



## THE PERSISTENT GRIP OF CHEWING TOBACCO AND ITS HARMFUL EFFECTS ON AN INDIVIDUAL – A REVIEW ARTICLE

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## ABSTRACT

A majority of individuals in India engage themselves in daily consumption despite the prominent warning labels on tobacco chewing products such as “Tobacco is injurious to health and tobacco kills”, “Tobacco causes painful death”, and “Tobacco users die younger”. Tobacco kills over 8 million people annually and is readily available at a meagre price in our country. Its nicotine content makes it a potent and highly addictive substance. Once an individual becomes hooked on nicotine, breaking free becomes a challenge due to the relentless grip of withdrawal symptoms and insatiable cravings. Tobacco has become a coping mechanism to help an individual navigate the stress, anxiety and emotional turmoil of life. This reliance bows to a psychological dependence that's hard to escape. Hence, the repeated and continued use of tobacco results in addiction. Its usage poses serious health risks, and there is no safe level of exposure to tobacco. From its origin in America to its global spread, tobacco's legacy is complex and complicated. The modern-day challenges of regulations and health issues continue to evolve as society balances the interests of public health, economic considerations and an individual's freedom. In *Ayurveda*, Tobacco was first described as *Tamakhu* by *Aacharya Yogratnakara* in the 17<sup>th</sup> century. Combating this global threat is essential to save lives and improve public health. The need of the hour is to create awareness, which can help in decreasing the harmful effects of long-term consumption of tobacco.

**Keywords:** Tobacco, Nicotine, Addiction, *Ayurveda*, *Tamakhu*

## INTRODUCTION

Consumption of tobacco is one of the significant health hazards prevailing all over the world. A majority of individuals in India engage themselves despite the prominent warning labels on tobacco chewing products<sup>1</sup>. Approximately 80% of the 1.3 billion tobacco users live in low and middle-income countries, aggravating the health and economic burdens. In 2020, 22.3% of the world's population used tobacco, of which 36.7% were men and 7.8% were women<sup>2</sup>. On average, tobacco users lose 15 years from their life expectancy<sup>3</sup>. It kills over 8 million people annually<sup>2</sup>. India is the second largest tobacco producing nation<sup>4</sup> and the second largest consumer of tobacco worldwide<sup>2</sup>. According to the GATS 2 (Global Adult Tobacco Survey Second), which was carried out during August 2016 - February 2017 they are revealed that 28.6% (266.8 million) of adults in India aged 15 and above use tobacco in some form or another. About 24.9% adults (232.4 million) are daily users and 3.7% (34.4 million) are occasional users of which 42.4% are men and 14.2% are women. Every tenth adult in India (10.7%) currently smokes tobacco, every fifth adult (21.4%) in India uses smokeless tobacco and about 3.2 crore adults use both the forms of tobacco. The prevalence for smokeless tobacco among men is 29.6% and in women is 12.8%<sup>5</sup>. One of the key features of chewing tobacco related mortality in India is the high incidence of Oral cancer.

### ORIGIN OF TOBACCO

The word 'Tobacco' originates from the Taino language of the native Caribbean people. The Taino word 'tabaco' means 'a roll of tobacco leaves or 'a kind of pipe for smoking tobacco'<sup>6</sup>. When Spanish explorers including Christopher Columbus arrived in the Caribbean, they adopted the term from the Taino people. The Spanish word 'Tabaco' then spread to other European languages, eventually becoming 'Tobacco'. Some suggest that the Spanish word 'tabaco' might have been derived from the Arabic word 'tabaq' which refers to medicinal herbs. Archaeological evidence suggested that tobacco was cultivated in the America's as early as 6,000 BC. The native's used tobacco in various forms including chewing, smoking

(in pipes) and as snuff. The Mayans and Aztecs used tobacco for ceremonial, medicinal and recreational purposes. Christopher Columbus had his first encounter with tobacco when he arrived in America (1492), he noted the taino people using tobacco. This was one of the first documented encounters of Europeans with tobacco. Tobacco was then introduced to Spain and Portugal by sailors and explorers. By the mid-16th century, tobacco smoking, chewing and snuff-taking had become popular among European's<sup>7</sup>.

