

4.3

Tobacco and Vascular Diseases

Cardiovascular diseases (CVD), as a group, are the leading cause of death in the world. Tobacco use is a major known risk factor for CVD and leads to a high burden of early death and disability. CVD is also the largest contributor to tobacco-related deaths, in terms of absolute numbers. In many countries, deaths due to CVD considerably outnumber cancer-related deaths. CVD-related deaths, therefore, become the leading form of tobacco-related death in these countries.

Magnitude of disease

Cardiovascular diseases accounted for 16.7 million or 29.2% of the total global deaths in 2002, according to the *World health report 2003*. Around 80% of deaths due to CVD took place in low- and middle-income countries. By 2010, CVD will be the leading cause of death in developing countries.⁴⁷ The contribution of developing countries to the global burden of CVD, in terms of disability-adjusted life-years (DALYs) lost, was 2.8 times higher than that in developed countries.⁴⁸

India contributed to 17% of the worldwide CVD mortality in 1990.⁴⁸ CVD-related deaths in India are expected to rise from about 3 million in 2000 to 4.8 million in 2020.⁴⁹ By 2020, about 42% of the total deaths in India are projected to be due to cardiovascular causes (Table 4.2).⁵⁰

During the period 2000–2030, about 35% of all deaths due to CVD in India are projected to occur in the age group of 35–64 years.⁴⁹ Tobacco, as a major cause of premature CVD, becomes especially relevant in this context. There is also

Table 4.2 Deaths due to cardiovascular diseases (CVD), coronary heart disease (CHD) and cerebrovascular disease in 2000 and 2020 in India⁵⁰

Disease	1990 Estimated numbers (%)	2020 Projected numbers (%)
All CVD	2,266,000 (24.2)	4,774,000 (41.8)
CHD	1,175,000 (12.5)	2,584,000 (22.7)
Cerebrovascular disease	448,000 (4.8)	945,000 (8.3)

Figures in parentheses indicate CVD deaths as a percentage of total deaths

increasing evidence that the lower-middle class and urban poor are becoming highly vulnerable to CVD as the epidemic advances in India.⁵¹

The social gradient of tobacco consumption in India, which is characterized by higher consumption patterns among the poor, is also relevant to these social dimensions of CVD.

Tobacco and CVD (constituents and mechanisms)

Tobacco use, especially smoking, is associated with vascular diseases such as coronary heart disease (CHD, heart attack), angina (chest pain), sudden cardiac death (SCD, unheralded sudden death), arrhythmias (electrical disturbances), stroke (brain attack), peripheral artery disease (gangrene of the legs), abdominal aortic aneurysms (ballooning of the blood vessels), renal artery stenosis (decreased blood flow to the kidneys), cor pulmonale (poorly functioning lungs) and erectile sexual dysfunction (male

Box 4.2 Pathogenetic pathways

The major constituents of tobacco smoke which are responsible for the cardiovascular effects are nicotine and carbon monoxide. Other chemicals that cause vascular injury include nitrogen oxides, hydrogen cyanide and tar, with cadmium, zinc and carbon disulphide being minor contributors.⁵²

Smoking causes endothelial dysfunction (blood vessels cannot dilate normally), lipid alterations (raised levels of 'bad' fats in the blood) and platelet activation, leading to a prothrombotic state (increased tendency of the blood to clot).⁵³ Tobacco use also increases the risk and severity of vascular disease by increasing the risk of diabetes, which itself damages the vessels by accelerating atherosclerosis (Fig. 4.1).

