International Journal of Chemical Studies

P-ISSN: 2349-8528
E-ISSN: 2321-4902
Impact Factor (RJIF): 6.85
www.chemijournal.com
IJCS 2025; 13(5): 110-115

Received: 15-06-2025
Accepted: 18-07-2025

Ganesh L Kirdat
Department of Chemistry, The People's Education Societies, Jamkhed Mahavidyalaya, Jamkhed, Ahilyanagar, Maharashtra, India

Sagar J Rode
Department of Chemistry, Shri Chhatrapati Shivaji Mahavidyalaya, Shrigonda, Ahilyanagar, Maharashtra, India

Corresponding Author:
Ganesh L Kirdat
Department of Chemistry, The People's Education Societies, Jamkhed Mahavidyalaya, Jamkhed, Ahilyanagar, Maharashtra, India

An integrated analysis of tobacco's history, varieties, production, utilities, legality, and regulation in India

Ganesh L Kirdat and Sagar J Rode

Abstract
The term "tobacco" refers to a variety of plants of the Solanaceae family genus Nicotiana as well as any goods created from these plants' dried leaves. Although there are more than seventy different verities (species) of tobacco, *N. tabacum* is the most widely grown kind. In certain nations, the more powerful variety *N. rustica* is also utilized. Nicotine, a highly addictive stimulant alkaloid, and harmala alkaloids are both present in tobacco. The majority of tobacco products, including cigarettes, cigars, pipes, and shishas, are made from dried tobacco leaves. They may also be used to make snus, snuff, chewing tobacco, and dipping tobacco. In India, tobacco use causes around 14 lakhs fatalities annually, or 700 deaths per minute. Use of tobacco significantly raises the risk of lung conditions, heart conditions, strokes, all types of cancer, and early mortality. Government agencies will eventually raise public knowledge of the dangers of cigarette, zarda, beedi use. Regulations that place restrictions on who can buy tobacco products, how and where they can be acquired, and where and when they can be used (like smoke-free laws in bars, restaurants, and other public places), additionally to advertising limitations and mandatory packaging health warnings, can all be used as policy-level measures to discourage smoking.

Keywords: Fatalities, harmala alkaloids, snus, solanaceae, zarda

1. Introduction
The World Health Organization (WHO) forecasts India will observe the most rapid pace of growth in the tobacco-related mortality throughout the early 21st century refers to the first two decades. Numerous serious illnesses brought on by tobacco smoking affect almost every organ in the body. These include various malignancies, cardiac conditions, and lung conditions. The primary driver of tobacco use is the totality of industrial activity, which supports the marketability and profitability of the product. This comprises organizational work, support for supplementary operations, political activism, and advertising and promotion. In nearly every region of India (urban areas), tobacco smoking among men has been found to be quite prevalent. The incidence of women using smokeless tobacco varies between 15% and 60% over much of India. From 3.3% in Goa to 62.8% in Nagaland, 13 to 15-year-old school-age youngsters now use any tobacco product. India's annual mortality toll from tobacco use was estimated at 630,000 in the late 1980s. According to conservative estimates, there are presently between 800,000 and 900,000 fatalities annually linked to tobacco use.
The burden of sickness and death brought on by tobacco in the world is largely borne by India. Our country (India) is the 2nd leading producer and user of tobacco in the globe, making the complicated link between corporate interests and obligations to the public health particularly clear in this nation.
In order to assess the scope of the issue, the health issues it is causing, identify knowledge gaps, evaluate the laws and initiatives aimed at reducing tobacco use in India & lay a solid foundation for upcoming tobacco prevention efforts, the goal of this study is to synthesize the most recent corpus of scientific research on tobacco use in India.

2. Saga - Tobacco
Christopher Columbus sailed sail in 1492. He ended himself in America as a result of his erratic travels. Along with the "discovery" of the "New World," Portuguese sailors also discovered tobacco." The Portuguese quickly welcomed this plant, which the American "Indians" valued for its purported medical and clear stimulant effects, and then transported it to Europe's "Old World."

