

Health Risks Associated with Tobacco Consumption in Humans: An Overview

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Abstract

Tobacco use remains a significant public health concern globally, with over 8 million anticipated deaths annually by 2030, despite declining rates in some high-income nations. Smoking is prevalent worldwide, particularly in developing and middle-income countries, where over 80% of smokers reside. The inhalation of tobacco substances leads to various diseases, including cancer and respiratory ailments, resulting in more deaths than AIDS, tuberculosis, and other major causes combined. Secondhand smoke exposure also poses significant health risks. The economic burden of tobacco-related deaths and diseases is substantial, especially in low- and middle-income economies, where almost 80% of tobacco-related deaths occur. Lack of awareness, societal influence, and ineffective enforcement of anti-tobacco laws contribute to widespread tobacco use. Although anti-tobacco campaigns and policies have shown some success, challenges persist, particularly in rural areas where tobacco dependence is high. In India, despite declining tobacco use attributed to awareness campaigns and increased taxes on cigarettes, certain demographics, such as middle-aged individuals, illiterates, and rural residents, continue to have high tobacco consumption rates due to inadequate implementation of anti-tobacco norms and limited access to information. Quitting smoking can significantly extend life expectancy and reduce the risk of smoking-related diseases. However, nicotine addiction poses a challenge, with only a small percentage of users successfully quitting without assistance. Professional support and cessation drugs can double the likelihood of successful quitting, and nicotine replacement therapy has shown effectiveness. Overall, there is no safe level of cigarette use, emphasizing the importance of comprehensive tobacco control efforts to mitigate the global health and economic impacts of tobacco use. This review deals with the health risks associated with tobacco consumption in humans.

Keywords: Tobacco, Nicotine, Carcinogens, Cancer, Cardiovascular diseases.

Introduction

The term "tobacco" refers to several plants of the Solanaceae family's genus *Nicotiana*. Australia, South West Africa, North and South America and South Pacific regions are the indigenous countries of tobacco. There are more than 70 species of tobacco recognized, but *Nicotiana tabacum* (Figure 1 and Table 1) is the most important commercial variety¹. Despite having a tropical origin, tobacco is cultivated all over the world. To reach maturity in the field, grown tobacco (*N. tabacum*) needs a frost-free period of 100 to 130 days from the day of transplantation. *Aztec tobacco*, or *Nicotiana rustica*, is more potent and matures more quickly than tobacco that is widely cultivated. It has grown to some extent in places like Vietnam, India, and several Transcaucasian nations².

As external poultices for boils, skin diseases, wounds, bruises, and sprains, products produced from the tobacco leaves were used. Tobacco leaf teas have been used as an expectorant, a laxative, an emetic, an expectorant for fainting and dizziness, as well as for migraines and intestinal worms^{3,4}. Tobacco leaves are used as an antibacterial and a bleeding stopper on cuts. Headache, sinusitis, and conjunctivitis are all treated with plant sap and decoction⁵. Inflammatory conditions like swellings, hernias, rheumatism, arthritis, gout,

hemorrhoids, and stomach issues can also find relief through their pain-relieving properties⁶.

In ancient times, tobacco was utilized in ceremonial customs of diverse civilizations, but it was seldom adopted as a habit and wasn't widespread among the populace. However, with the onset of the 20th century, advancements in automated manufacturing enabled the large-scale production of inexpensive tobacco goods. These products are now extensively promoted through media channels and advertising, resulting in a significant increase in the consumption of commercial cigarettes⁷. Over the past century, there has been a notable rise in tobacco consumption, leading to a subsequent increase in the prevalence of diseases attributed to tobacco use over subsequent decades⁸.

Nicotine, a chemical with addictive properties, possesses both stimulant and depressant effects and is naturally occurring in the tobacco plant. Dried tobacco leaves form the primary ingredient in the production of most tobacco products, encompassing cigarettes, cigars, pipes, and hookahs. Additionally, these leaves are utilized in the creation of snus, chewing tobacco, snuff and dipping tobacco^{9,10}.

Table 1: Characteristics of *Nicotiana tabacum*

Scientific Name	<i>Nicotiana tabacum</i>
Botanical Family	Solanaceae (Nightshade family)
Other Common Name	Indian tobacco
Shape	Oval, egg-shaped or round
Size	1 to 3 metres (3 to 10 feet) high
Colour	Dark green
Odour	Seductive, sweet, earthy aroma
Taste	Bitter
Parts of the plant used	Leaves
Origin	The tobacco plant, originally native to South America, is now cultivated in numerous tropical and subtropical regions across the globe.