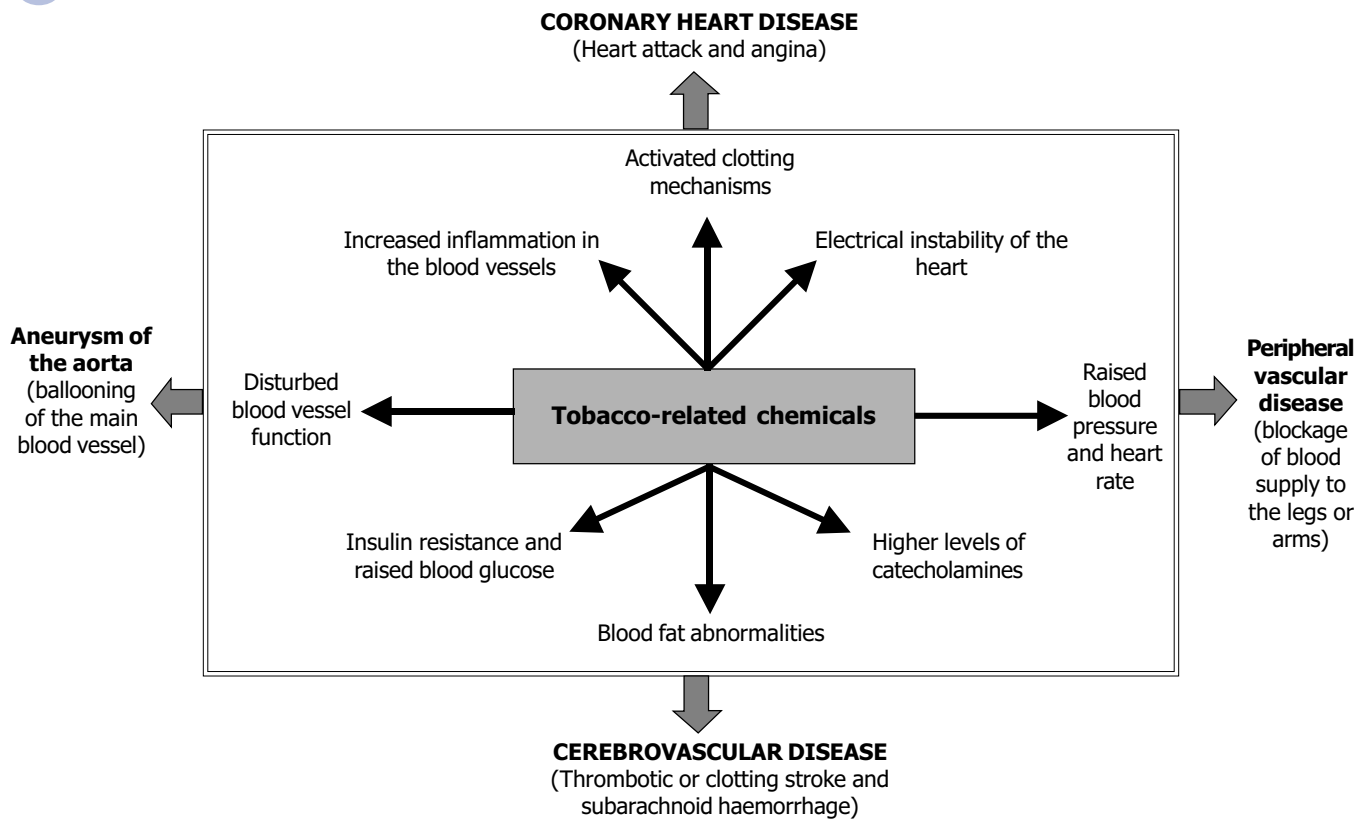


Fig. 4.1 Effects of tobacco on the cardiovascular system

impotence). Thus, smoking affects the entire vascular system.

Tobacco and CVD (global evidence)

Active smoking

In a study done in 52 countries, smokers were found to be at 2.87 times increased risk of CHD compared to non-smokers. The evidence was consistent across countries. The study also revealed a dose–response relationship. Individuals smoking more than 40 cigarettes per day had a 9 times increased risk of CHD compared to never-smokers. Smoking even 5 cigarettes per day was associated with an increased risk of CHD. Smoking accounted for about 35.7% of the population-attributable risk of CHD worldwide (after adjusting for a range of cardiovascular risk factors).⁵⁴

