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Conceptual Study of Chronic Tobacco Poisoning (Addiction) and its Management - A Review

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ABSTRACT

Tobacco used disorder is a major preventable cause of death. It is a drug of addiction which contains nicotine, a major chemical constituent which can act as a stimulant. Smoking cigarette becomes a fashion so that its use is increasing day to day. According to the WHO Reports, Tobacco kills about 8 million people every year. There are about 1.1 billion adult smokers and 367 million smokeless tobacco users are in the world today. The risk of tobacco smoking is four times greater than the death from normal heart diseases. It is global social and medical problem; so it needs awareness and education from primary level. Ancient Ayurveda text book Yogaratnakara, first time explained in detail about the toxic and ill effects of tobacco. It mentions about various therapeutic uses of tobacco. In this article, we have discussed about the study of tobacco as per Ayurveda and modern science, along with its medicinal uses as well as adverse effects and its preventive measures.

KEYWORDS

Tobacco used disorder, Addiction, Tobacco Hazards, Nicotine Replacement therapy, Tobacco prevention



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INTRODUCTION

Tobacco use is a major preventable cause of premature death and disease worldwide. Tobacco is a widely abused substance which is having legal and social permission to use in certain societies. In India, during certain rituals it is customary to offer the tobacco to the guests. According to the WHO reports, tobacco kills 8 million peoples every year¹. Smoking and chewing of tobacco leads to malignancy. Now a days, E cigarettes are being widely used among youth. Quite a number of people die of tobacco related diseases such as cancer, myocardial infarction, I.H.D., stroke, aortic aneurism and peptic ulcer. Nicotine, the main chemical constituent of tobacco is a CNS stimulant. Long term use of tobacco leads to addiction. Tobacco alone causes more death in comparison to all other psychoactive substances put together. Tobacco induced carcinoma of lung is increasing day by day. About 85-95% of patients have a history of smoking tobacco². The risk for smokers to develop carcinoma is 30 times greater than in non smokers. Smoking cigars or pipes doubles the risk of lung cancer. As tobacco is an abuse drug, it causes physical as well as psychological dependence. Very few dependant peoples make a conquest on tobacco addiction by using their will power. So it needs

psychological counselling, treatment and yoga therapy for calming the mind. Now a days, E-cigarettes have emerged in the market- these are present in many shapes and sizes. It includes a battery, a heating element, and a place to hold a liquid. E-cigarettes produce an aerosol by heating a liquid that usually contains nicotine. The addictive drugs in regular cigarettes, cigars, and other tobacco products have different flavours and other chemicals that help to make the aerosol. Users inhale this aerosol into their lungs. E-cigarettes are known by many different names. They are sometimes called “e-cigs,” “e-hookahs,” “mods,” “vape pens,” “vapes,” “tank systems,” and “electronic nicotine delivery systems (ENDS). Some e-cigarettes are made to look like regular cigarettes, cigars, or pipes. Some resemble pens, USB sticks, and other everyday items³.

Use of Tobacco in India - *Global Adult Tobacco Survey (GATS)*, India 2010, reports that nearly 1 million peoples die in every year due to tobacco use. Current tobacco adults users are 34.6%, amongst them current smokers are 14%, Bidi smokers are 9.2% and Smokeless tobacco users are 25.9%. Amongst daily users 60.2% consumes tobacco within half an hour of waking up. The victims of passive smoke usually in home and workplace are about 52.3% and 29.9% respectively⁴.



The plant Tobacco (*Nicotiana tobacum*) is an annually grown herb. Maximum concentration of nicotine is present in its leaves. All parts of plant, except ripened seeds contain nicotine, the alkaloid, a pyridine derivative, as an active principle. Nicotine is a colourless to pale yellow, very hygroscopic, oily liquid with an unpleasant pungent odour and sharp burning persistent taste.

As per text book, *YogRatnakar* (19th century), describes tobacco first time in Ayurved Samhita, as *Tamakhu* with his synonyms, its uses and harmful effects of chewing and smoking. He described the properties as sharp, hot, property that diminishes *kapha-vata dosha* and *kasa* (cough). It is also useful in conditions like breathlessness, flatulence, best in urinary bladder emptying (*bastishodhan*) and tooth ache. It destroys the worms and relieves itching. Tobacco is used for intoxication (*Madakar*), pitta kar. It causes delusion, vomiting, retching. It also causes blindness and other eye disorders, cardiac diseases and impotence. It is useful in scorpion sting⁵.