**Figure 1:** Illustrate the image of *Nicotiana tabacum*

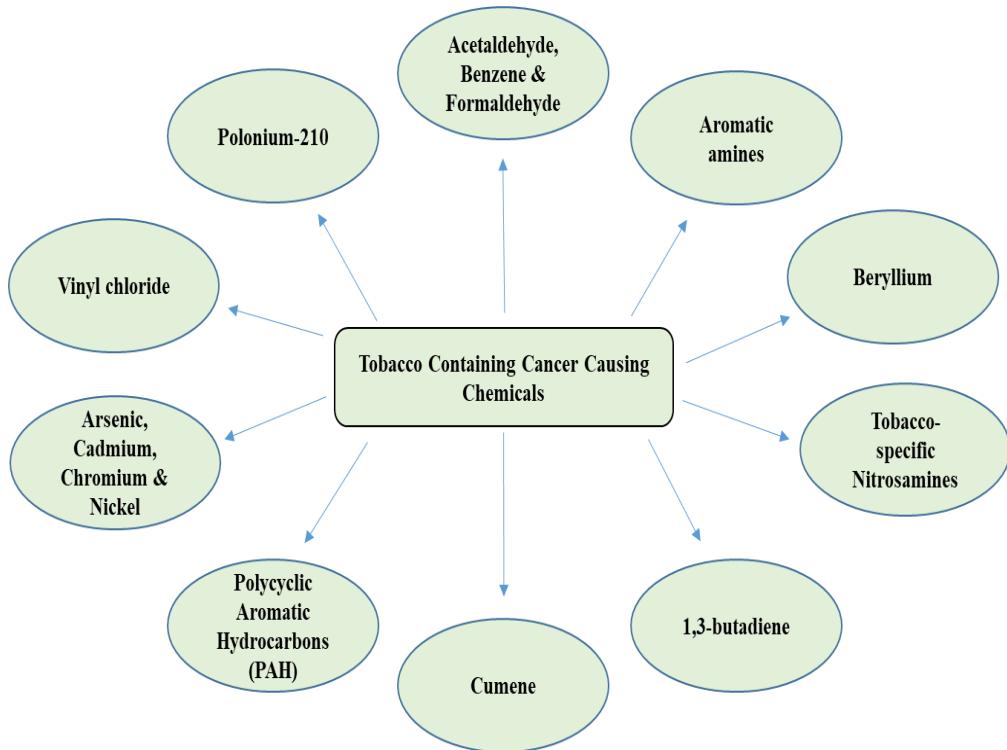
Beneficial effects of tobacco

Although smoking has several negative effects, there are some mechanisms by which smoking may also have positive effects. These effects include the anti-estrogenic impact of smoking, changes in prostaglandin production, and the activation of nicotinic cholinergic receptors in the central nervous system¹¹.

Tobacco constituents

With great effort put into proving the link between the putative carcinogens in tobacco smoke and the accompanying adverse health consequences, numerous scientific researchers have determined the chemical content of tobacco smoke. More than 4000 toxic chemical compounds have been found in the tobacco¹². During tobacco consumption, chemicals from it enter into the bloodstream, which then transports them to every part of the body. Several of these chemicals have the potential to harm the DNA and the cells that contain damaged DNA could abnormally differentiate and proliferate to form tumors in the body. The hazardous substances present in tobacco have been shown to cause heart and lung diseases as well as cancer¹³.

Tobacco contains a range of highly toxic chemical substances, including carbon monoxide, cyanide, carcinogens, formaldehyde, nickel, arsenic, cadmium, tobacco-specific nitrosamines, and phenols. It has been found that the majority of the hydrocarbons in tobacco smoke are heterocyclic. The primary cancer-causing components in both smoked and smokeless tobacco have been identified as TSNA¹⁴. Nitrosornicotine (NNN), 4-methyl-N-nitrosamino-1-(3-pyridyl)-1-butanone (NNK), N-nitrosoanatabine (NAT), and N-nitrosoanabasine (NAB) are the four main TSNA compounds found in tobacco. Of these four, the IARC identifies NNN and NNK as the primary tobacco-related cancer-initiating chemicals. When secondary and tertiary amines combine with nitriles, they produce nitrosamines, of which over 70 have been scientifically proven to be carcinogenic¹⁵ (Figure 2).

**Figure 2:** Chemical carcinogens of tobacco

Nicotine addiction

Nicotine, found in the tobacco plant, is highly addictive, leading to both physical and mental dependency. Physical addiction manifests as a craving for the substance, while mental addiction refers to users seeking nicotine's effects knowingly. Additionally, nicotine addiction encompasses behavioural dependence; where individuals develop a reliance on the actions associated with tobacco use. Indeed, individuals often develop habitual patterns of smoking, such as after meals or during stressful situations. Both the body and the mind derive pleasure from nicotine, reinforcing the habit and making it more challenging to quit¹⁶.

Nicotine induces an addiction to cigarettes and other tobacco products. Upon absorption into the bloodstream through the lining of the mouth and lungs, nicotine swiftly reaches the brain. The body's absorption of nicotine is heightened by more frequent and deeper inhalation of tobacco smoke¹⁷. When people smoke, the brain releases dopamine, a neurotransmitter linked to pleasure and reward, resulting in a temporary sensation of pleasure and contentment¹⁸.

The possible contributing factors for nicotine addiction include a family history of nicotine addiction and living in homes with tobacco users as well as being habituated to smoking at a young age. A higher risk of nicotine dependency exists in those who abuse alcohol, drugs, or both, as well as in those who suffer from mental illnesses. Due to its high level of addictiveness, even occasional use of nicotine can result in dependence. Utilizing nicotine patches, gum, or lozenges as aids for smoking cessation also carries the risk of fostering nicotine addiction. The nicotine content in these products is typically lower and delivered at a slower rate compared to nicotine from tobacco, thereby reducing the risk of nicotine addiction^{19,20}.