In the MONICA study, the risk of myocardial infarction (MI) in men and women 35–39 years of age, for those who smoked was five times higher than the risk for those who did not smoke. About 50% of MIs in men and women

younger than 50 years of age were attributable to smoking.⁵⁵

There is a dose–response relationship between the quantity of cigarettes smoked and cardiovascular morbidity and mortality.⁵⁶ Current cigarette smoking was seen to be strongly associated with the risk of coronary events for both MI and coronary artery disease (CAD).⁵⁷ In a study done in the United Kingdom, it was found that at 30–49 years of age, the rates of CHD in male smokers were about five times those in non-smokers, at 50–59 years of age, they were three times those in non-smokers and, at 60–79 years, they were twice as great as in non-smokers. It was also seen that 80% of MIs were due to tobacco in smokers 30–49 years of age, 67% in those 50–59 years and 50% in those 60–79 years.⁵⁸

In women less than 50 years of age, the majority of CHD is attributable to smoking. The risk increases with the number of cigarettes smoked and the duration of smoking.⁵⁹ About 48% of all MIs in young and middle-aged Italian women were attributable to cigarette smoking.⁶⁰

In the Nurses' Health Study, the risk of CHD among current smokers was found to be 4.23 times compared with those who had never smoked. The risk of CHD was 1.9 times among those smoking 1–4 cigarettes per day and 5.7 times among those smoking ≥ 4 –5 cigarettes compared to non-smokers.⁶¹

Of all the coronary risk factors, cigarette smoking is the strongest predictor of SCD. Middle-aged men who smoke have a 10-fold greater risk of SCD and a 3.6-fold increased risk of MI.⁶²

Passive smoking

Passive smoking is associated with ischaemic heart disease (IHD), with a 30% excess risk of IHD in non-smokers whose spouses smoke compared with non-smokers whose spouses do not smoke.⁶³

Non-smokers exposed to second-hand smoke had a 25% excess risk of CHD compared with non-smokers not exposed to smoke. There was a significant dose–response relationship.⁶⁴

In a prospective study conducted among nurses, it was found that, compared with women not exposed to second-hand smoke, the relative risk of CHD (adjusted for a broad range of cardiovascular risk factors) was 1.58 (95% CI: 0.93–2.68) among those reporting occasional exposure, and 1.91 (95% CI: 1.11–3.28) among women reporting regular exposure to passive smoking at home or work.⁶⁰

A ban on public smoking was associated with a reduced incidence of hospital admissions for acute MI. During the six months in which the law was enforced, the number of admissions fell significantly compared to the same period before and after the law was in effect.⁶⁵

Unlike the case with lung cancer, the risk of acute MI and CHD associated with exposure to tobacco smoke is non-linear at low doses, increasing rapidly with relatively small doses such as those received from second-hand smoke or actively smoking one or two cigarettes a day.^{63,66,67}

Stroke

A meta-analysis of 32 studies revealed that the overall risk of stroke increased by 1.5 times, of cerebral infarction (clotting stroke) by 1.9 times and of subarachnoid haemorrhage by 2.9 times in smokers.⁶⁸ The number of cigarettes smoked per day was associated positively with the risk of stroke. Compared with women who had never smoked, those who smoked 1–14 cigarettes per day had an age-adjusted relative risk of 2.2 (95% CI: 1.5–3.3), whereas those who smoked 25 or more cigarettes per day had a relative risk of 3.7 (95% CI: 2.7–5.1).⁶⁹

In a study from China, it was seen that a 10% increase in the prevalence of cigarette smoking was associated with a 19% higher mortality from stroke.⁷⁰ It was found that a high level of second-hand smoke exposure was independently associated with an increased risk of first ischaemic stroke among never-smoking women.⁷¹

Thromboangiitis obliterans

Thromboangiitis obliterans (TAO, non-atherosclerotic occlusive disease of the leg arteries) is associated with tobacco smoking. In a study conducted in Bangladesh, those smoking 11–20 *beedis* per day were 7 times more likely and those smoking > 20 *beedis* per day were 34 times more likely to have TAO compared to those smoking < 10 cigarettes per day. The comparative figures for cigarette smoking were lower (4 times for those smoking 11–20 cigarettes per day and 7 times for those smoking > 20 cigarettes per day).⁷²

