itself between periods of smoking), and therefore a smoker may develop less significant disorders such as worsening or maintenance of unpleasant dermatological conditions, e.g. eczema, due to reduced blood supply. Smoking also increases blood pressure and weakens blood vessels.<sup>[102]</sup>

### III. RESULTS

A study of an outbreak of an (H1N1) influenza in an Israeli military unit of 336 healthy young men to determine the relation of cigarette smoking to the incidence of clinically apparent influenza, revealed that, of 168 smokers, 68.5 percent had influenza, as compared with 47.2 percent of nonsmokers. Influenza was also more severe in the smokers; 50.6 percent of them lost work days or required bed rest, or both, as compared with 30.1 percent of the nonsmokers.<sup>[105]</sup>

According to a study of 1,900 male cadets after the 1968 Hong Kong A2 influenza epidemic at a South Carolina military academy, compared with nonsmokers, heavy smokers (more than 20 cigarettes per day) had 21% more illnesses and 20% more bed rest, light smokers (20 cigarettes or fewer per day) had 10% more illnesses and 7% more bed rest.<sup>[106]</sup>

The effect of cigarette smoking upon epidemic influenza was studied prospectively among 1,811 male college students. Clinical influenza incidence among those who daily smoked 21 or more cigarettes was 21% higher than that of non-smokers. Influenza incidence among smokers of 1 to 20 cigarettes daily was intermediate between non-smokers and heavy cigarette smokers.<sup>[106]</sup>



Surveillance of a 1979 influenza outbreak at a military base for women in Israel revealed that influenza symptoms developed in 60.0% of the current smokers vs. 41.6% of the nonsmokers.<sup>[107]</sup>

Smoking seems to cause a higher relative influenza-risk in older populations than in younger populations. In a prospective study of community-dwelling people 60–90 years of age, during 1993, of unimmunized people 23% of smokers had clinical influenza as compared with 6% of non-smokers.<sup>[108]</sup>

Smoking may substantially contribute to the growth of influenza epidemics affecting the entire population.<sup>[105]</sup> However, the proportion of influenza cases in the general non-smoking population attributable to smokers has not yet been calculated

Perhaps the most serious oral condition that can arise is that of oral cancer. However, smoking also increases the risk for various other oral diseases, some almost completely exclusive to tobacco users. The National Institutes of Health, through the National Cancer Institute, determined in 1998 that "cigar smoking causes a variety of cancers including cancers of the oral cavity (lip, tongue, mouth, throat), esophagus, larynx, and lung."<sup>[101]</sup> Pipe smoking involves significant health risks,<sup>[109][110]</sup> particularly oral cancer.<sup>[111]</sup> Roughly half of periodontitis or inflammation around the teeth cases are attributed to current or former smoking. Smokeless tobacco causes gingival recession and white mucosal lesions. Up to 90% of periodontitis patients who are not helped by common modes of treatment are smokers. Smokers have significantly greater loss of bone height than nonsmokers, and the trend can be extended to pipe smokers to have more bone loss than nonsmokers.<sup>[112]</sup>

Smoking has been proven to be an important factor in the staining of teeth.<sup>[113][114]</sup> Halitosis or bad breath is common among tobacco smokers.<sup>[115]</sup> Tooth loss has been shown to be 2<sup>[116]</sup> to 3 times<sup>[117]</sup> higher in smokers than in non-smokers.<sup>[118]</sup> In addition, complications may further include leukoplakia, the adherent white plaques or patches on the mucous membranes of the oral cavity, including the tongue.<sup>[119]</sup>

Smoking is also linked to susceptibility to infectious diseases, particularly in the lungs (pneumonia). Smoking more than 20 cigarettes a day increases the risk of tuberculosis by two to four times,<sup>[120][121]</sup> and being a current smoker has been linked to a fourfold increase in the risk of invasive disease caused by the pathogenic bacteria *Streptococcus pneumoniae*.<sup>[122]</sup> It is believed that smoking increases the risk of these and other pulmonary and respiratory tract infections both through structural damage and through effects on the immune system. The effects on the immune system include an increase in CD4+ cell production attributable to nicotine, which has tentatively been linked to increased HIV susceptibility.<sup>[123]</sup>

Smoking increases the risk of Kaposi's sarcoma in people without HIV infection.<sup>[124]</sup> One study found this only with the male population and could not draw any conclusions for the female participants in the study.<sup>[125]</sup>

