

The public health impact of tobacco

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Tobacco use is the world's leading cause of death, accounting for 4 million deaths per year. On the basis of current use patterns by the year 2030, it may kill more than 10 million people annually. Tobacco is addictive in all forms and it increases the risk of many cancers, heart attack, stroke, peripheral vascular disease, osteoporosis, chronic obstructive pulmonary disease, diabetes and adverse reproductive outcomes. Even second-hand smoke adversely affects pregnancy outcomes and causes lung cancer and heart disease. Exposed children suffer more respiratory infections and asthma. Awareness generation, tobacco control legislation, de-addiction programmes and smoke-free environments would help curb the tobacco menace.

DUE to public health advances during the last century, death rates have plummeted and life expectancy has risen sharply everywhere, although more so, in industrialized countries. Most dreaded infectious diseases have disappeared, decreased drastically or the knowledge to conquer them is available. Currently there are only two major preventable causes of death that are still rising globally, viz. HIV and tobacco.

Why concentrate on tobacco

The rising epidemic of deaths due to tobacco continues, despite a vast amount of knowledge available about it: based on several tens of thousands of the original research studies and scientific papers. A discussion on the public health consequences of tobacco use is timely and important for the following reasons¹:

- At the beginning of the last decade (the 1990s), *at least one-third of the global adult population, or 1.1 billion people, used tobacco*. Although tobacco use has decreased in many developed countries, it has increased in most developing countries. An estimated 48% of men and 7% of women in developing countries smoked; in industrialized countries, 42% of men and 24% of women smoked, representing a marked increase among women.
- *Most tobacco use starts during childhood and adolescence*. Addiction to nicotine is established in most smokers during the teenage years, within a year of experimentation, often before the legal age for buying cigarettes.

- No amount of tobacco use is safe. A long-term tobacco user has a 50% chance of dying early from tobacco-caused disease. *Each year, tobacco causes some 4 million premature deaths. This epidemic is predicted to eventually kill 250 million children and adolescents who are alive today, a third of whom live in developing countries.*
- By the year 2020, tobacco will become the world's largest single health problem, causing an estimated 8.4 million deaths annually, claiming more lives than HIV, tuberculosis, maternal mortality, motor vehicle accidents, suicide, and homicide, combined. As tobacco use is increasing rapidly in many developing countries, while declining in many developed countries, the burden of disease caused by tobacco will shift dramatically. Deaths in developed regions are expected to rise nearly 50%, from 1.6 million to 2.4 million, while deaths in Asia will soar almost four-fold from 1.1 million in 1990 to an estimated 4.2 million in the year 2020 (ref. 2).
- Tobacco contains nicotine, which has addictive power. Teenagers who smoke one or more cigarettes per day show evidence of addiction similar to that seen in adults, but addiction can be evident at even lower levels of smoking. Only about 5% of smokers do not appear to be addicted. Once addicted, *most smokers cannot give it up, even when they develop smoking-related disease*. Although most smokers want to give up their habit and keep on trying, only about 2% succeed in giving it up in any given year. This is a major reason why prevention of tobacco use is so important³.
- Because tobacco products are carefully designed to undermine efforts to quit using them, quitting is not simply a matter of choice for most tobacco users, but involves a struggle. Tobacco use is typically woven into everyday life, and can be physiologically, psychologically, and socially reinforcing. Many factors, including media depictions and cultural and societal acceptance of tobacco use, combine with tobacco's addictive capacity, making quitting difficult.
- Quitting has immediate and long-term health benefits. Abstinence from tobacco products and freedom from exposure to second-hand smoke are necessary for maximizing health and minimizing risk. *Effective treatment for tobacco dependence could significantly improve overall public health within only a few years.*

Health consequences of tobacco use

Tobacco causes a wide spectrum of fatal and nonfatal diseases. Although tobacco is smoked and used in a wide

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variety of ways all over the world, especially in India, the epidemiologic evidence of specific harmful effects of tobacco is based largely on studies of people who smoke cigarettes, the most popular form in the West. However, studies on some of the effects of cigars, pipes, bidi and smokeless tobacco show that all forms of tobacco use are harmful. We discuss here several potentially fatal diseases implicating tobacco, as found in studies of cigarette smokers and people exposed to second-hand smoke. A few health risks to tobacco workers are mentioned. A discussion of tobacco-related disease in cigar and bidi smokers and smokeless tobacco consumers is given below.