Smokeless tobacco

The limited number of studies available so far have shown conflicting results regarding the relationship between smokeless tobacco use and the risk of fatal MI. While one study found no relationship, smokeless tobacco use was linked with a higher risk of dying from CVD in another prospective study.^{73,74}

Tobacco and CVD (Indian evidence)

The relationship between tobacco and CVD has

not been extensively studied in the Indian context. The evidence comes mostly from cross-sectional surveys and case–control studies. Data from cohort studies are still awaited. Cross-sectional studies have several methodological limitations in assessing causation: survival bias, inability to adjust for multiple confounders and misclassification bias arising from relatively non-specific diagnostic instruments used for the diagnosis of CHD in surveys.

In a case–control study conducted in Bangalore, it was found that the most important predictor of acute MI was current smoking of cigarettes or *beedis*. The odds of acute MI was 3.6 in current smokers overall and, in individuals who currently smoked 10 or more cigarettes per day, it was 6.7 compared to never-smokers. It was also found that compared to individuals without risk factors, those with multiple risk factors had a markedly increased risk. For example, smokers with an elevated blood glucose were 10.7 times more likely to have acute MI.⁷⁵ In another unpublished case–control study conducted in hospitals in New Delhi and Bangalore, it was seen that, compared to never-smokers, current cigarette smokers who smoked 22 cigarettes per day had an 18-fold increased risk of CHD. Independent association was also found between *beedi* smoking and CHD risk, with those consuming 25 *beedis* per day having a 10-fold increased risk.⁷⁶

In the Global Interheart Study (in which many Indian centres participated), data for South Asia were analysed separately. Tobacco smoking was found to be associated with CHD; those who smoked were 2.4 times more likely to be at risk for CHD compared to non-smokers. Smoking accounted for about 37% of population attributable risk of CHD in South Asia.⁷⁷

Cross-sectional surveys conducted in urban and rural communities have also attempted to relate smoking with the risk of CHD. A survey in Jaipur observed a 1.33 times increased risk of CHD among male smokers.⁷⁸

In a stroke registry in Hyderabad, 28% of patients with ischaemic stroke had a history of smoking.⁷⁹ In another study, smoking was found to be a significant factor for acute ischaemic stroke with an odds ratio of 1.8.⁸⁰

There are as yet no Indian studies that have looked into the effects of second-hand smoke and smokeless tobacco on CVD. Given the extensive levels of exposure to these risk factors in India, it is essential that investigation of their cardiovascular effects is considered a priority for research.

4.3 TOBACCO AND VASCULAR DISEASES

KEY MESSAGES

- Cardiovascular diseases (CVD) are major contributors to death and disability. By 2010, CVD will be the leading cause of death in developing countries.
- Tobacco use is a major known risk factor for CVD. CVD is the leading cause of tobacco-related deaths.
- Tobacco use is associated with earlier myocardial infarction coronary (MI) (heart attacks) and coronary heart disease (CHD)-related deaths at an early age.
- Many of the deaths due to CVD occur at a younger age in India compared to other countries. In India, 42% of the total deaths by 2020 are projected to be due to cardiovascular causes.
- Tobacco use, especially smoking, is associated with vascular diseases. The major constituents of tobacco smoke which are responsible for the cardiovascular effects are nicotine and carbon monoxide.
- Global studies show the association between active and second-hand smoking, and CVD, cerebrovascular stroke, peripheral vascular disease and sudden cardiac death (SCD). Presently, there is limited evidence relating smokeless tobacco use and CVD.
- There are a few Indian studies (mostly cross-sectional studies; a few case-control studies; no cohort studies) which have looked into effects of active smoking. These indicate an increased risk for *beedi* as well as cigarette users. Indian studies related to the association of second-hand smoking and CVD are awaited.
- Investigation of the cardiovascular effects of tobacco use should be taken up as a priority for research in India.