The Americas have a lengthy history of tobacco usage, with some Mexican cultivation sites reaching as far back as 1400-1000 BC. Tobacco is traditionally grown and used by several Native American tribes. The Woodlands cultures of the Northeast traditionally traded tobacco in sachets considered an elementary good. The substance was smoked for ceremonial purposes, such as to formally seal a commercial agreement or peace treaty, as well as for social purposes. There are some Native American civilizations; Smoking tobacco at religious ceremonies is viewed as a way to express intentions and meditation to the Almighty.

But introduction of the British colonial control resulted in a significant increase in the commercial aspects of India's tobacco use and production. Around 1887 saw the founding of the first beedi production company, and by 1930 the beedi business had spread throughout the nation. The working classes were more likely to use beedis because of the price difference from cigarettes, and this home product quickly replaced cigarettes as the most popular way to consume tobacco.

While tobacco chewing has been a tradition for many years, with the advent of the gutka, commercial production and marketing have significantly increased. The pace of rise in gutka use has surpassed that of tobacco products used for smoking. As a result, In India, the battle between the public's health and commercial tobacco has grown and opened a new front.

To properly comprehend the differences in tobacco usage among socioeconomic, religious, and ethnic groupings, it is necessary to recognize a various social and cultural elements additional to economics, which may have been the primary driver behind tobacco's seemingly inexorable progress in India.

3. Types of Tobacco

In many regions of India, tobacco is farmed for cigarettes (FCV), beedis, chewing tobacco, hookahs, cigars, cheroot, snuff, nas, and Burley cigarettes. The three basic types of cigarette tobacco are FCV, burley, and natu. The main component used to make cigarettes is flue-cured Virginia tobacco. As contrast to Gujarat, it is mostly cultivated in Karnataka and bifurcated Andra Pradesh, where beedi tobacco is grown.

Nicotiana is a genus of plants that contains several tobacco species. It belongs to the nightshade family (Solanaceae) and is a native of North America, South America, South Pacific, South West Africa, and the Australia.

The majority of nightshades include various levels of nicotine, which is a potent poison to insects. But compared to other products, tobacco often has a significantly higher proportion of nicotine. They are free of tropane alkaloids, of which are often poisonous to people and other living things, like many other Solanaceae plants do.

Although Nicotiana species contain enough nicotine and other compounds to deter the majority of herbivores, including varying concentrations of germacrene, anabasine, and other piperidine alkaloids, some of these living things (animals) have developed the capacity to ingest Nicotiana taxa without experiencing any detrimental consequences. However, tobacco is unpleasant to many animals due to its other characteristics. Even though tobacco's trichomes and gummosis may make it difficult for immature larvae to thrive, a nuisance is the cabbage looper that damages a number of plants. As the result, in some places, particular tobacco plants—most notably N. glauca—have developed into invasive weeds.

4. Production of Tobacco

With an estimated 800 million kg of yearly tobacco production, India is the 2nd biggest tobacco producer in the globe. Only 24/100 of the nation's total arable land is used to cultivate tobacco. It is mostly grown in regions that receive rain and are semi-arid, where other crops cannot be effectively farmed.