Cultivation of Tobacco in India was introduced by the Portuguese in 1605. An English settler John Rolfe in Virginia (1612) successfully cultivated a strain of tobacco that was milder and more palatable to Europeans and led to a boom in tobacco farming. It quickly became the primary cash crop influencing the economic and social structure. Global Expansion and Innovation started in the 18th and 19<sup>th</sup> century. The Industrial Revolution and Mass Production began. In India, tobacco was grown in Kaira and Mehsana districts of Gujarat and later it spread to other areas of the country. In 1814, seven species of *Nicotiana* were imported from America for the cultivation in the botanical gardens of Calcutta. The Imperial Agricultural Research Institute (IARI) established in 1903, carried out botanical and genetic studies of tobacco. The Central Tobacco Research Institute (CTRI) was established in 1947 and the function of CTRI was taken over by Indian Council of Agricultural Research (ICAR) in 1965. CTRI, Rajahmundry with its six regional Research Stations located at Guntur, Kandukur, Jeelugumilli, Hunsur, Veda sandur and Dinhat conducts and monitors research on various types of tobacco grown in India<sup>8</sup>. There are about 70 *Nicotiana* Sp. available all over the world, of which about 45 are being maintained in India.

### TYPES OF TOBACCO<sup>8</sup>

The rich agro-climatic diversity in India has the unique position of growing all types of tobacco which are broadly classified as:

1. FCV (Flue-cured Virginia) Tobacco - Andhra Pradesh & Karnataka

2. Bidi Tobacco – Gujarat, Karnataka & Andhra Pradesh
3. Cigar & Cheroot - Tamil Nadu & West Bengal
4. Hookah Tobacco - Assam, West Bengal, Bihar & UP
5. Chewing & Snuff - Tamil Nadu, West Bengal, Bihar, Assam & U.P.
6. Natu, Burley, Lanka & HDBRG - Andhra Pradesh
7. Pikka Tobacco – Odisha

### **ADDICTION AND ITS PATHOPHYSIOLOGY**

Addiction is the term which refers to a condition that arises from the repetitive administration of a drug on a periodic or continuous basis. It is characterised by the consumption of a drug or substance at dose levels and under circumstances and settings that significantly increase the potential for harm, regardless of whether it is intended for therapy, pleasurable or physician-prescribed purposes. There are mainly two types of dependency -

(a) Psychological dependence, which is defined as the development of a craving for a drug or substance because its effects are perceived as pleasurable.

(b) Physical dependence, which implies the occurrence of a physiological or biochemical change produced by drugs, necessitating the continuous presence of the drug, such as tobacco, in the body. A person experiencing withdrawal symptoms after discontinuation<sup>9</sup>.

In modern science, Nicotine is a Cardiac poison. Cardio toxin in nature affects the mechanism of the heart. It is found in the *Nicotiana tabacum* plant (all parts and mainly in leaves). It first stimulates & then represses the vagal and autonomic ganglia and the cerebral and spinal centres. Nicotine addiction involves the brain's nerve cells and neurotransmitters like acetylcholine. Nicotinic receptors are activated by nicotine and activate the nicotinic acetylcholine receptors (nAChRs) in the CNS, leading to increased activity and affecting mood, appetite, memory, learning, etc. Later on, it affects the normal functioning of the CNS. This dependence on nicotine for normal function causes addiction. Nicotine also boosts dopamine, which is responsible for pleasure and makes an individual feel good<sup>10</sup>. Chewing tobacco contains nico-

tine, carcinogens (TSNAs, PAHs) and other harmful substances (primarily heavy metals such as cadmium, uranium and polonium) that impact the different systems of body<sup>21</sup>. Nicotine is absorbed directly through the mucous membranes of the mouth, entering the bloodstream, which leads to the activation of nicotinic acetylcholine receptors, stimulating dopamine release and causing a pleasurable sensation. As time passes, this creates dependence and addiction, which are characterised by cravings and withdrawal symptoms when nicotine levels drop.

### **HARMFUL IMPACTS OF CHEWING TOBACCO**

Smokeless or chewing tobacco products like *Khaini* (mixture of dry raw tobacco with lime), *Gutka* (mixture of tobacco, lime, areca nut), *Jarda*, Betel quid with tobacco, *Pan masala*, etc. Chewing tobacco contains more than 28 cancer-causing agents, including benzopyrene<sup>11</sup>. *Nicotiana rustica* (Aztec tobacco/strong tobacco) is a very potent variety of tobacco, containing up to nine times more nicotine than the common species. Its leaves have a nicotine content as high as 9%, whereas *N. tabacum* leaves contain about 1 to 3%. According to ICAR – CTRI (Central Tobacco Research Institute), Chewing & Snuff tobacco are mainly grown in Tamil Nadu, West Bengal, Bihar, Assam & U.P. Since *N. rustica* requires a cooler climate, its cultivation is primarily confined to the northern and north-eastern areas of the country, i.e., U.P., West Bengal, Bihar and Assam<sup>12,13</sup>. Tobacco leaf comprises alkaloids, mainly Nicotine, Nornicotine, Anatabine, Anabasine, Cotinine, and Myosmine. The potent one is nicotine. Nicotine absorption occurs through the oral cavity, skin, lung, urinary bladder and gastro-intestinal tract<sup>14</sup>.