Tobacco and cancer

The role of tobacco in increasing the risk of lung cancer is widely known. Richard Doll's 1950 paper, demonstrating the association between smoking and lung cancer, has become a public health classic⁴. Many people may not realize that tobacco use increases the risk of cancer at many sites in the body: the head and neck (covering cancers of the oesophagus, larynx, tongue, salivary glands, lip, mouth, and pharynx), urinary bladder and kidneys, breast, uterine cervix, pancreas, colon and other sites⁵.

Lung cancer

How much risk of lung cancer does cigarette smoking pose? *On an average, smokers increase their risk of lung cancer between 5 and 10-fold, and in developed countries, smoking is responsible for more than 80% of all lung cancers.* Using American data, 24% of men who smoke can expect to develop cancer during their lifetime.

Recently, the spread of tobacco use to developing countries has led to similar disease patterns there. In a report from India, roughly two-thirds of all patients with lung cancer were smokers of either cigarettes and/or bidis (hand-rolled tobacco in tendu leaves). Among 54 female patients, only 5% were smokers, reflecting both the low prevalence of tobacco use among women and the cancer-causing effects of environmental tobacco smoke⁶. In a study of 1,000,000 deaths in China, lung cancer risk was found to be two to four times higher among men who smoked compared to nonsmokers and this association was generally consistent over both rural and urban areas⁷.

Lung cancer remains a disease of dismal prognosis. Although one-year all-stage survival is reported to have increased from 32% in 1973 to 41% in 1994, five-year survival has remained unchanged at 14%. Early detection has been promoted as a potentially valuable intervention but its cost-effectiveness puts it beyond the reach of all but the best funded health care systems, and even then, early detection pales in comparison to the cost-effectiveness of comprehensive programmes and policies to reduce tobacco consumption.

Head and neck cancer

Tobacco use has long been linked to head and neck cancers, particularly in tissues through which inhaled smoke passes. *For oral cancers, men who smoke have a 27-times higher rate of oral cancer than men who do not smoke. For laryngeal cancer, rates are 12 times higher among smokers.*

Urinary bladder and kidney cancer

In the Western countries, tobacco use is the single most important cause of bladder cancer, accounting for an estimated 40–70% of all cases. Smokers' risk of bladder cancer is 2–3 times higher than of nonsmokers. Poly-aromatic hydrocarbons contained in cigarette smoke are known carcinogens and may be absorbed into the blood and transported to the bladder where the cells are unable to withstand their carcinogenic effects.

Breast cancer

For women in developed countries, cases of breast cancer have been rising over the last few decades, in consonance with the rapid increase in female smoking that has occurred from the middle of the 20th century. Data on links between breast cancer and smoking have, however, been mixed, and this has led to conflicting health messages. In Danish women interviewed at the time of mammography, smoking for more than 30 years was associated with a 60% higher risk of breast cancer and an age of onset at an average of eight years earlier, when compared with nonsmokers.

Given that breast cancer incidence is soon to be eclipsed by lung cancer incidence among women, further data clarifying the role of smoking in causing breast cancer should be of value in strengthening efforts to inform and assist women to quit smoking.

Uterine cervix cancer

The effect of tobacco on cervical cancer has only been recently recognized, in part because women who smoke may also have other risk factors for cervical cancer, particularly exposure to human papilloma virus. Nevertheless, there is now general consensus that *cigarette smoking increases risks of cervical cancer, particularly among women smoking as many as 40 cigarettes daily, and is responsible for approximately 30% of cervical cancer deaths in the US.*

Pancreatic cancer

Smoking is estimated to be responsible for 30% of pancreatic cancer. Like for bladder cancer, carcinogens inhaled by the smoker are thought to enter the blood stream and reach the pancreas via the blood and the bile,

secreted by the liver to aid digestion. Pancreatic cancer prognosis remains very poor, with 5-year survival less than 5% in most reports.

