

4.1

Overall (all-cause) Mortality due to Tobacco

It is well established that overall mortality rates for cigarette smokers are 60% to 80% higher than for non-smokers. Similarly, in India, *beedi* smokers are reported to have significantly higher death rates compared to non-tobacco users.^{11–13}

There are differences in the nature of effects of *beedi* and cigarette smoking. For instance, cancer deaths due to cigarette smoking are primarily related to lung cancer, which accounts for over 70% of tobacco-related cancer deaths and a third of all cancer deaths in the USA. In India, where *beedi* smoking and tobacco chewing are common habits, the major effects of tobacco are seen in the oral cavity, pharynx and oesophagus, which together account for a large proportion of the tobacco-related cancers that occur in the country.^{11,14}

The information on excess mortality among tobacco users is available from four follow-up (cohort) studies and one case–control study.

A 10-year cohort study was conducted among 10,287 individuals aged 15 years and above in villages of the Ernakulam district, Kerala, during 1967–1976.¹³ Among men, 50% were smokers, 15% were chewers and 21% had mixed practices (smoking and chewing), whereas among women, very few (<1%) smoked and 41% were chewers. The vast majority of smokers (~90%) were *beedi* smokers. The overall age-adjusted relative risk estimates revealed a 40% higher risk for tobacco users compared to non-tobacco users. There was one-and-a-half-fold excess mortality among male smokers (age-adjusted relative risk = 1.5). Chewers among women (age-adjusted relative risk = 1.3) and mixed users among men (age-

adjusted relative risk = 1.4) also had significantly higher risk of dying than non-users.¹³

A similar 10-year follow-up study of a random sample of 10,169 persons aged 15 years and above was conducted in the Srikakulam district of Andhra Pradesh (1967).¹⁵ The dominant habit in Srikakulam district was reverse smoking (see Section 3.1). Conventional smoking was practised by about 30% of the men, which included *beedi* and *chutta* smoking. Tobacco chewing was less popular at that time (4% of men and 3% of women), and both chewing and smoking were practised by 12% of men. Around 19% of men and 33% of women did not use tobacco in any form. After 10 years' follow up, 1432 deaths were recorded for the 80,612 person-years available for analysis. Men as well as women who smoked in the reverse fashion had nearly double the rate of death, adjusted for age, compared to the rates for non-users of tobacco in any form (relative risk [RR] = 1.95 and 1.91, respectively). The age-adjusted relative risk of death for conventional smokers was also nearly two-fold (RR = 1.8) compared to non-users of tobacco.¹⁵

The Mumbai cohort study (ongoing since 1992) is a population-based study of 99,598 individuals 35 years of age. The baseline survey was conducted on a house-to-house basis during 1992–1994. The survey population consisted largely of individuals belonging to the lower and lower–middle classes.¹⁶ Interim results from follow up of 52,568 individuals were published.¹² Updated follow-up results are reviewed here.¹⁴

In an active follow up after an average of 5.5 years, 97,244 individuals (98%) were traced. Among these, 7531 deaths were recorded. A total of 210,129 person-years of follow-up was accrued among men, of which 27% was contributed by smokers, 46% by smokeless tobacco users and the remaining 27% by non-users of tobacco. Among male smokers, 45% were cigarette smokers and 55% were *beedi* smokers (some smoked cigarettes as well).

Among smokeless tobacco users, men who used *mishri* (including those who also used other forms of tobacco) accounted for 55% of the person-years among men and 83% of the person-years among women. The next most common habit was *paan*-tobacco (betel quid) chewing, accounting for 25% of the person-years among men and 11% among women.¹⁴

Since age and education play a role in influencing mortality, the analysis was adjusted for these factors. Both men and women who used smokeless tobacco had a 20% greater risk of death than non-tobacco users (RR = 1.2). Those who smoked had a 60% greater risk of death than non-users of tobacco (RR = 1.6). When the type of smoking was analysed separately, cigarette smokers had a 36% greater risk of death and *beedi* smokers a 68% greater risk of death than non-users of tobacco. Those who smoked six or more *beedis* per day had a 75% greater risk of death (RR = 1.75) compared to non-users of tobacco. Those who smoked a fewer number of *beedis* per day had a 40% higher risk than non-users, demonstrating a dose-response relationship. Age-specific mortality rates among *beedi* smokers were higher than among non-users of tobacco across all age groups, the excess risk being twice as high for people less than 50 years of age compared to older people (RR = 3.2 vs RR = 1.5).¹⁴