Nicotine addiction is characterized by an inability to cease tobacco product usage, experiencing withdrawal symptoms upon cessation of nicotine intake, persisting in smoking despite health issues, and continued use despite adverse effects on one's life. The primary method through which people intake nicotine is by smoking cigarettes. The addiction to nicotine among cigarette smokers is a serious global public health concern. Nicotine addiction can contribute to disease vulnerability and brain disorders. As nicotine is highly addictive, infrequent use can even lead to its dependence. Using nicotine patches, gum, or lozenges as aids to quit smoking carries the potential risk of nicotine addiction. The amount of nicotine in these products is lower as well is delivered more slowly than the nicotine in tobacco, which lowers the risk of nicotine addiction.²¹⁻²².

Tobacco production

Between 1971 and 2020, there has been a dramatic growth in tobacco output worldwide. In 1971, 4.2 million metric tons of tobacco leaves were produced. The increase in production was primarily driven by the significantly increased productivity in developing countries, which witnessed a rise of over 100%²³. In 2020, global tobacco production reached nearly 6 million metric tons. China emerged as the leading tobacco producer worldwide, accounting for over a third of the total production. Brazil and India are also significant contributors to global tobacco production. At the peak of global tobacco production, about 20 million rural Chinese households engaged in cultivating tobacco across 2.1 million hectares of land. The single largest contributor to the rise in global output of tobacco was China. Nearly 135,000 family farmers in Brazil depend on tobacco cultivation as their primary source of income. Flue-cured tobacco, along with burley and Galpo Comum air-cured tobacco, are grown in the southern regions of Brazil, including varieties such as Virginia and Amarelhinho^{24,25}.

In India, approximately 0.25% of its total arable land is dedicated to tobacco cultivation. The India's Tobacco Board's main office is in the Andhra Pradesh city of Guntur. There are 96,865 tobacco growers in India who are registered, and there are many more, who are not registered²⁶.

Epidemiology of tobacco use

Around 1.3 billion people worldwide are habituated to tobacco smoke. One billion of them live in developing countries or countries with transitional economies. While the frequency of smoking has decreased in many developed nations, it has increased among women and in developing nations. In most populations, men are more habituated to tobacco smoke than female populations²⁷. In underdeveloped nations, about 50% of males and 9% of women currently smoke, compared to 35% of men and 22% of women in high-resource countries. The incidence of women's smoking rates varies considerably, but they seldom match those of men. Factors such as demographic location, socioeconomic status, sociocultural influences, and religious beliefs all play a significant role in determining the prevalence of tobacco use²⁸.

In 2020, 36.7% of men and 7.8% of women worldwide consumed cigarettes, accounting for approximately 22.3% of the global population. Nearly 1 billion men and 250 million women smoke tobacco products globally, constituting roughly 23% of all adults. The gender gap in smoking prevalence is narrowing as more women begin smoking. Smoking prevalence showed notable variation across the six WHO regions. Europe reported the highest rate at 29%, whereas Africa had the lowest at 8%. Men exhibited a higher frequency of cigarette smoking compared to women globally. The most significant gaps were observed in the Western Pacific Region, where males smoked 15 times more frequently than females, and in the Southeast Asia region, where men smoked 10 times more frequently than women²⁹. In upper-middle and high-income countries, smoking rates among women were estimated to be relatively high (15%). According to the WHO, one in every two young individuals who start smoking and keep doing so will develop malignancies due to tobacco use. Moreover, people with less education, those who make less than the federal poverty threshold, those covered by Medicaid, those without insurance, and patients with disabilities are more likely to experience it. Tobacco use is prevalent among various populations across Europe, particularly among men. Countries like Turkey, Latvia, and Greece exhibit higher rates of smoking, especially among men. Additionally, Spain stands out for its high rate of male smokers within Western Europe³⁰. The countries with the highest rates of female smokers include the former Yugoslav Republic of Greece, Hungary, Macedonia, Netherlands, Poland, and France. Interestingly, Sweden stands out as the only EU member where more women smoke than men^{30,31}.

Various forms of tobacco

There are numerous ways and forms in which tobacco is used.

Beedi (also known as bidis)

Indian cigarettes made of tobacco wrapped in a tendu leaf and bound with coloured thread at one end are known as beedi or bidis. Abuse of bidis has been linked to several health risks, including heart attacks, as well as cancers of the oral and lungs³².

Chewing tobacco

Smokeless tobacco has a rich history across various regions, including North Europe, North America, India, other parts of Asia, and certain areas of Africa. The first method of ingesting tobacco leaves is through chewing. It is consumed

orally and comes in two different forms: sweetened strands (also known as "chew" or "chaw"), or shreds ("dip"). This method of tobacco use, commonly known as dipping tobacco, involves lightly chewing tobacco into a ball or placing small portions of shredded tobacco between the bottom lip and gum, where it is consumed by gently crushing it between the teeth. Both techniques stimulate the salivary glands, leading to the emergence of spittoons. Tobacco chewing elevates the risk of developing pancreatic, esophageal, and oral cancers, as well as heart disease and gum disease³³.

Cigars

Cigars are tightly rolled tobacco bundles that smokers ignite and draw into their lips to enjoy the smoke's flavour and aroma. Despite often not being inhaled, cigar smoke contains more harmful compounds than cigarette smoke, according to studies. Smoking cigars heightens the risk of developing heart diseases and, lung, esophageal, laryngeal, and oral cancers, as well as pancreatic cancer³⁴.