In *Ayurveda*, tobacco is referred to by the name *Tamaku*<sup>15</sup>. Its synonyms are *Tamraparna*, *Dhoomakhya*, *Dhoomvriksha*, *Brihatpatra*, *Dhoompatra*, *Dhomawah*, *Tamrakut*, *Tambaku*, *Gudhaku*, *Tomaka*, *Tamaku*<sup>15,16,17</sup> etc. and is recognised for its potent and harmful impacts on the body. *Tamaku* has been classified under the category of *Visha* (poison), i.e. cardiac poison, due to its highly toxic nature and ad-

dictive properties, which disrupt the balance of the *Tridoshas* (*Vata*, *Pitta* and *Kapha*) and lead to various diseases. Tobacco, being one of the *Sthavara Vanaspatika Visha*, when accumulated in the body over a long period of time, even in low doses, may cause harm when the concentration in different tissues of the body reaches a high level due to their cumulative effect. It acts as a *Dushi Visha* (slow poison) in the body. Repeated and continued use of tobacco results in addiction. In *Ayurveda*, addiction is not mentioned directly, but terms like *Vyasana*, *Mada*, *Madakari*, etc., have been mentioned. *Vyasana* refers to an attachment towards indulging in desires, delusions or illusions, often tied to the consumption of substances. It signifies a strong inclination towards satisfaction. *Mada* typically refers to as intoxication, and *Madakari* can be termed as substances which intoxicate. Some *Ayurvedic* texts have described *Tamakhu's* harmful effects on an individual. The harmful effects are as follows -

1. *Yogratnakara*<sup>15</sup> – first described *Tamakhu* in the 17<sup>th</sup> century.  
“मदपित्तभ्रमकरं” – causes *Mada*, *Pitta* and *Bhrama* effect over the body.  
“दृष्टिमान्द्यकरं” – diminishes eyesight.  
*Tamakhu*, if taken in smoked form – “हृदिशुक्रहत” – smoking *Tamakhu* causes cardiac debility and male infertility.
2. *Shaligram Nighantu*<sup>16</sup> –  
“मदकृदभ्रामकस्तिक्तोदृष्टिमान्द्यकरः सरः” causes *Mada*, *Bhrama*, *Drishti mandhyakar*.
3. *Adarsh Nighantu*<sup>17</sup> has described the same harmful effects as *Acharya Yogratnakara* and *Shaligram Nighantu*.

### HEALTH IMPLICATIONS

The method of exposure through the mucous membranes of the mouth leads to a distinct set of health effects as compared to smoking tobacco. Chewing tobacco leads to both localised and systemic pathophysiological effects. The primary areas of impact include the oral cavity, gastrointestinal system, and cardiovascular system, which are at significant risks for cancers, periodontal disease, and cardiovascular diseases. Nicotine addiction and systemic exposure to

carcinogens are the primary health risks posed by tobacco chewing. One of the features of tobacco-related mortality in India is the high incidence of oral cancer. Due to the continuous use of smokeless tobacco products, can lead to amblyopia, pre-cancerous lesions and other oral mucosal lesions such as leukoplakia (white/grey patches), erythroplakia, verrucous hyperplasia, oral submucous fibrosis, Inflammation of buccal and gingival mucosa and dental decay and caries. Other adverse health consequences can be oesophageal cancer, lung cancer, pancreatic cancer, cervical cancer, hypertension, heart disease, stroke, diabetes, insulin resistance, gestational age/pre-term birth, fetal growth restriction, congenital disabilities, erectile dysfunction, infertility, inflammatory bowel disease, macular degeneration etc<sup>18,19</sup>.