A case-control study comparing 43,000 adult male deaths with 35,000 living controls, was reported from urban (Chennai) and rural areas (Viluppuram district) of Tamil Nadu, southern India (1995-2000). In the urban study area, 59.6% of the men between 25 and 69 years of age who had died from medical causes (cases) had been smokers (52.2% in rural areas), as against only 39% of the corresponding age-matched controls (42.8% in rural areas). Smokers in that age group experienced a two-fold higher risk of death than non-smokers in the urban areas (RR = 2.1; 95% CI: 2.0-2.2) and a 60% greater risk (RR = 1.6; 95% CI: 1.5-1.7) in rural areas (adjusted for age, education and tobacco chewing).¹¹

Mortality estimates

Based on older studies

These estimates are from population-based house-to-house studies from 7 rural areas of India (from 5 areas based on random samples of over 10,000 individuals aged 15 years and over in each area; from one area based on a sample of 1,000,000 individuals aged 15 years and above; and from one area based on a sample of 35,000 individuals aged 35 years and above). In addition, the percentage of tobacco users among men over the age of 30 years is available from an older survey in three areas of India. The percentage of tobacco users in these areas ranged from 44% to 74%. Among women, the prevalence of tobacco use ranged from 15% to 67%, whereas among men it ranged from 62% to 86%. On the basis of population figures for 1986 and the latest available age-specific death rates, it was estimated that in India, among individuals aged 15 years and above, about 2.76 million deaths occur annually among men, and 2.3 million deaths among women. Applying minimum estimates, about 630,000 deaths annually were attributable to tobacco at that time.¹⁷

Based on recent studies

The estimation of tobacco-attributable mortality for the 35-69 years age group has been reported from the case-control study in Chennai and similar estimates were also reported from the Mumbai cohort study. Gajalakshmi *et al.* estimated that about a quarter of male *beedi* or cigarette smokers at 25-69 years of age are killed by their smoking and overall, smoking caused 552,000 deaths among men in India aged 25-69 years. Considering the prevalence of smokeless tobacco use among women in India to be 15% and of smoking among them to be 3%, about 5.9% deaths in women 35-69 years old can be attributed to tobacco use. This translates into 86,000 deaths among women per year, out of 1,453,000 all-cause deaths in women in India in the 30-69 years age group.¹⁸ Gupta *et al.* used slightly different parameters but came up with

very similar estimates. Thus the total estimated all-cause premature deaths in men and women in India due to tobacco use can be estimated from this study to be around 638,000 per year.¹⁴

Tuberculosis is an extremely important cause of death, contributing about a million adult deaths in India.^{11,14} Mortality from tuberculosis was reported to be four times as high among smokers (mainly *beedis*) compared to non-smokers. Thus, about a quarter of all persistent smokers of cigarettes or *beedis* are killed by tobacco before the age of 70 years, and will lose about 20 years of life expectancy. A third of the deaths caused by smoking are from vascular disease and half are from tuberculosis or other respiratory diseases. Among Indian males, smoking causes half of all deaths from tuberculosis and a quarter of all deaths from any disease in middle age. Overall, smoking currently causes about 700,000 deaths per year in India, about 550,000 in men aged 25–69 years, about 110,000 in older men, and in much

smaller numbers in women.¹¹ In addition, there are excess deaths due to smokeless tobacco use, which is common among men as well as women and also deaths due to exposure to second-hand smoke. These deaths have not been quantified, but it appears reasonable to assume that these will add at least another 100,000 deaths. Thus, a conservative estimate of tobacco-attributable mortality in India would be about 800,000.

These results demonstrate that *beedi* smoking and smokeless tobacco use are as important as cigarette smoking. Almost all the studies carried out in different parts of India reported a significantly high risk ($RR \geq 1.5$) of all-cause mortality among *beedi* smokers. These findings have important implications for public health efforts to reduce tobacco use. As the younger generation now reports *beedi* smoking as well as tobacco use in other forms, preventive measures have to be taken to avoid long-term health effects.

4.1 OVERALL (ALL-CAUSE) MORTALITY DUE TO TOBACCO

KEY MESSAGES

- The relative risk for death due to tobacco use in cohort studies from rural India is
 - 40% to 80% higher for any type of tobacco use;
 - 50%–60% higher for smoking;
 - 90% higher for reverse smoking;
 - 15% and 30% higher for tobacco chewing in men and women, respectively;
 - 40% higher for chewing and smoking combined.
- An urban cohort study in Mumbai found that the relative risk of dying was more than 50% higher for smokers and about 15% higher for smokeless tobacco users.
- An urban case–control study in Chennai found that the relative risk of dying for smokers was slightly higher than 2-fold.
- Overall, smoking currently causes about 700,000 deaths per year in India.