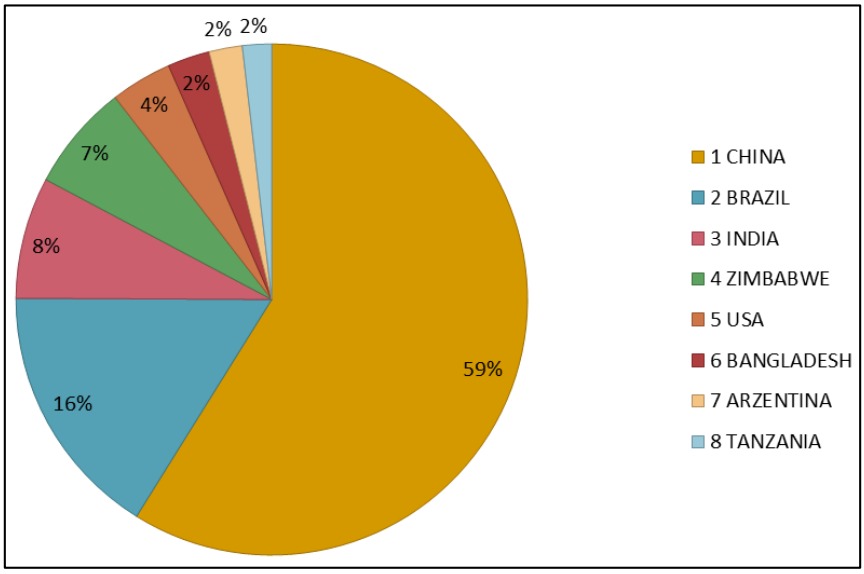

Fig 1: World Flue - Cured Virginia Production in Million Kgs. - 2022

The 3rd massive producer of FC Virginia - tobacco in the globe is India (Fig 1). Around 30% of the total tobacco cultivated in India is produced as Flue-Cured Virginia (FCV) tobacco, a kind used in cigarettes. With an annual production of over 242 million kg (Tab 1)

Table 1: Worldwide Flue - Cured Virginia (FCV) Production in Million Kgs. - 2022

S. No	Country	FCV (M. Kgs)
1	China	1852
2	Brazil	510
3	India	242
4	Zimbabwe	212
5	USA	122
6	Bangladesh	84
7	Arzentina	66
8	Tanzania	58

Only three Indian States Andhra Pradesh, Karnataka, and Telangana grow this particular kind of tobacco. The FCV kind of tobacco is high profitable than remaining crops cultivated into the area and is challenging to understudy, according to studies done by the CTRI - Rajahmundry.

In India, FCV - tobacco productivity has increased over the past ten years, reaching a record high of 1788 Kgs/hectare in 2017-2018. The average yield of FCV tobacco in Andhra Pradesh grew from 1168 Kgs/hectare in 2010 - 2011 to 1422 Kgs/hectare in 2020 - 2021. Tobacco FCV production in Karnataka grew from 876 Kgs/hectare in 2010-11 to 1100 kg/ha in 2020 - 2021 (Fig 2). This is mostly the fault of the FCV tobacco value chain in India's more-yielding varietals, technologies for production and conservation.

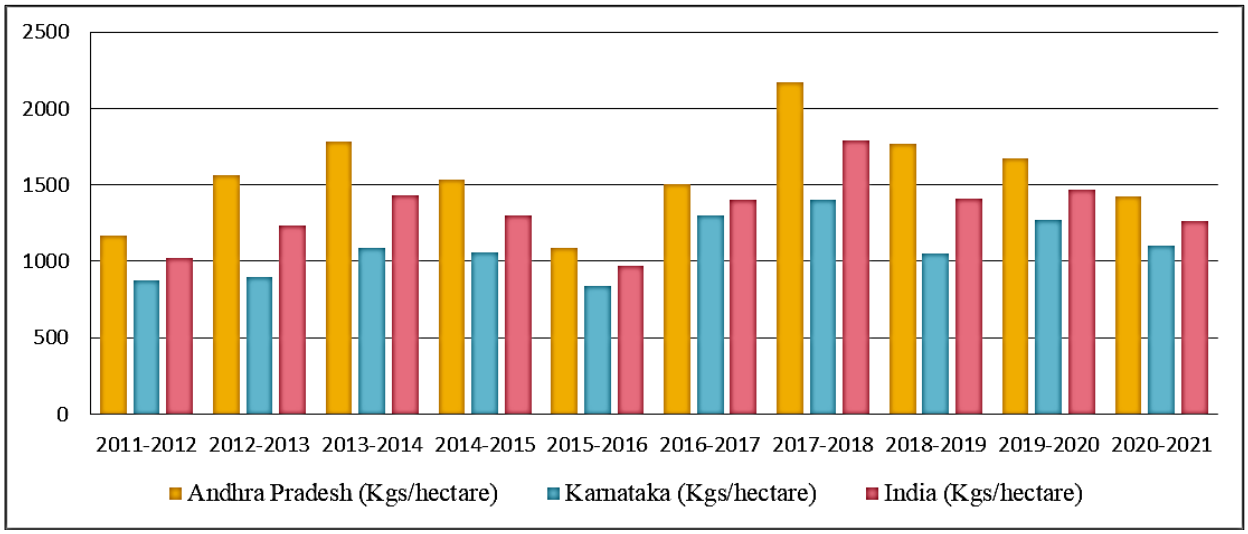

Fig 1: Indian states of Andhra Pradesh, Karnataka, and FCV Tobacco productivity trends