Cigarettes

Cigarettes are made from cured, finely chopped tobacco leaves mixed with reconstituted tobacco and other ingredients. These components are rolled into a paper cylinder for smoking. The consumption of cigarettes in various forms has been strongly associated with the development of various diseases, including cancer³⁵.

Creamy snuff

Creamy snuff, also known as toothpaste snuff, is a tobacco paste typically packaged in a toothpaste-like tube. It consists of tobacco, glycerin, clove oil, menthol, spearmint, and camphor. Brands such as Ipcos (produced by Asha Industries), Denobac, Tona, and Ganesh are marketed primarily to women in India. In certain regions of Maharashtra, it is locally referred to as mishri³⁶.

Dipping tobaccos

Dipping tobacco, also known as "dip," is a type of smokeless tobacco that differs from chewing tobacco, often referred to as "chew." Dipping tobacco is taken out of the tin in a small chunk and placed between the gums and the lower or upper lip. To minimize mess, certain companies, such as those producing snus, portion their products into small, permeable pouches³⁶.

Gutka

Crushed betel nuts, tobacco, and savoury or sweet flavourings are the ingredients in gutka. It's produced in India and shipped to a few other nations. It is marketed throughout India in tiny, individual-sized packets and is a mild stimulant³⁷.

Dokha

Middle Eastern dokha is typically smoked using a thin pipe called a medwakh and is renowned for its high nicotine content. It is cultivated in regions of Oman and Hatta. Dokha is a ground, dried form of tobacco that contains minimal to no flavor- and aroma-enhancing additives, except fruits, flowers, and spices³⁸.

Hookah

A hookah is a single- or multi-stemmed water pipe used for smoking, often featuring a glass base. Originating in India and Persia, hookahs have gained widespread popularity throughout the Middle East. Hookahs operate through indirect heat and water filtration, providing a smooth smoking experience. Hookahs offer the option of smoking herbal fruits or moassel, a blend of tobacco, flavoring, and honey or glycerin. While some perceive it to be less harmful and addictive than

smoking cigarettes. On the other hand, kreteks are cigarettes crafted from a complex blend of tobacco, cloves, and a flavoring "sauce"³⁹. Smoking kreteks has been linked to an increased risk of lung cancer and other respiratory diseases⁴⁰.

Roll-your-own

Roll-your-own cigarettes, also called "rollies" or "roll-ups," have gained popularity in multiple European countries. Smokers make these cigarettes by buying loose tobacco, cigarette papers, and filters individually, and then manually putting them together. Roll-your-own cigarettes are often cheaper to produce than pre-packaged cigarettes⁴¹.

Snuff

Snuff is a smokeless tobacco product that is crushed up and inhaled by the nose. To produce loose leaf tobacco for chewing, tobacco leaves are air-cured, crushed, and infused with a flavouring agent. Dry snuff is composed of fermented and fire-cured powder, whereas wet snuff, also known as snus, is formed of air- and fire-cured black tobacco⁴².

Snus

Snus is a type of smokeless tobacco product typically placed under the upper lip. Unlike smoking, using snus does not involve inhaling smoke into the lungs. Typically contains lower levels of tobacco-specific nitrosamines (TSNAs) compared to other forms of smokeless tobacco. However, it still carries health risks, including oral cancer, gum disease, and addiction to nicotine⁴³.

Tobacco pipes

A tobacco pipe typically comprises a small bowl where the tobacco is burned, connected to a thin stem that ends in a mouthpiece. Tobacco shreds are placed into the bowl and ignited for smoking. However, it's important to note that smoking a pipe is associated with increased risks of esophageal, laryngeal, oral, and throat cancers, as well as lung cancer⁴⁴.

Tobacco water

A common organic insecticide utilized in residential gardening is tobacco water. Similarly, tobacco dust serves as another organic insecticide used for the same purpose. It is created by steeping potent tobacco in water for an extended period or boiling it in water. The mixture can be "painted" or sprayed into the leaves of garden plants when it has cooled, where it will kill insects. However, the National Organic Program of the USDA prohibits the use of tobacco as a pesticide in cultivation that is certified as organic⁴⁵.

Age and sex distribution of tobacco use

The prevalence of smoking and other addictions is disproportionately high among sexual and/or gender minorities. Almost 90% of smokers begin between the ages of 15 and 25. Another behaviour that is well-known for defying social standards is teenage tobacco use. Tobacco consumption is a severe public health issue that particularly affects young people worldwide⁴⁶. Most smokers begin using tobacco well before the age of 18, which has significant psychosocial and health impacts. Around the world, approximately 1 in 10 girls and 1 in 5 boys aged 13 to 15 are smokers. Additionally, it is projected that existing tobacco usage patterns will lead to the premature deaths of 250 million children and young adults over time, with the majority occurring in developing countries. Therefore, adolescent and early adult tobacco use has significant negative effects on public health⁴⁷.