Colon cancer

Colon cancer risk is also greater among smokers, presumably due to the transport of carcinogens to the colon from inhaled or swallowed tobacco smoke. Data supporting this association come from several longitudinal studies in which groups of people are followed over many years to record the occurrence of various illnesses.

Based on data from both male and female health professionals in the US, smoking appears to double the risk of colon cancers. Most colon cancers begin as polyps. Risk of cancer increases with polyp size and there is a dose-response relationship with increasing years of tobacco use associated with larger polyps and, after 35 years of smoking, colon cancer.

Tobacco and atherosclerotic diseases

In atherosclerosis, blood vessels are narrowed as plaques of lipid material build up in them, typically when ravaged by harmful substances (e.g. free radicals – molecules with unpaired electrons, that grab electrons from other substances around them, damaging them) contained in high concentrations in tobacco ‘tar’. Atherosclerosis reduces blood flow through the coronary arteries supplying the heart muscle, the carotid arteries feeding the brain and the small vessels in the legs. *Smoking can increase the size of plaques in the carotid arteries by over three-fold*, as demonstrated by studies of identical twin pairs, in which one smokes and the other does not, thus cancelling out the effects of genetic predispositions to atherosclerosis⁸. The implication of smoking in heart disease, stroke and peripheral vascular disease is discussed below.

Heart disease

A heart attack (myocardial infarction) occurs when a diseased coronary artery is blocked by a blood clot or a breakup of the plaque material. The link between smoking and heart (cardiovascular) disease has been well described in populations all over the world. Twenty-five years of follow-up in the Seven Countries Study (16 cohorts of men, aged 40 to 59 at enrolment in the USA, Finland, the Netherlands, Italy, Croatia, Serbia, Greece and Japan) reported a dose-dependent increase in the risk of death. After 25 years, 57.7% of persons smoking 30 cigarettes per day had died, compared to only 36.3% of non-smokers⁹. Additional long-term data come from a 40-year follow up of British physicians noted that *excess mortality from cardiovascular disease was twice that among smokers compared to non-smokers but this ratio was even more extreme during middle age*¹⁰.

The data for men and women differ slightly, but recent work underlines the importance of smoking as a cause of heart attack in both. In a Norwegian study, rates of myocardial infarction among women who smoked were six times higher than in female non-smokers and rates among men, three times higher than among male nonsmokers¹¹. Danish investigators concluded that women might be more sensitive to tobacco, as risks of heart attack due to current smoking and total tobacco exposure were consistently higher in women than in men.

In an increasing number of health systems, patients are offered expensive therapies, like coronary bypass surgery or angioplasty, to open or bypass vessels that have become too narrow to supply enough oxygen to the heart. *American data show that after an average of four and a half years of follow-up of 3437 patients, people who continued to smoke after angioplasty had a 76% increased risk of death, compared to nonsmokers, and a 44% higher risk of death compared to those who quit smoking*¹².

Stroke

A stroke occurs when blood flow to the brain is reduced, often by a blood clot, or less commonly, when a blood vessel in the brain bursts. Non-fatal strokes often leave their victims substantially disabled. Research has shown that tobacco use increases the risk of stroke. Stroke risk is also increased among people with uncontrolled blood pressure. Smoking cessation and treatment of hypertension combined can reduce the risk of stroke and also that of cardiovascular and peripheral vascular disease.

How high is the risk of stroke from tobacco use? Research results vary, but data from US physicians show a 2.71 higher risk of non-fatal stroke among persons smoking more than 20 cigarettes a day and data from the UK report a 3.7 times higher risk of stroke among current smokers. The risk among current smokers may be as high as seven times greater than that among non-smokers for subarachnoid haemorrhage (blood between the two innermost of the three membranes protecting the brain), which if survived is likely to cause more devastating disability¹³.

The risk of stroke among smokers increases with the amount smoked so that heavy smokers can make the greatest improvements to their health by quitting. The good news is that several studies, with both male and female subjects, report that *five years after quitting, the former smoker has no higher risk of stroke than the non-smoker*¹³.