MODE OF ACTION

Commonest source of nicotine poisoning is cigarette smoking. The smoke contains nicotine, tar and particulate matter. The quantity of nicotine in one cigarette is about 6 to 11 mg; while European and Turkish

cigarettes contain higher amount of nicotine. Cigar contains 15-40mg of nicotine. Many more nicotine escapes in burning cigarette by side stream smoke, while large amount is present in butt and filter, so only 0.5 – 2 mg (avg.1mg) of nicotine is inhaled by the smokers⁶. In India bidi smokers are more in village areas. *Bidies* are made up from tobacco enrolled in *Tendu / Temburni* leaves (*Diospyros melanoxylon*). It is more toxic than regular cigarette. The hazards of smoking also depends on number of puffs, time limit of withheld of smoke in chest for greater kick, number of cigarette packets per day and also depends on whether it is with filter or without filter. In case of tobacco chewers, health problems depend upon the amount of tobacco placed in mouth, its time period of chewing, ~~weather~~—whether it is alone or mixed with lime water, pug or any other substance. Chewing tobacco along with other substance has greater risk of mouth cancer.

Smokeless tobacco -

Chewing Tobacco – Procedure of this method is that, a small quantity of tobacco is taken in the hand and it has to be mixed with little amount of lime and after rubbing over with the finger of the other hand, placed in between the lower lip and gum. Habitual people use it early in the morning for proper bowel evacuation. Another



method of using tobacco is placing the tobacco in betel leaf along with areca nut (*areca catechu*) and lime; this will be helpful for proper digestion. Now a days tobacco is mixed with (*Supari*) pug and lime water contained in polythene bag and it is rub against palm or through rubbing machine; well mixed product popularly known as *kharra* or baba material is used widely in Maharashtra. Chewing tobacco causes gum diseases and mouth cancer.

Snuff (Nasal insufflations) - It is made from ground or pulverised tobacco leaves. It is sniffed by placing pulverised tobacco in between the thumb and index finger, or by using "snuffing" device.

Snus – Snus (Swedish terminology) is a moist tobacco powder, originating from a variant of dry snuff in early 18th century. It is placed in upper lip for extended periods⁷. The advantage of snus is that it does not need spitting.

Dipping Tobacco—It is a type of finely ground or shredded, moistened tobacco. It is commonly and idiomatically known by various terms—most often as dip and sometimes as rub. It is used by placing a lump, pinch, or "dip" of tobacco between the lip and the gum. The act of using it is called dipping⁸.

Insecticidal spray – Nicotine is also used in agricultural work as fertiliser, fumigant and insecticidal spray etc.

MECHANISM OF ACTION

Nicotine acts on the nicotine receptors which are seen in the autonomic ganglia, adrenal medulla, CNS, spinal cord, neuro muscular junction and chemoreceptors of carotid and aortic bodies⁹. Initially, it stimulates the CNS, but later it can lead to depression. Nicotine is absorbed through the skin, mucus membrane and lungs. It is metabolised in liver and excreted through urine and milk.

Sources of Nicotine

Table 1 Sources of Nicotine

Sr.no	Name of source	Nicotine content
1	Cigarette	13-19 mg
2	Cigarette butt	5-7 mg
3	Cigar	15-40 mg
4	Snuff –Dry	12-15 mg
5	Snuff- Wet	5-30 mg
6	Chewing tobacco	2-8 mg
7	Tobacco leaf	1-6% nicotine per leaf
8	Insecticidal tobacco	Up to 40%
9	Nicotine Gum	2-4 mg per piece
10	Trans dermal nicotine patch	Vary 8-14mg but delivered 7-21 mg/day

As mentioned table 1 it describes nicotine content with their sources¹⁰

Fatal dose– 40- 60 mg of nicotine

Or 2 gm of tobacco(Tobacco present in two cigarettes)

Or 1 teaspoonful of Insecticide¹¹.

Fatal period – pure nicotine - few minutes to few hours (when swallowed)

TOBACCO and SYSTEMIC ILLNESS–

1) **Tobacco and Gastro intestinal tract** – Nicotine increases the motility and tone of G.I.T. It occasionally causes



diarrhoea due to stimulation of parasympathetic ganglia. It causes stimulation followed by decrease in motility and tone leading to constipation¹². It also stimulates the salivary secretions followed by their inhibition. Nicotine enhances the metabolism of various drugs in liver. Tobacco causes cancer of mouth, tongue and oesophagus. It can also lead to halitosis, gingival recession and staining of teeth, tooth loss and leukoplakia.