The tobacco consumption situation in India is highly complex owing to the availability of many kinds of tobacco. Moreover, adolescence and early adulthood, or the

ages of 15 to 24, are regarded as the life phases where tobacco smoking is most likely to start in India⁴⁸. According to the research that is currently available, between 5% and 25% of Indian young people currently use or have ever used tobacco. Although smokeless tobacco is less popular, considerable rates of its use among teenagers aged 13 to 15 have been found in India (15% of boys and 5% of girls). Men are more likely than women to smoke⁴⁹.

Tobacco mortality

Tobacco consumption poses a significant threat to public health, contributing to various chronic conditions such as cancer, respiratory issues, heart disease, and strokes. It is a major global concern, causing over 8 million deaths annually. Of these, around 7 million are directly attributed to tobacco use, while roughly 1.3 million result from exposure to second-hand smoke among non-smokers⁵⁰.

Using any form of tobacco carries considerable health risks, with no safe level of exposure. Cigarette smoking is the primary method of tobacco consumption globally. Approximately 80% of the 1.3 billion tobacco users worldwide live in low- and middle-income countries, where rates of tobacco-related diseases and fatalities are highest. Tobacco use can push households into poverty by diverting funds from essential needs like food and housing. Its addictive properties make it difficult for individuals to control their spending on tobacco products⁵¹.

Annually, tobacco use and exposure lead to approximately 480,000 premature deaths in the United States. These untimely fatalities stem from various causes, with approximately 36% associated with cancer, 39% with heart disease and stroke, and 24% with lung disease. Smokers face a mortality risk about three times higher than nonsmokers⁵².

Tobacco usage stands as a significant contributor to mortality and illness in India, resulting in over 1.35 million deaths annually. India, being the world's second-largest consumer and producer of tobacco, faces substantial health challenges due to its widespread usage. The accessibility of various tobacco products at highly affordable prices across the country exacerbates the issue⁵³. Based on the Global Adult Tobacco Survey India (2016-17), nearly 267 million adults aged 15 and above in India use tobacco, constituting approximately 29% of the total adult population. Smokeless tobacco emerges as the predominant form of tobacco use in India, with popular products like gutkha, betel quid with tobacco, and zarda. Moreover, smoked tobacco products include bidis, cigarettes, and hookahs⁵⁴.

Cigarette smoking: the most common tobacco abuse

Cigarette smoking is widely recognized as a primary cause of cancer and mutagenesis. The duration and quantity of smoking are significant factors that increase the risk of developing certain histologic types of lung cancers. Cigarettes contain highly addictive substances such as nicotine, phenols, polyaromatic hydrocarbons, and nitrosamines. Additionally, gases such as carbon-hydrogen cyanide, monoxide and nitrogen oxides are also present. During smoking, over 600 components in a cigarette are burned, producing more than 7,000 compounds, including at least 70 recognized carcinogens⁵⁵. Smoking inflicts harm on nearly every organ in the body and elevates the risk of numerous diseases, profoundly affecting smokers' overall health. Statistics reveal that approximately 0.8-1.1 million cigarettes smoked result in one smoking-related death, indicating that the roughly 7.4 trillion cigarettes consumed globally in 2019 contributed to around 7 million deaths⁵⁶. In comparison, cigarette smoking

claims more lives annually than HIV, illegal drug use, alcohol consumption, motor vehicle accidents, and firearm-related incidents combined⁵⁷.

Around 90% of lung cancer deaths are directly linked to cigarette smoking. Remarkably, lung cancer takes more lives among women annually than breast cancer. Moreover, approximately 80% of all deaths from chronic obstructive pulmonary disease (COPD) result from cigarette smoking. Both men and women who smoke face increased mortality risks from various other causes. Additionally, smoking negatively affects smokers' overall health, leading to increased absenteeism from work and heightened healthcare utilization and costs associated with medical treatment⁵⁸.

Secondhand smoke

The smoke exhaled by a smoker and the smoke produced from the burning end of cigarettes or other smoking devices, such as bidis and water pipes, is referred to as secondhand tobacco smoke. It is also known as environmental tobacco smoke, involuntary smoking, and passive smoking. Both children and non-smoking adults can experience illnesses and premature death due to exposure to secondhand smoke. Exposure to secondhand smoke irritates the airways and has immediate adverse effects on the heart and blood vessels. Research suggests that it increases the risk of heart disease by 25% to 30% and raises the likelihood of stroke by 20 to 30%. Pregnant women exposed to secondhand smoke face a greater risk of delivering a baby with a slight decrease in birth weight^{59,60}.

Non-smoking adults can indeed develop lung cancer from inhaling secondhand smoke. In the United States, approximately 3,000 individuals die each year from lung cancer attributed to exposure to secondhand smoke. Moreover, more than 46,000 nonsmokers die annually from heart disease associated with secondhand smoke. Children exposed to secondhand smoke face an elevated risk of experiencing ear problems, asthma, and respiratory infections, which can be both more frequent and severe⁶¹.

Electronic cigarettes

Electronic cigarettes, also known as e-cigarettes, pod mods and vape pens are battery-operated devices used to create an aerosol from a liquid that usually contains nicotine, the addictive substance found in tobacco products like normal cigarettes⁶². The essential components of the solution by volume are propylene glycol, with or without glycerol, and flavouring agents. The user exhales the aerosol after inhaling it. Exposure to secondhand aerosols can occur through the use of electronic cigarettes. These aerosols contain carcinogens, heavy metals like lead, volatile chemical compounds, nicotine, and other hazardous and potentially harmful components. It is important to note that e-cigarettes are not safe for children, teenagers, or pregnant women⁶³.