Peripheral vascular disease

Peripheral vascular disease refers to a cluster of conditions in which atherosclerosis occurs in the peripheral circulation, particularly in the legs. Peripheral vascular disease, unlike myocardial infarction, has a relatively low

risk of death but *causes substantial disability* as affected limbs are at higher risk of amputation and infection.

The link between peripheral vascular disease and tobacco use was described in the early 1900s by Buerger after whom one form of vascular disease, rare in non-smokers, is named.

Tobacco and diabetes

Diabetes mellitus is a chronic disease affecting multiple systems in the body and often leading to substantial disability due to blindness, vascular disease necessitating leg amputation, kidney failure and premature death. Tobacco use increases the risk of diabetes, *which itself speeds up atherosclerosis*, with its attendant diseases.

There are two forms of diabetes mellitus, insulin-dependent (IDDM) and non-insulin-dependent (NIDDM). NIDDM usually is diagnosed in midlife and may be treated with diet modification, drugs and lifestyle modification to encourage regular exercise. Studying the effect of smoking on NIDDM is complicated by the fact that people who smoke are more likely to be sedentary and overweight, therefore already at risk for NIDDM. This problem has been solved by following a group of non-diabetic people over time and identifying diabetics when they are initially diagnosed with NIDDM, so that their smoking habits at the time of diagnosis and in the years leading up to diagnosis are recorded.

Male health care professionals in the US who smoke 25 or more cigarettes daily appear to have a double risk of NIDDM¹⁴. This is important because once diagnosed, NIDDM is often more severe in those who continue to smoke.

Tobacco and chronic obstructive pulmonary disease

Chronic obstructive pulmonary disease (COPD) encompasses chronic bronchitis and emphysema. Chronic bronchitis refers to a productive cough for at least three months in each of two successive years for which other causes have been ruled out. Emphysema involves destruction of the lung architecture with enlargement of the airspaces and loss of alveolar surface area.

COPD prevalence increases with age, but there is a dramatic synergy with smoking. Unlike heart disease, *quitting smoking does not produce substantial reversal of tobacco's harmful effects once COPD is established*. As a result, in many developed countries, COPD is increasing as a cause of death as cardiovascular death rates fall⁵. As with other tobacco-associated adverse health effects, smoking either cigarettes or cigars increases risks of COPD. Thus, cigar smokers are reported to have a 45% higher risk of COPD when compared to nonsmokers¹⁵.

Tobacco and osteoporosis

As populations age the world over, osteoporosis, or loss of bone mineral density, will generate an increasing bur-

den of disease. Far more common among women than men, osteoporosis itself is less a disease than a risk factor because people with osteoporosis have much higher risk of fractures, particularly of the hip and vertebrae.

Hip fractures often cause substantial disability and may prevent someone from returning home even after surgery and rehabilitation, if their home is unsuitable for their impaired mobility. In even the most resource-rich health care systems, the resources that will be consumed by treatment and care of persons with such fractures is expected to grow exponentially.

The strongest evidence of the effects of smoking in decreasing bone mineral density comes from a meta-analysis which considered 29 studies and concluded that *roughly one in eight hip fractures is attributable to cigarette smoking*. Hip fracture risk among smokers is greater at all ages but rises from 17% greater at age 60 to 71% at age 80 and 108% at age 90 (ref. 16). Risks are lower in former smokers, suggesting a benefit of quitting smoking in slowing the rate of bone loss.

Tobacco and the thyroid

The thyroid gland sits in the neck and is responsible for metabolic control. It produces thyroid hormone, which is involved in many of the body's metabolic processes. Among women with hypothyroidism (insufficient thyroid hormone), smoking is reported to be responsible for both decreasing secretion of thyroid hormone and blocking its action, thus exacerbating the symptoms of hypothyroidism and reducing basal metabolism¹⁷. Symptoms include obesity, poor appetite, fatigue, poor memory, slow heart beat, low body temperature, cold intolerance, reduced sweating, dry, rough skin, constipation, joint pain and muscle cramps. Case-control studies have reported that *smoking is over seven times more frequent among hypothyroid patients with Graves' ophthalmopathy*, a severe form of hypothyroidism involving the eyes.