Chewing tobacco contains at least 28 chemical constituents, many of which are known to be human carcinogens<sup>20,21</sup>. Carcinogens like tobacco-specific nitrosamines, TSNAs (from tobacco alkaloids during curing, fermentation and ageing) and polycyclic aromatic hydrocarbons (PAHs) induce DNA mutations in cells, increasing the risk of cancers of the oral cavity. It commonly affects the lips, gums, tongue and inner lining of the cheeks. Chewing tobacco for the long term increases the risk for cancers in the oropharynx and esophagus due to carcinogenic exposure. Tobacco intake weakens the lower oesophageal sphincter, which increases the risk of gastroesophageal reflux disease (GERD), which contributes to oesophageal cancer over time. Tobacco-specific nitrosamines (TSNAs) are among the most potent carcinogens in chewing tobacco. They are formed during the curing and processing of tobacco and are absorbed through the oral mucosa, increasing the risk of cancers in the mouth, throat, oesophagus and even the pancreas. Polycyclic Aromatic Hydrocarbons (PAHs) are the carcinogens found in smokeless tobacco products which contribute to DNA mutations and cancer development. Chewing tobacco contains heavy metals like arsenic, cadmium and lead, which can have toxic effects on multiple organ systems. Long-term exposure to these metals can damage the kidneys and contribute to cancer<sup>21</sup>. Nicotine stimu-

lates the release of adrenaline (epinephrine), which constricts blood vessels and raises heart rate and blood pressure. Nicotine and other chemicals in tobacco promote endothelial dysfunction and inflammation, leading to the formation of plaques in blood vessels. This increases the risk of coronary heart disease, stroke and peripheral artery disease. Nicotine and other toxins present in tobacco chewing increase platelet aggregation, making the blood more prone to clotting and further increasing the risk of heart attack and stroke<sup>22</sup>.

Chewing tobacco contributes to insulin resistance, increasing the risk for diabetes mellitus II. Nicotine interferes with glucose metabolism and insulin signalling, making it harder to regulate blood sugar levels<sup>23</sup>. The studies have shown a link between the use of smokeless tobacco (chewing tobacco) products and an increased risk of pancreatic cancer. The carcinogens in tobacco products are swallowed along with saliva and absorbed through the digestive tract, where they can cause mutations in pancreatic cells<sup>24</sup>. Nicotine and other chemicals from chewing tobacco irritate the lining of the stomach and intestines, causing dyspepsia (indigestion), nausea and even ulcers in chronic users<sup>25</sup>.

Tobacco suppresses the immune system of the body. The findings suggest that nicotine weakens the immune system by altering the function of macrophages and converting them from defenders to the type that helps resolve protective inflammatory response and support tumour growth<sup>26</sup>. Chewing tobacco affects fertility in both men and women. In men, nicotine impacts sperm quantity and motility, while in women, tobacco use can disrupt the menstrual cycle and impairment of ovulation<sup>27,28</sup>. Chewing tobacco also contributes to cognitive decline through its effects on blood vessels. Nicotine and other chemicals in tobacco increase the risk of atherosclerosis by impairing blood flow to the brain<sup>29</sup>. Using tobacco narrows your blood vessels, which can negatively impact sexual performance and cause erectile dysfunction.<sup>33</sup>

Tobacco use is a risk factor for the development of vision impairment and blindness. Long-term use can lead to cataracts, Glaucoma, optic neuropathy, age-

related macular degeneration and dry eye syndrome. There are limited studies on how smokeless tobacco impacts vision. A study in Chennai, India 2001 assessed glaucoma development in rural Indian people. Of the people in the study population who smoked, over half (52.8%) responded that they also used tobacco in its smokeless form. The odds ratio (OR) for the history of tobacco use in any form and cataract was 1.39 (95% CI 1.15–1.68) when adjusted for age and sex. Smokeless tobacco use was found to be statistically associated with nuclear cataracts (OR 1.67,  $p=0.067$ , 95% CI 1.16– 2.39) after adjusting for age and sex<sup>30</sup>.

The effects of tobacco chewing by pregnant women were investigated. When compared with the non-tobacco chewers, the tobacco-chewing mothers had an increased stillbirth rate and a significant reduction in birth weight, which was due in large part to early delivery<sup>31</sup>. Smokeless tobacco use in pregnant women reduces birth weight and increases the number of low birth-weight babies. It shortens the gestational period and increases the number of pre-term deliveries by<sup>32</sup>. Tobacco's hot and dry nature suppresses *Kapha*, which weakens innate immunity and causes dryness (dry mouth), leading to disorders such as oral diseases. The first *Dhatu* to be affected is the *Rasa dhatu*, which leads to dryness in the body and causes excessive thirst and dehydration. Later, *Tamakhu* impairs the nourishment of other *dhatu*s, leading to weakness. Tobacco's effect on *Mamsa dhatu* manifests as muscle weakness, deterioration of oral tissues and increased vulnerability to oral cancers. Long-term use affects the *Shukra dhatu* (reproductive system), leading to reduced fertility and lowered vitality. The direct contact of tobacco with the oral cavity leads to *Danta-mala* (decay of the teeth), gum diseases and other oral conditions. Chronic exposure to toxins in tobacco causes disorders such as *Mukha Roga* (mouth diseases), including leukoplakia and oral cancers. The toxic effects of *Tamakhu* weaken the body's natural defences and make one susceptible to various disorders. Overall, chewing tobacco depletes the *Oja* (immunity), leading to fatigue and weakened immunity, leading to illnesses.