More over half (60%) of India's major exportable tobacco, FCV, is exported, with the remaining portion going towards domestic cigarette production. In India, non-cigarette tobacco variants predominate due to the modest and declining amount of tobacco usage in the form of legal cigarettes (8%)

In the Andhra Pradesh state city of Guntur, there is the main office of the Indian Tobacco Board. There are 96,865 tobacco growers in India who are registered, and there are undoubtedly many more. There were 3,120 factories producing tobacco products in India as of 2010. India uses around 0.25% of its total arable land for tobacco cultivation.

The Indian government has promoted the expansion of the tobacco sector since 1947. There are seven tobacco research centers in India, with the main research institutes being in West Bengal, Punjab, Bihar, Punjab, Tamil Nadu, and Andhra Pradesh.

5. Consumption of Tobacco

Youth in India consume tobacco, albeit the prevalence varies greatly between states. One in ten females and two out of ten boys use tobacco products. There is no statistically significant difference between kids ages 13 to 15 who now smoke in rural and urban areas. Many young people believe that smoking is healthy for their teeth or overall health. The number of people starting to use tobacco products before turning 10 is rising. Student smoking rates were lower in states with higher levels of curriculum teaching. In India's rural areas than in its urban ones, where 73% of the population lives, smoking is more prevalent.

The NFHS, conducted in 19-20, collected information on smoking habits by Indian adults in 22 different states and territories under the union, was recently released by the Indian government. It included the significant survey results from Phase one.

The NFHS study also discusses the negative impacts of tobacco use in general. According to the report, "tobacco habit (smoke) is linked to a several different illness, heart and lung conditions, including several cancers, diabetes, rheumatoid arthritis and eye conditions."

In addition to carrying the same health risks as men, studies have revealed that women who smoke have a harder time getting pregnant and are more likely to experience low birth weight infants, early births, pregnancy difficulties, and infertility still births, baby deaths and miscarriages.

There are several ways to ingest tobacco, in many different forms. The most often used brands include zarda, khaini, and gutkha betel with tobacco. Tobacco is smoked through bidi, cigarettes, and hookah devices. Tobacco usage is one of the major dangers to public health on a global scale.

6. Chemistry of Tobacco Leaves (Significance, Consequences and Awareness)

Different types of chemicals present in the tobacco leaves, those are Nicotine, pectin, oxalic acid, amides, amino acids etc. (Fig 3)

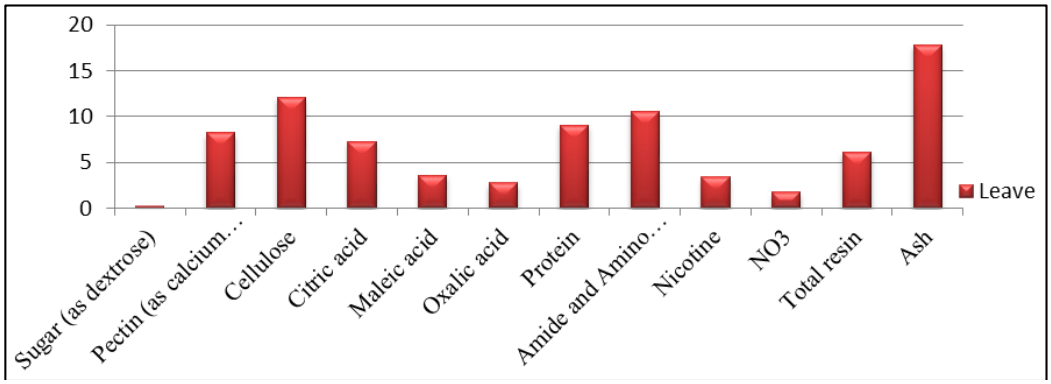

Fig 3: Composition of the tobacco leave (% weight)