Tobacco and women's health

The adverse health effects of tobacco are universal in that they increase risks of cancer and heart disease among all smokers and quitting smoking reduces these risks. However, for women, smoking carries special risks. In addition to cancer risks unique to women and a greater risk for osteoporosis, smoking by pregnant women and mothers may affect their offspring. Pregnancy outcomes, including lower birth weight and intrauterine growth retardation, are more frequent among women who smoke than among those who do not smoke. Smoking during pregnancy is also a major cause of sudden infant death syndrome (SIDS) and decreased lung function, which are well-documented effects⁵. In India a high proportion of women use smokeless tobacco even during their pregnancy. This has been shown to cause a range of adverse reproductive outcomes¹⁸.

Second-hand smoke

Second-hand smoke or environmental tobacco smoke (ETS) is a very serious form of indoor air pollution. The process of breathing it is called involuntary smoking or passive smoking. Nonsmokers breathe in the same toxic chemicals in tobacco smoke as smokers do, with similar, although smaller effects. Tobacco smoke contains thousands of toxic chemicals, implicated in many diseases, including benzene, cyanide, cadmium, lead, radioactive polonium, benzo(a)pyrene, ammonia, carbon monoxide, and nicotine¹⁹.

Cigarette smoke inhaled passively by pregnant women, often from a male partner who smokes in the home – a situation common in India – can affect the health of the baby before and after birth, causing a decrease in birth weight and contributing to the risk of SIDS, although the risks are smaller than for mothers who actively smoke.

Infants and children who typically spend most of their waking hours in close proximity to mothers or other caregivers who smoke, are adversely affected. Such exposure causes a wide variety of illnesses in children, including lower respiratory tract infections like pneumonia and bronchitis, coughing and wheezing, worsening of asthma, and middle ear disease. Exposure of children to environmental tobacco smoke may also contribute to neurobehavioural impairment and even cardiovascular disease in adulthood.

Responding to the 1997 Declaration on Children's Environmental Health of the Environment Leaders of the Eight (G8), the World Health Organization convened an International Consultation on Environmental Tobacco Smoke (ETS) and Child Health in Geneva, Switzerland from 11 to 14 January 1999. Experts from developed and developing countries concluded that ETS is a substantial threat to infant and child health, as nearly half of the world's children are regularly exposed, without choice. They concluded that preventing children's exposure to tobacco smoke will lead to improved child, adolescent, and ultimately adult health, reduced suffering and death and substantial amounts saved in health care and other direct costs. The Consultation recommended swift action to highlight the need for strong public policies to protect children by right from exposure to tobacco smoke. Two complementary strategies to help achieve this were identified: eliminating children's contact with tobacco smoke before birth and in childhood, and reducing overall consumption of tobacco products. It recommended a combination of *educational programmes and legislative interventions aimed particularly at eliminating tobacco use in settings frequented by children*²⁰.

In the US alone, second-hand smoke causes about 3000 lung cancer deaths a year, compared to less than 100 lung cancer deaths per year from traditional forms of outdoor air pollution. The effects on heart disease are even more important. The chemicals in second-hand smoke poison the heart muscle, interfere with the ability of blood

vessels to adjust themselves to control blood pressure and flow, increase the build-up of blockages of blood vessels (which lead to heart attacks), and make blood stickier. The net effect of passive smoking is *that there are about 15 times more deaths from heart disease caused by second-hand smoke in the US (35,000–62,000 deaths annually) than from lung cancer*¹⁹.

While the tobacco industry continues to claim that evidence for second-hand smoke-causing disease – particularly lung cancer – is controversial, every independent authoritative scientific body that has examined the evidence has concluded that second-hand smoke causes many diseases. Moreover, this evidence is not new. The first studies linking second-hand smoke with breathing problems in children and lung cancer in adults were conducted 20 years or more ago and the studies linking second-hand smoke and heart disease are over 10 years old^{20–23}.

Evidence of adverse health effects has also been found from other forms of tobacco use, confirming the negative effect of tobacco on health.

