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Tobacco and tuberculosis

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ABSTRACT: ***Tobacco and tuberculosis. J.P. Zellweger.***

Smoking is not only the most important source of avoidable disability and death, but a risk factor for TB infection, disease and death. Even passive smoking exposure may increase the risk of infection and disease in adults and children exposed to TB. Considering the increase in tobacco consumption in developing countries, where the prevalence of TB is the highest, smoking may be responsible for a large part of the burden of disease. Therefore, medical advice and counselling in smoking cessation is an important activity for all care providers engaged in management of TB.
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Keywords: Tobacco smoke, Tuberculosis, Infection, Passive smoking, Developing countries.

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Human beings are not all equally sensitive to infection with *M. tuberculosis* if exposed to a source of contamination. Among persons exposed to the contact with an index case with transmissible tuberculosis, some will develop a latent infection. Of those with a latent tuberculosis infection, some will develop a clinical tuberculosis, and among those suffering from tuberculosis some will die. Several individual factors modulate these risks. Many of them, like HIV infection, steroid treatment or diabetes, are related to the immune defence mechanisms. Smoking, as one of the most potent irritants to the airways, also influences the local immune mechanisms of defence against infection and has long been suspected of influencing the development and outcome of tuberculosis, but the evidence were anecdotal [1]. Other factors, frequently associated with tuberculosis and with smoking, like abuse of alcohol, social deprivation, homelessness and unemployment were suspected to confound the relation [2, 3]. Recently, two systematic reviews of the existing literature have addressed in details the possible influence of smoking on several aspects of tuberculosis and have come to remarkably similar conclusions [4, 5]. Simultaneously, The International Union against TB and Lung Disease and the WHO have prepared documents addressing the relations between tobacco and tuberculosis, and a plan for further action [6, 7].

The mechanisms by which tobacco smoke can influence the mucosal defences responsible for the control of mycobacterial infection include the increase of the production of bronchial secretions, the decrease in mucociliary clearance, and the impairment of macrophage function. This leads to a decrease of bacterial adherence at the surface of macrophages, a decrease of their phagocytic ability, a decrease of the release of proinflammatory cytokines with impaired intracellular killing capacity and a reduced production of TNF-a and nitric oxide (summary in [8]).

The influence of tobacco smoke on tuberculosis can be assessed for different types of risk:

a) risk of infection if exposed to tuberculosis (children exposed to passive smoking and adult smokers);
b) risk of disease if infected, (adults and children);
c) risk of death from tuberculosis.

Risk of infection (if exposed)

Smokers have an increase in the risk of infection (usually assessed by the size of the tuberculin reaction) if exposed to tuberculosis. This increase has been observed in adult smokers, as well as in non-smoking adults and children passively exposed to tobacco smoke. The risk for children passively exposed to tobacco smoke and tuberculosis was assessed in several studies in US [9], India [10], South Africa [11] and Spain [12]. The relative risk was proportional to the intensity and duration of exposure and is evaluated between 1.7 and 3.2. The increased risk of infection for active smokers was demonstrated in UK among elderly nursing home residents [13], in adults in South Africa [14], and Vietnam [15] and in incarcerated adults in Pakistan [16]. The risk is also proportional to the intensity and duration of smoking. The OR lies between 1.72 and 3.2 [3].

Risk of disease (if infected)

Once infected, only a minority of patients will develop tuberculosis, estimates being between 10% for adults and 50% for infants under the age of 1 year [17]. Individual factors influence this rate, the most important being immune deficiency due to HIV, immunosuppressive therapy or dia-

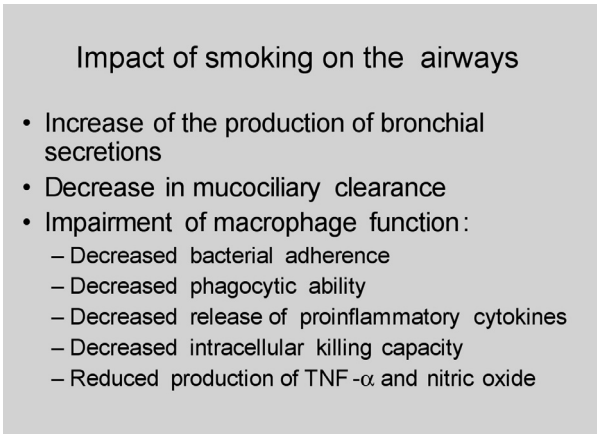

Fig. 1. - Impact of smoking on the airways (after ref 8).

