

Effect of Cigarette Smoking on Human Health

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Abstract: *Cigarette smoking remains a significant public health concern, contributing to a wide range of adverse health effects, including respiratory diseases, cardiovascular diseases, and various types of cancers. This abstract provides a concise overview of the detrimental health effects of cigarette smoking and explores the promising potential of mangroves as a natural remedy. Cigarette smoking is a leading cause of preventable deaths worldwide. It is associated with an increased risk of lung cancer, chronic obstructive pulmonary disease (COPD), heart disease, stroke, and various other health problems. Second hand smoke exposure can also harm non-smokers, making it a concern for public health. Mangroves, coastal ecosystems comprised of salt-tolerant trees and plants, have gained attention in recent years for their remarkable ability to purify the environment. These unique ecosystems can filter pollutants, absorb carbon dioxide, and provide a habitat for diverse wildlife. Moreover, mangroves release organic compounds into the environment, some of which have been found to have potential health benefits. Research suggests that mangroves produce phytochemicals and bioactive compounds that possess antioxidant, anti-inflammatory, and anticancer properties. These compounds can help combat the oxidative stress and inflammation caused by cigarette smoke exposure, potentially mitigating some of the health risks associated with smoking. The abstract highlights the urgent need to address the public health crisis of cigarette smoking and underscores the potential of mangroves as a natural remedy to counteract some of its adverse health effects. Future research in this area may uncover novel therapeutic applications of mangrove-derived compounds and contribute to efforts aimed at reducing the global burden of smoking-related diseases.*

Keywords: Cigarette smoking.

I. INTRODUCTION

The use of tobacco has been historically revered, with names like the "holy herb" and "God's remedy" ascribed to it. The Nicotine genus, part of the Salicaceae plant family, is recognized by its sticky leaves and tubular flowers, encompassing over 60 species differentiated by leaf and flower characteristics. Notably, Nicotine tobacco (*N. tobacco*) is indigenous to South America, while *N. rustica* originates from the West Indies. Nicotine, a volatile, colorless, and toxic alkaloid, sets Nicotine apart from other plants.

The consequences of tobacco use on human health are grave, surpassing the combined toll of HIV, illicit drug use, alcohol consumption, motor vehicle accidents, suicides, and homicides. Smokers, on average, experience a premature death, up to 14 years earlier than non-smokers. Tobacco smoking stands as a leading cause of cancer and fatalities, with a higher prevalence in developing nations compared to developed ones. A substantial 70% of tobacco-related deaths are projected to manifest in developing countries.

The worldwide population of smokers currently stands at approximately 1.3 billion individuals, with half of them succumbing to smoking-related ailments. In the year 2020, an estimated 13.3% of all deaths are anticipated to result from tobacco use. Alarmingly, approximately half of all smokers will meet their demise as a direct consequence of tobacco consumption. Cigarette smoking, especially with products like beedis and smokeless tobacco, has a longstanding tradition in India. Nevertheless, the recent surge in its popularity among women and children has become a pressing public health issue. Shockingly, almost one in ten Indian adolescents starts using tobacco before the age of 10. Roughly 47% of Indian males and 14% of Indian females are tobacco users. India witnesses around 850,000 new cases of cancer annually, resulting in approximately 580,000 cancer-related deaths. Recognizing the gravity of the smoking epidemic, this review has been compiled to assess the current status of this pressing issue.

II. CONTEXTUAL BACKGROUND

2.1 Toxic Chemical Composition of Cigarette

Tobacco cultivation and trade are prevalent in various countries, with China, the USA, former Soviet States, Brazil, and India being the largest producers. Cigarettes are manufactured from the dried leaves of the tobacco plant. The chemical composition of tobacco varies significantly due to diverse climatic conditions, even within the same tobacco plant. Components such as chlorophyll a, chlorophyll b, neoxanthin, violaxanthin, lutein, and β -carotene are present in N. tobacco. Post-harvest, tobacco leaves undergo treatment with a multitude of chemicals. Cigarette smoke is known to contain over 4,000 different chemicals, many of which are carcinogenic. The smoke includes a black, sticky tar loaded with toxic substances like ammonia, toluene, and acetone. Tar is a primary contributor to throat and lung cancer and is responsible for the yellowish brown stains on fingers, teeth, and lung tissue. Nicotine, a potent addictive substance, is the primary drug in tobacco and was first isolated from tobacco leaves as early as 1828. Nicotine exerts various harmful effects on the human body, including stimulating the nervous system, increasing heart rate, elevating blood pressure, and constricting small blood vessels under the skin, potentially leading to wrinkles. Carbon monoxide, a poisonous gas found in cigarette smoke, reduces the oxygen-carrying capacity of red blood cells. Hydrogen cyanide damages the tiny hairs responsible for cleaning the lungs naturally, resulting in the accumulation of harmful substances. Cigarette smoke contains toxic heavy metals such as lead, nickel, arsenic, and cadmium. Furthermore, cancer-causing radioactive compounds are present in cigarettes. Pesticides like DDT and methoprene used during tobacco cultivation can also be found in tobacco smoke. Additionally, other chemicals like benzene, creosote, and certain asphalts have been linked to skin cancer, lung cancer, and reduced reproductive capacity. Out of the 2,256 distinct components in cigarette smoke, 542 are found in conventional cigarette smoke. Highly carcinogenic compounds like dimethyl Benz(a)anthracene, dimethyl nitrosamine, and methyl naphthalene are intentionally added during cigarette manufacturing.