Working with tobacco

Quite apart from the health impacts of using tobacco products are the health hazards of working with tobacco. Nicotine is rapidly absorbed through the skin when harvesting tobacco, leading to a condition called 'green tobacco sickness' (GTS). Bidi rollers exposed to tobacco have shown high concentrations of nicotine in their bodies¹⁸. GTS has been reported to occur in 1–10% of US tobacco workers and younger workers are at higher risk, which implies that *the prevalence of GTS may be even higher in developing economies where children play a substantial role in harvesting and processing tobacco*. Symptoms of GTS include weakness, headache, nausea, vomiting, dizziness, abdominal cramps, breathing difficulty, abnormal temperature, pallor, diarrhoea, chills, fluctuations in blood pressure or heart rate, and increased perspiration and salivation²⁴. These symptoms are generally self-limiting but may decrease productivity by increasing absenteeism from work.

Similar symptoms, in addition to high rates of tuberculosis and asthma, have also been reported in Indian bidi makers in Bihar and Tamil Nadu, who include children, especially girls. Girls making bidis in Tamil Nadu have also seen to be suffering from growth stunting, menstrual disorders, joint pain, eye irritation and numbness of the fingers. Poor reproductive outcomes were frequent in mothers engaged in bidi work. It is thus hard to justify tobacco work as an economically beneficial occupation.

Known health risks of other forms of tobacco use

Cigars

Made of tobacco and smoked, cigars can be expected to have many of the same harmful effects as cigarettes. Cigar

smoking is limited to certain social groups and certain countries. One of the most exhaustive studies of the effects of cigars comes from the National Cancer Institute in the United States. The Smoking and Tobacco Control Monograph No. 9 reviewed hundreds of studies and noted that many of the effects of smoking cigarettes are seen in persons who smoke cigars¹⁵.

Differences between the health effects of cigarette and cigar smoking do exist, though, in large part, because cigar smokers generally inhale less than cigarette smokers and also because the total amount smoked is generally less among cigar smokers than among cigarette smokers. Some people have suggested that heavy smokers should be advised to switch to cigars, but if there is any benefit from this, it appears to be because the switch translates into less tobacco use and less inhalation. While cutting down on tobacco use is a first step to improved health, even better is quitting smoking altogether, whether cigarettes or cigars.

The International Agency for Research on Cancer (IARC) found similar results in a study of lung cancer among men in Germany, Italy and Sweden, with cigar smokers nine times more likely to develop lung cancer than non-smokers. Cigar smoking increased lung cancer risk less than cigarette smoking due to lower tobacco consumption among cigar smokers²⁵. Other health effects of cigar smoking are similar to those discussed under the health effects of smoking.

Bidi smoking

Bidi is a smoking stick specific to India although it is being exported and raising alarm bells in other countries as well²⁶. In India bidi smoking is the most common form of tobacco use, about 6 times more common than cigarette smoking. In various case control studies bidi smoking has shown a similar magnitude of relative risk as cigarette

Table 1. Death rates and the age-adjusted relative risks by the type and the frequency of smoking habit among men in Mumbai Cohort Study²⁷

	Person years	Death rate	AADR	AARR
Bidi	13,545	32.4	26.0	1.78
Cigarette	13,329	19.2	20.3	1.39
Bidi + cigarette	1163	33.5	32.5	2.23
Others	281	35.8	31.1	2.13
Bidi frequency				
1-5	2578	28.7	23.7	1.62
6 +	10,967	33.3	27.1	1.86
Cigarette frequency				
1-5	6056	15.7	19.1	1.31
6 +	7275	22.1	21.7	1.49
No tobacco use	27,236	16.1	14.6	1.00

AADR, Age-adjusted death rate; AARR, Age-adjusted relative risk.

smoking for various types of cancers, heart disease and lung disease. In a recent cohort study in Mumbai, the relative risk of overall mortality after 5 years of follow-up was no less among bidi smokers than among cigarette smokers (Table 1)²⁷. Although a bidi contains about one-fourth the amount of tobacco compared to a cigarette, it delivers a comparable amount of 'tar' and nicotine. A bidi is thus no less dangerous than a cigarette. The same is true for other Indian smoking products such as the 'chutta'²⁸.