The economic impact of tobacco

Tobacco use has significant economic impacts. It diverts household spending away from necessities such as food and shelter towards cigarettes, contributing to poverty. Additionally, the government of India receives approximately 20 billion Indian Rupees annually from the sale of tobacco. Tobacco use carries a significant economic burden, including high medical expenses for treating tobacco-related diseases and the loss of human capital due to illness and premature death resulting from tobacco use⁶⁴. Although the CDC reports a continual decline in smoking rates in the United States, statistics reveal that the tobacco industry still maintains a substantial market worth, estimated at US\$121 billion in the US alone. Cigarette smoking accounted for over \$225 billion (or

11.7%) of the country's annual healthcare spending on health costs in 2014. Between 2010 and 2014, Medicaid's expenditure on medical treatment related to smoking increased by over 30%⁶⁵. Maintaining regular tobacco use requires tobacco users to allocate a significant amount of money towards purchasing cigarettes, particularly given the high taxes imposed by governments on tobacco products. For instance, a smoker in the state of New York would need to budget approximately \$4,690.25 per year solely for cigarettes⁶⁶.

Health risks associated with tobacco

Tobacco smoking and liver diseases

An avoidable risk factor for early morbidity and mortality is cigarette smoking. About 40% of individuals with liver diseases have a smoking history, and more research is looking into the possible effects of smoking on chronic liver diseases. With an estimated incidence of 25% worldwide, non-alcoholic fatty liver disease (NAFLD) stands as the most prevalent cause of chronic liver disease. Both genetic and environmental factors affect how NAFLD develops and progresses. Among the latter, mounting data suggests that smoking has a detrimental impact on the development of fatty liver disease. Almost 20% of NAFLD patients smoked cigarettes^{67,68}.

One of the main risk factors for morbidity and mortality in patients with chronic liver disease is hepatic fibrosis. Significant data demonstrates that smoking may play a profibrogenic function among the environmental factors that aggravate liver fibrosis across all aetiologies. As a result, there is growing evidence from cross-sectional and retrospective research that smoking cigarettes negatively affects the development of chronic viral hepatitis, PBC, and NAFLD. Several studies show that smoking cigarettes is linked to a higher incidence of hepatocellular carcinoma (HCC) in people with cirrhosis⁶⁹.

Smoking and reproductive health of women

There are numerous health impacts of smoking tobacco on women. The primary ingredient in tobacco, nicotine, causes hormonal imbalance in the body by stimulating the production of growth hormone, vasopressin, cortisol and oxytocin, which in turn inhibits the release of luteinizing hormone and prolactin. As a result, smoking tobacco or using smokeless tobacco has been linked to decreased fertility, decreased chances of conception, increased frequency of monthly irregularities, and delayed onset of spontaneous menopause in women⁷⁰.

Smoking and pregnancy

Women who smoke often encounter more difficulties in getting pregnant. It's estimated that around 0.4 million infants are exposed to maternal smoking in utero each year. Tobacco smoke has adverse health effects on both the mother and fetus, increasing the risk of experiencing adverse pregnancy outcomes and affecting infant survival. A pregnant smoker is at a higher risk of experiencing a miscarriage, an ectopic pregnancy, premature birth, abnormally low birth weight, and the birth of a child with cleft lip and/or palate. Smoking also increases the risk of Sudden Infant Death Syndrome (SIDS) in both the pregnant woman and her unborn child^{71,72}.

Tobacco smoking and periodontal diseases

Tobacco, particularly tobacco smoking, significantly impacts periodontal health and the occurrence of periodontal disease. It is associated with a higher prevalence of periodontal bone loss, loss of periodontal attachments, and the

development of periodontal pockets. Additionally, tobacco use has a masking effect on gingival inflammatory symptoms^{73,74}.

Tobacco smoking and cancer

Cancer is defined by abnormal cell growth with the potential to invade or spread to other parts of the body, making it the second leading cause of death globally. Despite this, advancements in cancer detection, treatment, and prevention have resulted in rising survival rates for numerous types of cancer. It's crucial to note that tobacco use stands as the most common cause of cancer and cancer-related deaths. Due to the presence of various harmful chemicals in tobacco products and secondhand smoke, which can damage DNA, individuals who regularly use these products or are exposed to environmental tobacco smoke face an elevated risk of developing cancer⁷⁵. Tobacco smoking increases the risk of various cancers, including acute myeloid leukemia, as well as cancers of the lung, oral cavity, kidney, bladder, liver, pancreas, colorectal, and cervix. Similarly, individuals who use smokeless tobacco, like snuff or chewing tobacco, face an elevated risk of developing pancreatic and oral malignancies⁷⁶.

A study on the likelihood of developing cancer in the 35–70+ age range in India revealed that men were more prone than women to develop malignancies associated with cigarette use (4.75% vs. 2.16%). Additionally, the study highlighted that tobacco use accounts for approximately 45% of male cancer cases and 20% of female cancer cases. The incidence rates for mouth cancer in Western India, as well as esophageal, pulmonary, and hypopharyngeal cancers in the Northeast of India, were highest among male smokers. Similarly, the Northeast region exhibited the highest incidence of lung and esophageal cancer among female smokers⁷⁷.