## DISCUSSION

There was a tremendous rise in tobacco users in the 20<sup>th</sup> century. It is observed that companies are using marketing tactics, including celebrity endorsements and attractive packaging, to promote tobacco products. Nicotine dependence can cause cravings, mood swings, headaches, irritability and anxiety, especially during withdrawal periods. Nicotine's interaction with the brain's reward pathways leads to mood regulation issues. By the mid-20th century, scientific research started and created awareness of tobacco with serious health concerns, including lung cancer, oral cancer, heart disease and respiratory disorders. In 2008, the WHO Framework Convention on Tobacco Control (FCTC) introduced a cost-effective way to reduce tobacco<sup>2</sup>. WHO implemented MPOWER measures to reduce tobacco use and protect people from tobacco. MPOWER introduced six interventions to reverse the harmful impacts of smoking as follows-

- M - Monitoring tobacco use and prevention policies (Article 20)

P - Protecting people from smoking (Article 8)

O - Offering help to quit tobacco use (Article 14)

W - Warning about the dangers of tobacco (Articles 11 and 12)

E - Enforcing bans on tobacco advertising, promotion and sponsorship (Article 13).

R - Raising taxes on tobacco (Article 6)

Treating tobacco chewing addiction involves a multi-faceted approach that combines behavioural therapies, medical interventions and lifestyle changes. Counselling can help addicted individuals understand the triggers for their tobacco use and develop strategies to cope with the cravings. Cognitive Behavioral Therapy emphasises changing the negative thoughts associated with tobacco to help individuals develop healthier coping mechanisms. Motivational Interviewing technique encourages people to explore their reasons for wanting to quit and strengthens their motivation for the change. Nicotine Replacement Therapy (NRT) Products such as nicotine gum, lozenges, inhalers, nasal sprays and patches help reduce withdrawal symptoms and cravings by providing a controlled dose of nicotine. Nowadays, prescription med-

ications like Bupropion (Zyban), an antidepressant, help to reduce cravings and withdrawal symptoms by affecting neurotransmitters in the brain, and Varenicline (Chantix) reduces cravings and withdrawal symptoms as it is a partial agonist of the nicotinic acetylcholine receptor that mimics nicotine's effects by stimulating dopamine release in the brain. Various tobacco Cessation Programs provide resources, support and strategies for quitting chewing tobacco.

Ayurvedic therapies such as *Shodhana* and *Shaman* process help to eliminate toxins from the body. *Shodhana* (Detoxification) therapies like *Virechana* (purgation) and *Nasya* (nasal medication) help to manage the toxic effects of tobacco (*Tamakhu*). It helps to cleanse the *Strotas* and restore the balance of the *Doshas*. Ayurvedic rejuvenation therapies restore vitality by strengthening the *Dhatus* and improving *Ojas*. *Agad* formulations are often recommended to counteract the damage caused by tobacco use and rebuild overall health. Proper *Ahara* (diet) and *Vihara* (lifestyle) should be followed by engaging oneself in physical activities or hobbies to distract the mind from insatiable cravings. *Yoga*, *Pranayama*, meditation and deep breathing can help reduce stress and anxiety, which are common triggers for tobacco use.

## CONCLUSION

*Tamakhu* (Tobacco) is viewed as a cardiac toxic substance in Ayurveda that disrupts the balance of *Doshas*, damages *Dhatus* and leads to severe health concerns over time. Learning about the health risks associated with chewing tobacco can reinforce the decision to quit addiction. Awareness programs and workshops are to be organised to provide valuable information regarding the harmful effects of tobacco chewing addiction. Overcoming nicotine addiction is crucial for preventing long-term health consequences and complications and improving overall health. Life is precious, so one should embrace inner strength and make healthy choices rather than wasting it on momentary pleasure.

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