6.1. Significance of the Tobacco: The juice and leaves were frequently used to treat skin conditions, potentially even basal cell carcinoma. Dosage was mainly regulated in tobacco medicinal uses. As external poultices for boils, skin diseases, wounds, bruises, and sprains, products produced from the leaves were used. Tobacco leaf teas have been used as an expectorant, a laxative, an emetic, an expectorant for fainting and vertigo, as well as for migraines and intestinal worms. Tobacco leaves are used as an antibacterial and a bleeding stopper on wounds. Additionally, tobacco leaves were ground and smoked as "snuff" for ceremonial and medical uses. Smoked tobacco is occasionally breathed into the ear to relieve earaches.

It has traditionally been believed that tobacco is a healing plant. Prior to being utilized as a smoking substance, it was a prevalent sickness treatment in traditional medicine. It is stated to have antibacterial, sedative, emetic, purgative, and pain-relieving properties. Nicotine has recently been suggested for hypodermic injections in cases of strychnine and tetanus poisoning. The plant is also utilized as a source of the isoprene units needed to make the cardiac medication UQ-10. Tobacco has been proven to be effective as an antibacterial for treating wounds in veterinary applications. Additionally, it may have anti-coccidial effects in poultry.

Tobacco wastes, such as the stalks, top leaves, stem, scraps, and dusts, can be used as sources of nutrients and nicotine. Being biodegradable makes them particularly tempting substitutes for synthetic pesticides and fertilizers, especially in current times of high level concern for "environment-friendly" technology and the high cost of synthetic fertilizers and pesticides.

Tobacco may be used as a food and a feed source. Its leaves may be used to extract a very high grade protein (known as fraction-1 protein) for human consumption. The seeds are high in oil (35%) and protein (25%) but contain no nicotine. They are therefore excellent suppliers of both industrial and culinary oils. Cattle and horses are fed a protein-rich diet made from the seed cake left over after the oil has been extracted.

Historically, tobacco has been grown primarily for its leaves. This approach was encouraged by the extremely high financial returns from the leaves, which led to the ignoring of the potential of the other parts of the plant. However, the NTA is confident in its ability to contribute to advancing the industrialization of rural areas given the present focus on the development of other tobacco-related goods and the extremely positive outcomes we are seeing.

6.2 Consequences of Tobacco: Anabasine is a chemical found in tree tobacco. This substance is lethal. When someone is poisoned, they may have heart failure, brain damage, severe muscular spasms and weakness, severe vomiting, breathing difficulties, seizures, high blood pressure, and eventual death.

Tobacco contains a lot of addicting nicotine. Dopamine is a neurotransmitter that is released by your brain as a result. Dopamine is a "feel good" neurotransmitter that uplifts your mood, aids in concentration, and provides you greater vigor.

Nicotine, carbon monoxide, tar, and hazardous substances including benzene, arsenic, and formaldehyde are all present in tobacco smoke.

Veins and arteries become narrowed by nicotine. It can harm our heart by making to work harder & quicker, slowing our blood, decreasing the amount of oxygen getting to our hands and feet. When exposed to (CO_2) carbon monoxide, smoker's heart lacks the O_2 it needs to drive blood throughout our physique. With pulse, our lungs may hold less air due to expanding airways. Tar covers our lungs like chimney soot because it is a sticky material. Phenols kill and paralyze the cells that resemble hair in our airlines. These cells keep the airway lining clean and defend against illness. Throat, lungs, and 'smoker's cough' are irritated by the little cigarette smoke particles (Fig 4). This damages lung tissue and increases mucus production issues. The nose, throat and eyes get irritated by formaldehyde and ammonia. Chemicals that cause cancer force cells to divide improperly or too quickly. These conditions might produce cancerous cells.