Lung cancer

Lung cancer, a malignancy originating in the lungs, is predominantly associated with tobacco smoking. It is classified into two primary types: non-small cell lung cancer and small cell lung cancer. Risk factors for lung cancer encompass smoking, exposure to secondhand smoke, exposure to specific chemicals, and family history. Common symptoms of lung cancer include a persistent cough, chest pain, wheezing, and weight loss, though these manifestations typically manifest only in the later stages of the disease⁷⁸.

The risk of developing lung cancer is higher globally than the risk of any other significant tobacco-related cancer sites. One well-known adverse effect of smoking is lung cancer, with tobacco use contributing to 80–90% of lung cancer cases. Younger smokers or those who smoke an increased number of cigarettes have a higher risk of developing lung cancer, although lifetime exposure to smoking as a whole is also strongly correlated with lung cancer risk. Despite fewer cigarettes being consumed per smoker since the 1960s, a smoker's chance of developing lung cancer has increased when compared to nonsmokers⁷⁹.

Smoking and cardiovascular diseases

Cardiovascular diseases (CVDs) encompass a range of heart and blood vessel disorders. Individuals who smoke are at a higher risk of developing these conditions. Smoking significantly contributes to coronary heart disease and stroke, which are among the leading causes of mortality in many countries. Early symptoms of cardiovascular disease can manifest in individuals who smoke as few as five cigarettes per day. Smoking damages blood arteries, leading them to thicken and become more constricted. This results in elevated blood pressure and an increased heart rate. Smoking-related obstructions can also reduce blood flow to the skin and legs. Approximately one in four deaths from cardiovascular diseases

is attributed to smoking, making it a significant contributor to the disease. Smoking can elevate triglyceride levels, lower HDL cholesterol, and accelerate the formation of plaque in blood vessels. Overall, smoking cigarettes has a profound negative impact on cardiovascular morbidity and mortality. Strong evidence from epidemiological studies indicates that smoking significantly raises the risk of fatal coronary artery disease and myocardial infarction in both men and women. Smoking accounts for 20% of mortality from ischemic heart disease and 33% of all deaths related to cardiovascular disease worldwide^{80,81}.

Smoking and COPD

The term "chronic obstructive pulmonary disease" (COPD) refers to a group of diseases that obstruct airflow and hinder breathing, including emphysema, chronic bronchitis, and sometimes asthma. Smoking is a primary cause of COPD as it damages the airways and the small air sacs (alveoli) in the lungs, leading to lung diseases. Smokers face a 12- to 13-fold higher risk of dying from COPD compared to non-smokers, and as many as 8 out of 10 COPD-related deaths are attributed to smoking. It's important to note that one in four Americans with COPD have never smoked cigarettes. Smoking during childhood and teenage years can indeed impede the growth and development of the lungs, potentially increasing the risk of developing COPD in adulthood. Additionally, smoking tobacco can trigger an asthma attack or exacerbate an existing condition⁸².

Tobacco smoke and asthma

Tobacco smoke acts as a potent trigger for asthma symptoms by irritating the lining of the airways. Common asthma symptoms include chest tightness or pain, shortness of breath, wheezing during exhalation, and difficulty sleeping due to shortness of breath, coughing, or wheezing. Secondhand smoke can pose an even greater risk to individuals with asthma. Smoke from cigars, cigarettes, and pipes can damage the respiratory system. Asthmatic individuals have highly sensitive airways that can be triggered by various factors. Smoke from cigarettes can significantly worsen asthma symptoms. Inflammatory substances present in the moist lining of the airways, which accumulate when a person inhales tobacco smoke, can trigger asthma attacks. Additionally, tobacco smoke affects the cilia, microscopic hair-like projections in the airways responsible for clearing mucus and particles from the lungs⁸³. Cigarette smoke damages cilia, impairing their function and preventing them from effectively clearing mucus and other irritants from the airways. Consequently, the lungs produce an excess of mucus in response to smoke exposure. With dysfunctional cilia, the accumulation of mucus and irritants in the airways occurs. Tobacco smoke contains numerous carcinogenic chemicals that can accumulate in the lungs, leading to the development of lung diseases such as emphysema and lung cancer^{84,85}.

Exposure to secondhand smoke, especially in young individuals, can lead to reduced lung function and inflammation of the airways, resulting in symptoms like coughing, wheezing, and increased mucus production. Asthmatic children, in particular, are highly sensitive to secondhand smoke, and exposure increases their likelihood of experiencing asthma symptoms. Moreover, they are at a heightened risk of developing sinus and lung infections, which can worsen asthma symptoms and make them more challenging to manage⁸⁶.

Smoking and diabetes mellitus

Smoking can also contribute to the development of type 2 diabetes and make its management more challenging. Active smokers face a 30–40% higher likelihood of developing diabetes compared to nonsmokers⁸⁷. The chemicals present in

cigarettes can damage the body's cells, impairing their normal function. This damage can lead to inflammation in the body, potentially reducing the efficiency of insulin in controlling blood sugar levels. Additionally, exposure to chemicals from cigarette smoke can lead to oxidative stress, a condition where these chemicals interact with oxygen in the body. Both inflammation and oxidative stress are associated with an increased risk of diabetes. Furthermore, individuals who smoke may have a higher risk of developing abdominal fat, even if they are not overweight, which further elevates their risk of developing type 2 diabetes⁸⁸.