American Psychologist stated, "Smokers often report that cigarettes help relieve feelings of stress. However, the stress levels of adult smokers are slightly higher than those of nonsmokers, adolescent smokers report increasing levels of stress as they develop regular patterns of smoking, and smoking cessation leads to reduced stress. Far from acting as an aid for mood control, nicotine dependency seems to exacerbate stress. This is confirmed in the daily mood patterns described by smokers, with normal moods during smoking and worsening moods between cigarettes. Thus, the apparent relaxant effect of smoking only reflects the reversal of the tension and irritability that develop during nicotine depletion. Dependent smokers need nicotine to remain feeling normal."<sup>[132]</sup>

#### IV. CONCLUSIONS

Smokers report higher levels of everyday stress.<sup>[135]</sup> Several studies have monitored feelings of stress over time and found reduced stress after quitting.<sup>[136][137]</sup>

The deleterious mood effects of everyday between-cigarette nicotine withdrawal symptoms explain why people who smoke experience more daily stress than non-smokers, and become less stressed when they quit smoking. Deprivation reversal also explains much of the arousal data, with deprived smokers being less vigilant and less alert than non-deprived smokers or non-smokers.<sup>[135]</sup>

Recent studies have shown a positive relationship between psychological distress and salivary cotinine levels in smoking and non-smoking adults, indicating that both firsthand and second-hand smoke exposure may lead to higher levels of mental stress.<sup>[138]</sup>

The usage of tobacco can also create cognitive dysfunction. There seems to be an increased risk of Alzheimer's disease (AD), although "case-control and cohort studies produce conflicting results as to the direction of the association between smoking and AD".<sup>[141]</sup> Smoking has been found to contribute to dementia and cognitive decline,<sup>[142]</sup> reduced memory and cognitive abilities in adolescents,<sup>[143]</sup> and brain shrinkage (cerebral atrophy).<sup>[144][145]</sup>



Most notably, some studies have found that patients with Alzheimer's disease are more likely not to have smoked than the general population, which has been interpreted to suggest that smoking offers some protection against Alzheimer's. However, the research in this area is limited and the results are conflicting; some studies show that smoking increases the risk of Alzheimer's disease.<sup>[146]</sup> A recent review of the available scientific literature concluded that the apparent decrease in Alzheimer's risk may be simply because smokers tend to die before reaching the age at which Alzheimer's normally occurs. "Differential mortality is always likely to be a problem where there is a need to investigate the effects of smoking in a disorder with very low incidence rates before age 75 years, which is the case of Alzheimer's disease," it stated, noting that smokers are only half as likely as non-smokers to survive to the age of 80.<sup>[141]</sup>

Some older analyses have claimed that non-smokers are up to twice as likely as smokers to develop Alzheimer's disease.<sup>[147]</sup> However, a more current analysis found that most of the studies, which showed a preventing effect, had a close affiliation to the tobacco industry. Researchers without tobacco lobby influence have concluded the complete opposite: Smokers are almost twice as likely as nonsmokers to develop Alzheimer's disease.<sup>[148]</sup>

Former and current smokers have a lower incidence of Parkinson's disease compared to people who have never smoked,<sup>[149][150]</sup> although the authors stated that it was more likely that the movement disorders which are part of Parkinson's disease prevented people from being able to smoke than that smoking itself was protective. Another study considered a possible role of nicotine in reducing Parkinson's risk: nicotine stimulates the dopaminergic system of the brain, which is damaged in Parkinson's disease, while other compounds in tobacco smoke inhibit MAO-B, an enzyme which produces oxidative radicals by breaking down dopamine.<sup>[151]</sup>

In many respects, nicotine acts on the nervous system in a similar way to caffeine. Some writings have stated that smoking can also increase mental concentration; one study documents a significantly better performance on the normed Advanced Raven Progressive Matrices test after smoking.<sup>[152]</sup>

Most smokers, when denied access to nicotine, exhibit withdrawal symptoms such as irritability, jitteriness, dry mouth, and rapid heart beat.<sup>[153]</sup> The onset of these symptoms is very fast, nicotine's half-life being only two hours.<sup>[154]</sup> The psychological dependence may linger for months or even many years. Unlike some recreational drugs, nicotine does not measurably alter a smoker's motor skills, judgement, or language abilities while under the influence of the drug. Nicotine withdrawal has been shown to cause clinically significant distress.<sup>[155]</sup>

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