2) **Tobacco and Respiratory system -**

The risk of carcinoma of lung increases due to tobacco smoking, as the cigarette also contains asbestos dust, nickel, arsenic, chromates or radioactive materials. Tobacco smoke also contains several

cancer initiators (carcinogens) and carcinoma promoters (co-carcinogens). The best known carcinogen is benzopyrene. The incidence of chronic bronchitis is higher in chronic smokers. The tobacco smoke contains many irritants which may cause bronchoconstrictions and damage to ciliated epithelium of respiratory tract¹³. 90% of Chronic Obstructive Pulmonary Disease (COPD) is caused by tobacco smoking. Chronic inflammation and narrowing of small airways and enzymatic digestion of alveolar walls which may result in pulmonary emphysema in 15% of smokers¹⁴. Interstitial Lung Disease (ILD's) can also be caused by tobacco.

The Major constituents of tobacco smoke

Table 2 The major constituents of tobacco smoke with their adverse effects

Sr. No.	Constituent of tobacco smoke	Adverse effects
1.	Tar, polycyclic aromatic hydrocarbons, Nitrosamines	Carcinogenesis
2.	Nicotine, Phenol	Tumor promoters
3.	Formaldehyde, Nitrogen Oxide.	Irritation and Toxicity to respiratory mucosa
4.	Carbon monoxide	Reduced oxygen transport

As mentioned table 2 it describes the major constituents of tobacco smoke with their adverse effects¹⁵

3) **Tobacco and Heart** – Smoking is the major risk factor for Coronary Artery Disease. The ratio of death due to cardiovascular disease caused by tobacco smoke is 1:5. “Tobacco Heart” is a functional disorder of heart characterised by a rapid and often irregular pulse caused by excessive tobacco smoke. The risk of

tobacco smoking is four times greater than the death from normal heart disease¹⁶. The most consistent effect of smoking is that it increases the heart rate and also causes peripheral vasoconstriction which may lead to hypertension. Approximately 90% of peripheral vascular disease in non diabetic population can be attributed to cigarette smoking. Cessation of cigarette smoking can reduce the risk of second coronary event within 6-12 months¹⁷.



4) **Tobacco and Muscles** – As nicotine produces transient depolarisation of motor end plate resulting in stimulation of skeletal muscles and twitching, but if the dose is increased then paralysis of myoneural junction occurs.

5) **Tobacco and Urinary system** – Nicotine stimulates the supraoptic nuclei of hypothalamus which may induce the release of Anti Diuretic hormone (ADH) and that can exert anti diuretic effects¹⁸. Cigarette smoking is believed to contribute up to 50% of diagnosed urothelial cancers in men and 40% in women¹⁹.

6) **Tobacco and Brain** – The principle constituent of tobacco is Nicotine, which is responsible for addiction. In small doses it stimulates the CNS causing tremors; while in large dose it produces convulsions. Addicted smokers regulate their nicotine intake and blood level by adjusting the frequency and intensity of their tobacco use both to obtain the desired psychoactive effects and avoid withdrawal.

7) **Tobacco and Amblyopia** – It commonly occurs in male who are pipe smokers. There will be chances of bilateral impairment of central vision followed by complete blindness²⁰. Ayurved text book YogRatnakar also describes the *Aandhyatva* (Blindness) caused by Tobacco.

8) **Occlusive Thromboangitis obliterans** – It is an inflammatory reaction in the arterial wall with the involvement of the neighbouring vein and nerve which can lead to thrombosis of artery. It is common in middle aged people who smoke more than 20 cigarettes per day. Burger's disease is a condition which is more seen in smokers who are habituated to tobacco from their earlier age onwards, which cause peripheral ischemia mainly of upper extremity²¹.

9) **Tobacco and Cancer** – Tobacco smoking causes cancers of mouth, throat, trachea, Lungs, Oesophagus, nasal Cavity, stomach, pancreas, Liver, kidney, urinary bladder, uterine cervix, breast cancer and myeloid leukaemia. There is a synergistic interaction between cigarette smoking and alcohol for cancer of the oral cavity, oesophagus and possibly lung cancer.

10) **Tobacco and Pregnancy** - In pregnancy smoking can increase the risk of maternal complications i.e. premature rupture of membranes, abruptio placentae, placenta previa and spontaneous abortion. Maternal smoking is an important cause for foetal retardation and respiratory distress syndrome in new born.

11) **Tobacco and Reproduction system** – Tobacco smoking is dangerous to ovaries and it interferes with folliculogenesis, embryogenesis and



uterine blood flow in females. In males it causes erectile dysfunction syndrome in 85% of individuals who are smokers²².

12) **Tobacco (Nicotine) Addictions** -

At molecular levels, nicotine acts over the nervous system and create dependence. Smokers usually experience unpleasant effects, when they try to quit. Even if they are aware that it is harmful, they cannot come out of addiction.

In psychiatry, DSM 4 criteria, it is related with addictions and is divided into two categories i.e. A) Nicotine dependence and B) Nicotine withdrawals.

