

Tuberculosis

Tuberculosis (TB) has been known and dreaded since Hippocratic times (460-377 BCE). It was once known as "consumption" and claimed the lives of such famous people as the Brontë sisters, Robert Louis Stevenson and Vivian Leigh. TB is an infectious disease that affects primarily the lungs, although all organ systems may be involved. Once [SMALLPOX](#) was controlled by vaccination in the 19th century, infection with the tubercle bacillus became the most fearsome plague in Asian and European countries.

Socio-economic factors determined the prevalence of the disease in the unsanitary conditions of the European Middle Ages and the Renaissance. There is evidence that TB existed in South America centuries before the arrival of Europeans. There is less evidence that TB existed in North America until it was introduced by European explorers and settlers. Successive waves of immigrants brought the disease to Upper and Lower Canada in the 17th century and to the West by the mid-19th century. Inevitably, the aboriginal population of Canada was placed at risk when exposed to frequently destitute European trappers and settlers. Europeans may have developed a significant degree of immunity to the disease, following population exposure over many generations, whereas the Inuit and First Nations were encountering the disease for the first time and had little resistance to the disease when they were infected.

Once the infective nature of the disease was recognized in Europe, steps could be taken to improve hygienic conditions in overcrowded urban environments - where the poor could not afford proper diets and were huddled in squalor - with the result that the mortality rate began to fall rapidly early in the 20th century. Well before active surgical intervention (collapse therapy to rest the involved lung) was undertaken in the 1930s and truly effective antituberculous drugs made their appearance in the 1950s, general improvements in living conditions led to a remarkable decline in incidence, as well as in mortality rates.

Mortality Rates in Canada

In Canada the tuberculosis mortality rate fell dramatically from 180/100 000 population in 1900 to less than 1/100 000 by the mid-1980s. The incidence rate also declined substantially over the same period. Before World War II there were more than 14 000 new cases of TB reported in Canada each year and more than 17 000 patients in TB sanatoria, the last of which was closed in the 1970s. Improved treatment and drug therapy caused a sharp decline in the number of cases reported in Canada and elsewhere after World War II. Although Canada has one of the lowest rates of TB occurrence in the world, the number of cases reported abruptly stopped declining in 1987 and has remained relatively constant.

In 2006, the latest year for which statistics are available, there were 1621 cases (5/100 000) of new active and relapsed TB reported. The most populous provinces - British Columbia, Ontario and Québec - representing 76% of the population accounted for 73% of the total of reported cases. The highest rate of cases was in Nunavut - 155.9/100 000. Of the people in that group who died, TB was reported as the underlying cause of death in 23% of cases. In approximately 40% of cases, TB contributed to, but was not the cause, of death.

Risk

Globally, TB incidence has increased tremendously since the mid-1980s. This re-emergence in recent years led the World Health Organization (WHO) to declare the disease a "global emergency" in 1993. In Canada the change in trends prompted an intensive re-evaluation of the tuberculosis situation. In 2007 the WHO announced that the epidemic had levelled off after having peaked in 2004 and held steady through 2005.

Groups at high risk for tuberculosis include people who have spent time in parts of the world with high rates of TB, First Nations peoples, seniors, homeless inner-city groups and anyone living in overcrowded and poor living conditions. Individuals with HIV infection are also considered to be at high risk. Health-care and social service workers may have frequent exposure to high-risk individuals; effective safety programs can prevent the development of TB in such workers.

Tuberculosis epidemics on First Nation reservations during the early 20th century had very high mortality rates. Malnutrition, lack of medical attention and crowded living conditions were contributing factors to these epidemics. Current TB infections in First Nations and aboriginal communities are caused by poor socio-economic standards, as well as high rates of diabetes, substance abuse and AIDS/HIV. Tuberculosis infections are highest in the western provinces of British Columbia, Alberta, Saskatchewan and Manitoba, as well as northwestern Ontario. TB rates in First Nations communities remain 8 to 10 times higher than the Canadian norm.

The effect of immigration on the epidemiology of TB in Canada reflects the state of TB in immigrants' countries of origin. In 1996, during the global TB epidemic identified by the WHO, the foreign-born accounted for 92% of TB cases in Toronto, a city with a high rate of immigration. In 2003 residents and visitors born in countries with high rates of TB accounted for more than two-thirds all reported cases of TB in Canada. Because of the serious risk to public safety, Canadian immigration authorities conduct TB screening of applicants for immigration and refugee status.