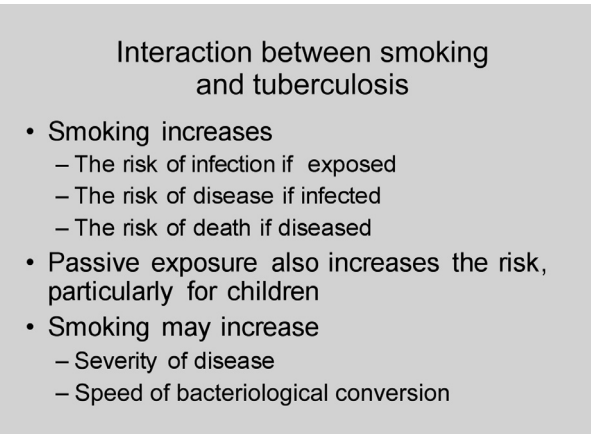

Fig. 2. - Interactions between smoking and tuberculosis.

betes. The increase in risk for smokers compared to non smokers is evaluated up to 4.6 for the development of disease. Furthermore, passive smoking exposure also increases the risk of developing tuberculosis if infected, particularly among children, where the relative risk is between 5 and 9.3 [18, 19].

One of the reviews also addressed the relation between exposure to indoor air pollution (mainly wood smoke from cooking, a general problem in many developing countries) and demonstrated that this was also associated with a higher risk of TB disease [3].

Death from tuberculosis

Once tuberculosis has developed, most patients will be cured by an adequate treatment but in some settings the death rate may still be elevated. This is particularly the case among elderly patients with diverse comorbidities, patients with lung destruction and chronic obstructive pulmonary diseases. The OR for death from tuberculosis associated with active smoking is estimated to be 2.2 [3]. In India, a large survey has concluded that up to half of all TB deaths can be attributed to smoking [20]. These date were confirmed by a prospective study [21].

Some studies have also concluded that the severity of disease, the speed of bacteriological conversion and the rate of failure and relapse may be negatively influenced by smoking [22].

Public Health impact of smoking among TB patients

Smoking has a large impact on public health, due to the increase in risk of several severe and potentially lethal diseases. It appears therefore that the increase in smoking habit is not only the cause of an increase in the prevalence of COPD [23, 24] but also of tuberculosis. Considering the large and increasing number of smokers in many developing countries which also experience a high burden of tuberculosis, the population attributable risk is now considered to be significant [25]. A recent evaluation by WHO has come to the conclusions that up to 16% of cases of tuberculosis in low-income countries and 28% in high-burden countries could be attributed to smoking [26]. The association between smoking and tuberculosis may be even higher in populations with a large proportion of HIV infection [8].

One of the intriguing questions is to know why it has taken so long to realize the interaction between smoking and tuberculosis. One of the reasons may be the fact that smoking was considered a health problem mainly in developed countries with a low burden of tuberculosis, whereas developing countries with a high burden of tuberculosis had until recently a low or moderate prevalence of smoking. One notable exception is Eastern Europe, where the prevalence of both smoking and tuberculosis is high. Considering the increase in smoking habits of the countries with the highest burden of TB, this interaction can no more be ignored.

The practical consequence for all health care workers active in the management of tuberculosis is the clear obligation to address the problem of smoking with all patients under treatment for tuberculosis and to advise the smokers to stop smoking. In order to achieve this, training of health care workers has to be provided. A study has demonstrated the impact of minimal advice in such settings [27]. Patients treated by trained health care workers have a greater chance of stopping smoking at the end of the treatment of tuberculosis than patients treated by untrained health care professionals. Tobacco cessation has to be included in standard practice for all caregivers engaged in the management of tuberculosis [28].

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