2.2 Cigarette Smoking and Cancer

Cancer-related deaths, which numbered around 100 million in the 20th century, are projected to reach 1 billion in the 21st century. The prevalence of cancer in the United States is approximately 300 cases per 100,000 people, whereas in Asian countries, the rate is less than 100 cases per 100,000 due to tobacco smoke exposure. In 2015, it was estimated that tobacco would cause 50% more deaths than HIV/AIDS and be responsible for 10% of all global deaths. Disturbingly, over 3,000 teenagers experiment with cigarettes for the first time every day. In India, the International Agency for Research on Cancer reported that around 635,000 people died from cancer in 2008, representing approximately 8% of all global cancer-related deaths and about 6% of all deaths in India [23]. The temperature at the glowing tip of a lit cigarette reaches 800 °C. With each puff, a smoker inhales a hot mixture of gases and numerous toxic particles. Tobacco smoke can induce changes in lung tissue shortly after exposure, including precancerous alterations. Tobacco-related cancers account for 11.45% of male cancer deaths, with oral cancers outnumbering lung cancers in India. Most cases of lung cancer and emphysema, as well as a significant percentage of heart attacks, are attributed to cigarette smoking.

Lung cancer is a highly aggressive and diverse disease, representing one of the most common malignancies worldwide. The lungs are crucial for respiration, supplying oxygen to all cells in the body, and they are directly or indirectly affected by cigarette smoking. Lung cancer cells, like other cancer cells, possess the capacity to invade neighboring tissues and metastasize to distant parts of the body. Non-small cell lung cancer, which accounts for over 80% of lung cancers, is the most frequent cause of cancer-related deaths globally. Among women, lung cancer is the third-most common cancer worldwide, following breast and colorectal cancers. Smokers are 5-10 times more likely to develop lung cancer, and approximately 87% of lung cancer cases are attributed to cigarette smoking. In the USA, one million smokers succumb to lung cancer annually, constituting 25% of all smoking-related deaths. One in ten moderate smokers and one in five heavy smokers (15 cigarettes per day) will die from lung cancer. About 85% of smokers diagnosed with lung cancer perish within 5.5 years. Tobacco smoking is linked to various other cancers, including pancreatic, colon, bladder, kidney, oral cavity, oropharynx, hypopharynx, esophagus, larynx, pancreas, stomach, cervix, leukemia, female breast, and prostate cancers.

2.3 Cigarette Smoking and Human Reproduction

Cigarette smoking has far-reaching implications for human reproduction. It affects both male and female fertility, as well as the health of the developing fetus.

- **Effects on Female Reproduction:** Cigarette smoking in women can lead to a range of reproductive issues. These include:
 - **Reduced Fertility:** Smoking is associated with a decrease in the likelihood of becoming pregnant. Women who smoke may take longer to conceive compared to non-smokers.
 - **Menstrual Irregularities:** Smoking can disrupt the menstrual cycle, leading to irregular periods. This can make it more challenging to predict ovulation, which is essential for conception.
 - **Early Menopause:** Female smokers are more likely to experience early menopause, which can further reduce their chances of conceiving.
 - **Ectopic Pregnancies:** Smoking increases the risk of ectopic pregnancies, a dangerous condition where the fertilized egg implants outside the uterus.
 - **Miscarriages:** Pregnant women who smoke are at higher risk of miscarriages and stillbirths.
 - **Low Birth Weight:** Smoking during pregnancy can result in low birth weight and preterm births, which are associated with various health problems for the baby.
- **Effects on Male Reproduction:** Cigarette smoking also adversely affects male fertility and reproductive health. These effects include:
 - **Sperm Quality:** Smoking can lead to reduced sperm count, motility, and overall sperm quality, making it more difficult to achieve pregnancy.
 - **Erectile Dysfunction:** Smoking is a well-established risk factor for erectile dysfunction, which can hinder a man's ability to engage in sexual activity and father a child.
 - **DNA Damage:** Smoking can cause genetic mutations in sperm, potentially impacting the health of offspring.
 - **Secondhand Smoke:** It's important to note that secondhand smoke exposure can also have detrimental effects on the reproductive health of both women and men. Women exposed to secondhand smoke may face fertility challenges, while men may experience reduced sperm quality. In conclusion, cigarette smoking significantly impairs human reproduction. It affects both male and female fertility, increases the risk of pregnancy complications, and can lead to adverse outcomes for the developing fetus. Quitting smoking is crucial for those trying to conceive and for the overall health of the family.