Symptoms

TB is caused by bacteria of the group Mycobacterium, which has 54 sub-species. In Canada it is usually caused by Mycobacterium tuberculosis. TB is contracted through contact with someone who has infectious (active) tuberculosis. People with infectious TB release TB organisms into the air when they cough. Anyone who inhales the organisms could develop the disease. Frequent exposure to an infected individual is usually required to develop TB; estimations are that exposure for several hours per day over

several months is necessary to infect the average healthy adult, although in some circumstances it may be transmitted in less time.

Exposure to TB bacteria does not necessarily result in TB. In fact, most people who inhale TB bacteria do not develop infectious TB. They do not become ill and do not spread the bacteria to others. Only about 10% of exposed people develop active TB.

Symptoms include a general feeling of being unwell, fatigue, weight loss, persistent coughing for more than 4 weeks and, in advanced cases, coughing up blood. A Mantoux skin test reveals whether a person has been exposed to TB, while X-rays and laboratory tests are required to diagnose active TB. Until a person with TB receives treatment, she or he may transmit the disease to others. Most people with active TB develop lung infections (pulmonary TB). Rarely TB can infect the brain (meningitis), kidneys, skin, bones, joints or lymph nodes. These rare cases occur more often in areas of higher risk.

Treatment

People who have been exposed to active TB, as revealed by a positive Mantoux skin test, should receive preventive therapy for 6 months to a year to reduce the risk of developing the disease. All cases of TB must receive a full course of treatment, which consists of taking at least 2, and often 3 or 4, drugs. Drugs for treating TB include Isoniazid (INH), Rifampin, Ethambutol, Ethyonimide, Capriomycin and combination drugs such as Rifampin-Ethambutol, INH-Rifampin and INH-Rifampin-Streptomycin. It is essential that the full course of treatment be followed precisely and completed. Without treatment, 50% of those infected with TB die within 5 years. Additionally, the most common reason for developing drug-resistant TB is not following prescribed treatment.

Drug-Resistant TB

Drug-resistant TB has been reported in Canada for decades. Usually the TB organism becomes resistant to one drug, but sometimes the disease becomes multidrug-resistant TB (MDR-TB). Since 1987 the United States has reported several outbreaks of MDR-TB among HIV/AIDS-infected individuals. The key to preventing MDR-TB lies in early identification and appropriate treatment of all cases of active TB and preventive therapy for exposed individuals. Drug-resistant types of TB occur in all countries of the world, including Canada.

XDR-TB

The reported occurrences of drug-resistant TB have become even more serious with the development of extensive drug-resistant TB (XDR). Recent surveys from the WHO and the US Centers for Disease Control indicate that XDR-TB has been identified worldwide, including in Canada, but is most prevalent in Asia and the states of the former Soviet Union. The difference between MDR-TB and XDR-TB is the differential resistance abilities of the bacteria. While MDR-TB is resistant to the two first-line tuberculosis drugs, XDR-TB is resistant to those drugs as well as 3 or more classes of the second-line

medications used to treat the disease. Treatment of XDR-TB can take several trials to find effective medications and as a result treatment is far more expensive.

TB and HIV

The HIV epidemic has accelerated a global resurgence of TB. Both diseases are more likely to affect the poor living in crowded, unsanitary conditions or those who engage in prostitution or drug abuse. Worldwide, an estimated 33 million people are living with HIV; 13 million of those people are at risk of developing TB. The greatest prevalence of HIV patients co-infected with TB occurs in sub-Saharan Africa where up to 80% of adult TB patients are also infected with HIV. The WHO estimates that about 12% of HIV deaths globally are due to TB and up to half in some places. The combination of TB and HIV is deadly, because TB is more likely to become active in people with suppressed immune systems. Approximately 58 000 Canadians are living with HIV/AIDS; approximately 23% of those people also have TB.

The more cases there are of active TB, the more likely it is that the disease will begin to spread among healthy populations. In order to control tuberculosis in Canada it is critical that effective screening, preventive and therapeutic programs be pursued meticulously in identified high-risk groups. Extensive education and monitoring programs are vital for reducing the frequency of infection and developing effective treatment of XDR-TB.

Research on tuberculosis is taking place at universities across Canada. These studies include examining tuberculosis control, molecular epidemiology of TB and cultural and socio-economic issues that affect treatment and prevention of the disease.

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