Smokeless tobacco

The use of tobacco without burning is referred as smokeless tobacco use. The term almost completely refers to the oral use of tobacco. Tobacco is known to be used nasally also, by inhalation of very fine, dry, powdery snuff, but it is a rare practice today. Unlike smoking, smokeless tobacco use is not common everywhere in the world. In the West, it is common in the USA and Scandinavian countries. It is also common in some countries in Africa and Asia. It seems most common in countries belonging to the Indian subcontinent. In India, tobacco is used in a smokeless manner in a wide variety of ways with multitudes of products such as betel quid, mixtures of tobacco, lime areca nut, tobacco with lime, mishri, manufactured smokeless tobacco products like gutkha and many others.

Epidemiological studies from the US demonstrate that the use of smokeless tobacco products significantly

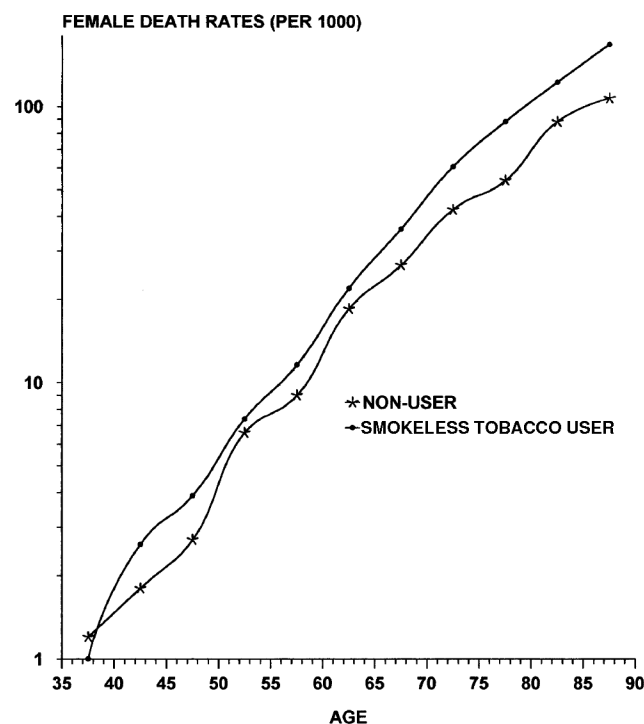


Figure 1. Age-specific comparison of mortality rates among women who used tobacco (almost all in smokeless form) and women who did not use tobacco in any form from 5-year follow-up of about 30,000 women²⁷.

increases the risk of oral cancer. Wherever smokeless tobacco products have been studied, they have been found to increase the risk of oral cancer. In India, smokeless tobacco use has been demonstrated to increase the risk of several other cancers belonging to the upper aero-digestive tract. In addition to these fatal diseases, smokeless tobacco use is shown to cause a variety of periodontal diseases such as recession of gums and oral mucosal lesions, many of which are precancerous²⁹.

On the basis of a cohort study conducted in Kerala, it was suggested that, like smokers, *smokeless tobacco users also experience a higher overall mortality*³⁰. This finding has been confirmed in a recent large cohort study reported from Mumbai, where for every age group, the mortality rate was higher in women tobacco users, who generally use smokeless forms in this country. Figure 1 shows age-specific mortality rates of about 30,000 women after a 5-year follow-up who did not use tobacco and those who used tobacco, almost all of them in smokeless form. For every age group, the mortality rate was higher in tobacco users²⁷.

Smokeless tobacco poses a major risk to women and to the children born to them. Studies carried out in India on the use of smokeless tobacco by pregnant women have reported adverse outcomes, especially low birth weight and stillbirths, similar to findings in the Western countries associated with smoking¹⁸.

Conclusion

All forms of tobacco are harmful and have been found to carry huge risks of suffering and disease, greatly increasing the burden of health expenditure throughout the world, including India. Any tobacco control programme in a given country must address all forms used. In India this includes smoked forms, like bidis, chuttas, cheroots, cigarettes and cigars, all the smokeless forms, such as khaini, zarda, pan with tobacco, pan masala, gutkha, mishri, snuff and tobacco toothpaste. The public needs to be better informed of the risks of all forms of tobacco use. Health professionals need to take on an active supportive role in helping individuals and communities stop smoking and chewing tobacco and advocate for legislation to protect children and the general public from environmental tobacco smoke. Only then will this scourge of humanity stop taking its toll.

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