A) Nicotine Dependence - A maladaptive pattern of nicotine use, leading to clinically significant impairment or distress, *as manifested by three (or more) of the following* occurring at the same time within a 12 month period²³ -

- 1) Tolerance
- 2) Withdrawals
- 3) Nicotine is often taken in larger amounts
- 4) Persistent desire or unsuccessful efforts to cut down or control nicotine use
- 5) A great deal of time is spent in activities necessary to obtain nicotine
- 6) Important social, occupational, or recreational activities are given up or reduced because of nicotine
- 7) Nicotine use is still continuing despite knowledge of its hazards.

B) Nicotine withdrawals – Use of nicotine for at least several weeks and abrupt cessation of nicotine use, or reduction in the amount of nicotine use following signs will develop within 24 hrs:-

- 1) Irritability, frustration or anger
- 2) Anxiety,
- 3) Difficulty concentrating,
- 4) Restlessness
- 5) Decreased heart rate
- 6) Increased appetite or weight gain
- 7) Dysphoric or depressed mood
- 8) Insomnia

MANAGEMENT– Counselling and medications are the tools to recover from addiction. National Cancer institute, USA made a plan for the patient willing to quit tobacco. It includes **5A**. - i.e. Ask ,Advice, Assess, Assist and Arrange.

Fagerstrom test and CAGE Screening tests are the questionnaire tests used to rule out the grades of dependency.

Pharmacotherapy – It is carried out when the counselling is not sufficient to help the patient for quitting the habit of smoking²⁴. It includes following treatment module -

- 1) Nicotine Replacement Therapy –It includes Nicotine gums, Nicotine Lozenges, Nicotine inhaler, Nicotine nasal spray and Nicotine patch.



A) Nicotine Gum –If a tobacco addict, who smokes 1-24 cigs/day then advise - 2mg gum (up to 24 pieces /day). If he smokes, 25 plus cigs /day then advice, - 4mg gums (up to 24 pieces /day). Major side effect is mouth soreness and dyspepsia.

B) Nicotine Lozenges – If patient smoke his first cigarette after 30 min of waking up then use 2mg Lozenges and if patient smoke his first cigarette within 30 min of waking up then use 4mg Lozenges. Patient must not use more than 20 lozenges /day.

C) Nicotine Inhaler – If smoker uses, 6-12 cartridge/day, each cartridge is 4mg, then use 80 inhalations up to 12 wks.

D) Nicotine nasal spray –It is used first time in 1926. It is available as metered dose inhaler containing 100mg of nicotine at 10mg/ml, designed to deliver 200 equivalent puffs each releasing 0.5 mg of nicotine in each nostril (1-2 spray /hr). In such tobacco addicts, maximum 8-40 puffs /day for period of 3-6 months are advisable.

E) Nicotine patch – It is also known as nicotine transdermal patch, it is available in 3 sizes, 30cm², 20 cm² and 10 cm². which deliver 21mg, 14mg and 7mg of nicotine respectively over 16 to 24 hrs.

All the above mentioned therapies are having some contraindications such as acute myocardial infarction, Coronary Artery Disease and Peptic ulcer.

2) There are some drugs which are helpful in withdrawal conditions i.e. Bupropion SR and Varenicline²⁵.

a) Bupropion –SR- it is non nicotine medication. It is very effective and cheap treatment for nicotine addiction and smoking. It acts by blocking the neural uptake of dopamine and noradrenalin.

b) Varenicline –It is a partial agonist under clinical development for smoking cessation. It reduces the craving as well as nicotine withdrawal.

c) Aversive drug - Silver acetate combines with the sulphides in tobacco smoke to produce bad taste. It also used in the form gum and pills.

PREVENTION– Many people like to win tobacco addiction, but a few overcome the addiction by their will power. Many rehabilitation centres come forward to overcome the addiction by counselling of the patient and family members with proper medication. The awareness and education regarding tobacco addiction would be given at school level. Government must take strict decision regarding tobacco hazards and may educate by advertising on street level by means of posters and using electronic media and also ban on the tobacco and tobacco products. Government should ban on all tobacco advertising, promotion and sponsorship so that it will help to decrease the use of tobacco. Tobacco taxes must be



increased at certain level that its prize might also be increased so that the poor people may not buy easily. For relapse prevention regular contact with doctor or counsellor and regular health checkups is important.

CONCLUSION

As tobacco addiction is increasing rapidly, if it is not controlled then India will become the capital of tobacco related disorders. Malignancies and heart disorders due to tobacco are hastily growing so it has to be controlled necessarily by primary education, Counselling and Nicotine replacement therapy. Yoga also assists for calming the anxiety. Government should take strict action for ban on advertising and selling of tobacco products.



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