Several associated factors may complicate the link between cigarette use and insulin resistance. For instance, an established risk factor for diabetes, increased body BMI is frequently linked to insulin resistance. In comparison to non-smokers without a significant smoking history, the frequency of advanced fibrosis was greater among diabetics (regardless of smoking status) and smokers without diabetes⁸⁹.

Other diseases associated with tobacco use

Smoking is associated with increased symptoms of adult asthma, as well as an elevated risk of developing aortic aneurysms, which are balloon-like bulges in chest arteries. Additionally, smokers are at a heightened risk of developing rheumatoid arthritis, osteoporosis and cataracts. Smokers are at a heightened risk of respiratory infections like tuberculosis and pneumonia due to smoking's detrimental impact on the immune system, which leads to heightened inflammation. Furthermore, smoking increases the likelihood of erectile dysfunction in men⁹⁰.

Smoking can adversely affect men's sperm, potentially reducing fertility and increasing the risk of birth abnormalities and miscarriages. Additionally, smoking can have detrimental effects on bone health. Smoking can lead to weaker bones in women past childbearing age compared to non-smoking women. Indeed, smoking is linked to an increased risk of developing cataracts, which involves the clouding of the eye's lens, leading to impaired vision. Furthermore, smoking is associated with age-related macular degeneration, a progressive condition affecting the central part of the retina that can ultimately result in vision loss⁹¹.

Quitting tobacco

Quitting smoking is among the most impactful decisions one can make to enhance their health and lifespan. Extensive research consistently shows that quitting smoking significantly prolongs life expectancy and diminishes the likelihood of developing smoking-related illnesses. These illnesses encompass various cancers, respiratory conditions like COPD and emphysema, as well as cardiovascular diseases such as heart attacks and strokes. However, nicotine addiction, a fundamental component of tobacco, presents a substantial barrier to quitting for numerous smokers. It changes brain chemistry, leading to cravings and withdrawal symptoms that often make cessation efforts difficult. Studies indicate that only a small fraction of smokers manage to quit successfully without any form of assistance⁹².

Fortunately, there are effective strategies and resources available to aid in smoking cessation. Professional support, such as counselling and behavioural therapy, can significantly increase the likelihood of successful quitting. These interventions help individuals develop coping mechanisms for managing cravings and addressing the psychological aspects of addiction. Additionally, pharmacological interventions, including cessation drugs like nicotine replacement therapy (NRT), have been proven to enhance quit rates. NRT works by delivering controlled doses of nicotine to the body, helping to alleviate withdrawal

symptoms and gradually wean individuals off their dependence on cigarettes. Other medications, such as bupropion and varenicline, target nicotine receptors in the brain to reduce cravings and withdrawal symptoms. It is crucial to recognize that there is no safe level of cigarette use. Even occasional or light smoking can have detrimental health effects and increase the risk of developing tobacco-related diseases. Therefore, the emphasis should be on complete cessation rather than simply reducing the number of cigarettes smoked^{93,94}.

Given the significant health and economic burdens associated with tobacco use, comprehensive tobacco control efforts are imperative. These efforts encompass a range of strategies, including public education campaigns, smoke-free policies, tobacco taxation, and regulation of tobacco advertising and marketing. By implementing evidence-based tobacco control measures, governments and public health authorities can reduce tobacco use prevalence, prevent tobacco-related diseases, and ultimately save lives.

Conclusion

The use of tobacco among the human population is still a serious public health issue. One of the most well-known narcotic substances that rural and urban populations in both developing and developed countries abuse is tobacco. Unfortunately, despite recent advancements in industrialized countries, more than 8 million deaths per year are anticipated by the year 2030. Smoking tobacco exposes individuals to a range of harmful substances that contribute to both reproductive and degenerative disorders, including cancer and severe lung ailments such as emphysema, asthma, and COPD. Consequently, tobacco-related fatalities surpass those attributed to AIDS, tuberculosis, car accidents, maternal mortality, homicide, and suicide combined. Recent estimates suggest that smokers may lose over 10 years of life expectancy as a result of their habit.

The widespread incidence of tobacco use can be attributed to factors such as a lack of awareness about the hazards of tobacco among individuals from poor socioeconomic backgrounds, societal influences, and ineffective enforcement of anti-tobacco laws. Therefore, there is an urgent need to intensify anti-tobacco campaigns and ensure comprehensive implementation of anti-tobacco policies. By quitting smoking, one can extend the life as well as reduce the risk of smoking-related diseases. To conclude, individuals addicted to tobacco products should be advised to quit immediately. Regardless of their age, smokers who quit have significant increases in life expectancy as compared to those who don't. Additionally, quitting smoking upon receiving a cancer diagnosis significantly lowers the risk of mortality. Similarly, individuals who cease smoking before the age of 40 experience a substantial 90% reduction in the likelihood of dying from smoking-related illnesses. The implementation of innovative and efficient behavioural and pharmacological smoking cessation strategies is imperative to enhance the quality of life and survival rates among tobacco users.

Conflict of interest

The author declares that there is no conflict of interest.

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