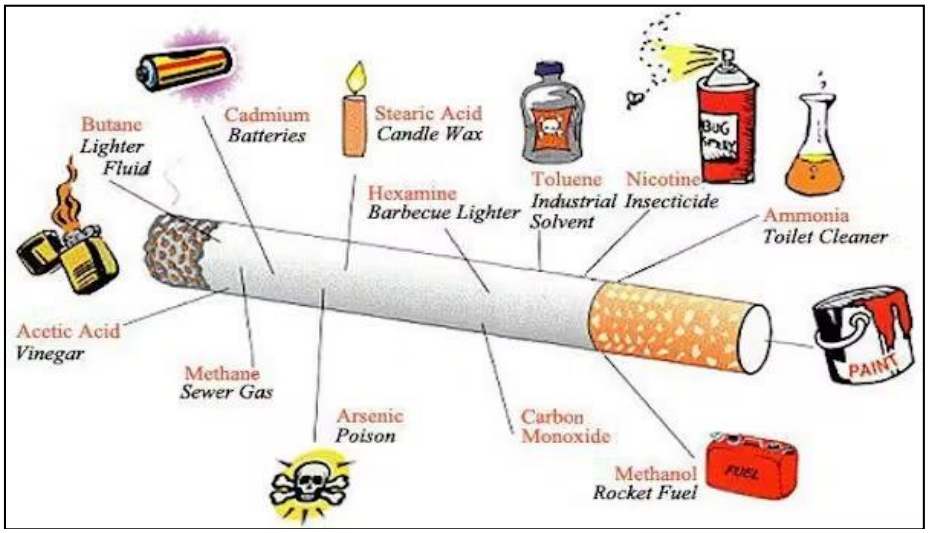

Fig 4: Tobacco Smoking Consequences

6.3Awareness about tobacco effects: According to current trends, 30 to 40 % of the 230 crores kids and teenagers throughout the globe would start smoking in their early twenties.

The most vulnerable period in India for tobacco usage start is between adolescence and the early stages of adulthood, or in the age range of 15 to 24 years.

Youth who participate in anti-tobacco activism are more likely than non-participants to abstain from using cigarettes. Effective approaches to discourage young people from commencing usage include outright banning all tobacco advertising (direct and indirect), taxing tobacco goods more and making the packages bigger will raise their price.

Given that India is second in worldwide production of tobacco and had previously acknowledged the potential for tobacco manufacturing and agriculture to generate income, It ought to have been logical to anticipate that officials would remain unenthusiastic about local or global initiatives to decrease cigarette use.

The GoI - The Cigarettes Act - 1975 [Production, Supply, and Distribution Regulation] was approved by the Indian government in 1975; it mandated that all cigarette packaging and advertisements have a legal health warning. This Act was created to set out some limitations on the distribution, supply, and manufacture of cigarettes as well as their trade and commerce. Smoking cigarettes is a dangerous habit that over time can result in serious health risks, according to the Act's aims and justification

All tobacco-related efforts should be centralized through the creation of the National Tobacco Control Commission (NTCC) 1991. Establishing the NTCC into a legislative committee would allow it to report to Parliament each year. The NTCC should set up testing facilities to determine the levels of nicotine and tar in cigarettes and beedis provide farmers with incentives to transition to alternative crops, assist individuals who would lose their employment as a result of tobacco control, and exempt donations to anti-tobacco campaigns from income tax.

The - FCTC discussions, were completed in 3rd month Mar-2003, included a considerable contribution from the Indian government. India ratified the FCTC in February 2004, began executing its National tobacco control's law in May - 2004, signed the FCTC in Sept - 2003. In Apr - 2003, the Indian Parliament established a thorough anti-tobacco bill.

On Feb - 27, 2005, India ratified the WHO - FCTC Smoke Free Areas: Smoking is absolutely prohibited in a lot of public areas, including offices, schools, hospitals, and government buildings, as well as on public transportation. However, the legislation allows for the creation of smoking places or spaces in airports, lodges and hotels with thirty or more number of rooms & restaurants with thirty or more seats. Open auditoriums, stadiums, train stations and bus stops/stands are nonsmoking areas in outdoor settings. Smoke-free legislation may be passed by sub national authorities that are stricter than the national law.