2.4 Adverse Effects of Cigarette Smoking

Cigarette smoking is a major contributor to an array of risk factors associated with non-communicable diseases, encompassing coronary heart disease, stroke, chronic obstructive pulmonary disease, peripheral vascular disease, peptic ulcer disease, and tuberculosis. It is strongly linked to the development of lung cancer, emphysema, chronic bronchitis, cardiovascular disease, as well as various other severe internal illnesses and cancers. The continuous, chronic inhalation of cigarette smoke disrupts a wide spectrum of immunological functions, impacting both innate and adaptive immune responses

2.5 Environmental Impact of Cigarette Smoking

The act of cigarette smoking raises significant environmental concerns . Over the past quarter-century, a staggering 52,907,756 cigarette butts have been collected from beaches worldwide, constituting 32% of all debris found. This number surpasses the combined quantity of other forms of waste. These discarded cigarette butts can be carried away by runoff into drains, eventually finding their way into rivers and, ultimately, the oceans. Although some of the materials in these butts are biodegradable, it can take up to nine months for cellulose acetate and plastic components to break down in sewage water .

Studies conducted in aquatic ecosystems have revealed that the presence of nicotinic acid and ethyl phenol in cigarette butts can adversely affect fish and microbial communities. Furthermore, cigarette smoking is responsible for releasing

approximately 2.6 billion kilograms of carbon dioxide into the atmosphere annually, along with about 5.2 billion kilograms of methane on a global scale

III. REVIEW OF LITERATURE

The literature on the effects of cigarette smoking on human health is extensive and well-documented. This review provides a broad overview of key findings and trends in this area:

Cancer Risk: Smoking is one of the leading causes of various types of cancer, most notably lung cancer. The relationship between smoking and lung cancer has been extensively studied, with overwhelming evidence showing that tobacco smoke is a major contributor to this deadly disease. Additionally, smoking is linked to cancers of the mouth, throat, esophagus, pancreas, bladder, and more.

Respiratory Diseases: Smoking is a primary cause of chronic obstructive pulmonary disease (COPD), which includes chronic bronchitis and emphysema. It is also associated with increased risk of respiratory infections and worsens pre-existing asthma.

Cardiovascular Diseases: Cigarette smoking is a significant risk factor for heart disease and stroke. It is known to accelerate the development of atherosclerosis (hardening and narrowing of the arteries) and increases the likelihood of heart attacks.

Addiction and Mental Health: Nicotine, the addictive component of tobacco, can lead to dependence and withdrawal symptoms when quitting. Smoking is also associated with mental health issues, including anxiety and depression.

Secondhand Smoke: Not only does smoking harm the smoker, but it also poses risks to non-smokers who are exposed to secondhand smoke. This includes infants and children who may experience sudden infant death syndrome (SIDS), respiratory infections, and impaired lung development due to secondhand smoke exposure.

Economic and Social Costs: The economic burden of smoking on healthcare systems is substantial, and the costs extend beyond medical expenses to include lost productivity due to illness and premature death.

Global Impact: While smoking rates have declined in many developed countries, they continue to rise in some developing nations. The global health impact is significant, with millions of smoking-related deaths occurring each year.

IV. CONCLUSION

The development of effective medications for treating smoking-related diseases is an imperative requirement, while concurrently addressing the urgency of preventing smoke-related cancers. In this context, the significance of plant-derived bioactive compounds in cancer treatment cannot be overstated. Notably, natural products account for a substantial proportion of the top-selling drugs globally. With over 270,000 higher plant species on Earth, including mangroves, it is apparent that there remains significant untapped potential for the discovery of bioactive compounds with the capacity to serve as foundational agents in the fight against cancer.

The pursuit of remedies from natural sources represents a highly effective approach to mitigating the burden of cancer diseases. In this regard, mangroves present a promising resource for the development of medicinal solutions. Substantial further research is warranted to harness the therapeutic potential of mangroves in combating smoking-related diseases, as outlined in the following phases:

Conducting extensive screenings of a diverse array of mangrove species, extracting compounds using solvents of varying polarities, with a specific focus on their anti-carcinogenic properties.

Isolating, purifying, and identifying the specific anti-cancer molecules present within the most potent extracts.

Thoroughly characterizing the bioactive compounds through comprehensive physical, chemical, and biological assessments.

Formulating drugs based on the bioactive compounds derived from mangroves and subjecting them to rigorous testing alongside standard drugs, both in vitro and in vivo, to evaluate their efficacy.

Undertaking a comprehensive cost-benefit analysis to ascertain the viability and commercial potential of these mangrove-based drugs.

This multifaceted approach holds the promise of not only expanding our understanding of the therapeutic potential of mangrove-derived compounds but also paving the way for the development of innovative and effective medications for addressing smoking-related diseases, thereby contributing to improved public health.

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