Films are certified by the CBFC in accordance with the stipulations of the cinematography Act of 1952 and the rules promulgated there under. The film certification criteria already direct CBFC, among other things, to make sure that any sequences that would promote, justify, or glamorize smoking or using tobacco are not presented. The CBFC has hinted that while certifying films, the aforementioned rules are followed.

7. Conclusion

Cigarette smoking and consumption are among the leading causes of mortality in India, accounting for close to 1.35 million fatalities per year. This translates to an average of 3,699 fatalities every day, or 154 per hour. According to the National Cancer Registry Programme Report 2020 published by the ICMR, tobacco use or tobacco-related products are to blame for 27% of all cancer cases in the nation.

The capabilities of the health care sector, the educational system, other development-related areas, civil society organizations, law enforcement organizations, non-health organizations, local self-governments, and the community at large must be increased through human resource development in order to effectively combat tobacco use.

References

1. Charlton A. Medicinal uses of tobacco in history. J R Soc Med. 2004;97(6):292-296. DOI:10.1258/jrsm.97.6.292.
2. Gupta PC, Ray CS. Epidemic in India. In: Boyle P, Gray N, Henningfield J, Seffrin J, Zatonski W, editors. Tobacco: Science, policy and public health. Oxford: Oxford University Press; c2004, p. 253-266.
3. Ministry of Health and Family Welfare, Government of India, International Institute for Population Sciences. Fact Sheets, Key Indicators 22 STATES/UTs FROM PHASE I: National Family Health Survey (NFHS-5) 2019-2020 [Internet]. Ministry of Health and Family Welfare, Government of India; c2020.

http://rchiips.org/NFHS/NFHS-5_FCTS/NFHS-5%20State%20Factsheet%20Compendium_Phase-I.pdf [Accessed 2020 Dec 15].
4. Narayan KM, Chadha SL, Hanson RL, Tandon R, Shekhawat S, Fernandez RJ, *et al*. Prevalence and patterns of smoking in Delhi: Cross sectional study. Br Med J. 1996;312:1576-1579.
5. Rath GK, Chaudhry K. Estimation of cost of management of tobacco related cancers. Report of an ICMR Task Force Study. New Delhi: Institute of Rotary Cancer Hospital, All India Institute of Medical Sciences; c1999.
6. Sanghvi LD. Challenges in tobacco control in India: A historical perspective. In: Gupta PC, Hamner J III, Murti P, editors. Control of tobacco-related cancers and other diseases, Proceedings of an International Symposium, 15-19 January 1990; Mumbai: TIFR, Oxford University Press; c1992, p. 47-55.
7. Purwono S, Syaifudin A, Puspitasari I, Setiawan B, Nindita V, Nugraha WA. The effect of solvent for extraction for removing nicotine on the development of charcoal briquette from waste of tobacco stem. J Sustain Energy Environ. 2011;2:11-13.
8. World Health Organization, Regional Office for South-East Asia. WHO Factsheet 2018, India
9. The Hindu, IANS, "Shimla to turn smoke-free soon", Chandigarh.
10. Jamkhandikar, Shilpa. Woody Allen stops Blue Jasmine India release because of anti-tobacco ads. Reuters. Archived from the original; c2013.
11. Kounteya Sinha. From October 2, head for the road to smoke. The Times of India, TNN, Archived from the original, c2013.
12. Seema Singh. 1 Mn Indian smokers will die every year. Livemint; c2013.
13. Chandrupatla, Siddardha G, Tavares, Mary, Natto, Zuhair S. Tobacco Use and Effects of Professional Advice on Smoking Cessation among Youth in India, Asian Pacific Journal of Cancer Prevention. 2017;18(7):1861-1867. doi:10.22034/APJCP.2017.18.7.1861. ISSN 2476-762X. PMC 5648391. PMID 2874912
14. Shanu Mishra, Mishra MB. Tobacco: Its historical, cultural, oral, and periodontal health association journal of international society of preventive & community Dentistry. 2013;3(1):12-18. DOI:10.4103/2231-0762.115708