**Pulmonary tuberculosis specificities in smokers**

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**KEYWORDS**

Clinic; Radiology; Bacteriology; Smoker; Tuberculosis

**Abstract**

*Background:* Smoking and tuberculosis are two major challenges in public health system. The aim of our study is to identify the impact of smoking on clinical, radiological manifestations and evolutive pulmonary tuberculosis.

*Methods:* This retrospective case-control study examined the files of 104 patients. The patients monitored for pulmonary tuberculosis were divided into 2 groups. We studied the clinical and radiological profile, and evolution in both groups.

*Results:* 104 patients were included, divided into two groups: Group I: 59 current smokers who have tuberculosis (TB) and Group II: 45 TB patients who have never smoked. The mean age is 38 years. All patients in Group I are male while there is no predominance of one sex over the other in group II. The time to diagnosis is delayed in patients who smoke. There is no significant difference in the clinical symptoms. Radiological lesions are diffuse among current smoker patients, as they are mostly unilateral in group II. The clinical outcome was good in 91.1% of TB non smoking patients with weight gain between 2 and 5 kg versus 35.3% in the group of smokers. Bacteriological conversion in the second month was reached in 95.6% of patients in group II, while there was a bacteriological negativity delay in group II patients. Three smoking patients died.

*Conclusion:* Our study raised the harmful impact of smoking on the clinical and radiological presentation of tuberculosis, and late bacteriological negativity, therefore we need to integrate smoking control into the national TB control program.

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**Background**

Smoking and tuberculosis (TB) represent two major issues of worldwide public health, especially in emerging countries. According to the World Health Organization (WHO), there were 8.6 million cases of tuberculosis disease (TD), responsible for 1.3 million deaths in 2012. Every year nearly 6 million deaths are due to smoking among which over 600,000 are non-smokers exposed to the smoke.

The incidence of tuberculosis remains strong despite the effectiveness of antibacillary chemotherapy. Several factors are involved: promiscuity, low socioeconomic status, HIV infection and genetic susceptibility to tuberculosis. Often neglected, the active and passive smoking is a risk factor for pulmonary tuberculosis occurrence. Our study aims to
investigate the effects of smoking on the diagnosis period, clinical, bacteriological, radiological and evolutive pulmonary tuberculosis.

Methods

We made a retrospective case–control study with patients monitored for pulmonary tuberculosis in a health center in Rabat from January 2013 to April 2014. The center’s chief doctor has given permission to conduct and publish this study. The diagnosis is confirmed by two positive bacteriological exams or a positive test and a positive culture or a radiological environment compatible with tuberculosis. We excluded patients in poor condition or malnourished, patients treated with steroids or immunosuppressive therapy, those with a history of respiratory and wean smoking. All data were collected on a pre-established form and data capture and analysis were performed using SPSS version 10.0 software.

This manuscript does not include details, images, or video relating to individual participants, therefore no consent was requested.

Results

A total of 104 patients were included and divided into two groups: Group I represents 59 current smokers with tuberculosis, and Group II represents 45 TB who have never smoked. The mean age of our patients is 38 ± 15 years. The age of the patients in group I (current smokers TB) ranges between 21 and 73 years; while the number of patients in group II ranges from 15 to 67 years. The mean age of patients in group I was higher than that in group II: 42.9 versus 31.6 years. All patients in group I were male while there was no significant gender predominance in Group II: 51.1% men versus 48.9% women.

Contact with tuberculosis was noticed in 37.3% of patients in group I versus only 4.4% in group II, with a statistically significant difference ($p < 0.001$). The degree of smoking intoxication in the smoker group was estimated between 14 and 33 pack-years with a mean of 20 pack-years.

In group I the diagnosis confirmation period is from 30 to 120 days with an average of 60 days, while in the second group the period is between 15 and 60 days with an average of 30 days. The difference between the two groups was statistically significant $p < 0.001$. Clinical symptoms were not different between the two groups (Fig. 1).

Regarding the type of radiological lesions, 89% of group II patients have only one type of radiological lesions. Meanwhile in group I, 44.2% of patients have a combination of several radiological lesions (Figs. 4 and 2). These lesions are usually extended in the group of smokers (71.2%), while they are mostly unilateral in patients who have never smoked (77.1%) with a statistically significant difference ($p < 0.001$) (Fig 3).

All patients were under the same therapeutic regimen: two months of combined rifampicin, isoniazid, ethambutol and pyrazinamide and four months of rifampicin and isoniazid combined. In group I all patients (100%) were compliant, while in group II, three patients discontinued treatment in the second month, but there was no significant impact of smoking on patient compliance.

In the second month of treatment, 91.1% of patients in group II have evolved clinically gaining 2–5 kg weight, while in the first group only 35.3% gained weight with a significant difference ($p < 0.001$).

The AFB sputum in the second month of treatment was systematic in all patients, it was negative in 95.6% of patients in group II versus 66.1% of patients in group I, with a statistically significant difference $p < 0.001$. Thus, smoking is linked to a late negativity Koch’s bacillus in sputum smears in our patients. Three patients died; they were active smokers. No death was observed in group II, but there was no significant difference between the 2 groups.

Discussion

The relationship between smoking and pulmonary tuberculosis was suspected since 1918 and it is only recently that the effect of smoking on TB has been identified [1]. Indeed smoking is not only a major cause of morbidity and mortality, but also one of the risk factors for the occurrence of tuberculosis.
In developing countries, where TB incidence is high, the increase in the prevalence of smoking can have a significant impact on the endemic tuberculosis. In 1956, Lowe had noted in a study in the UK, a higher prevalence of smoking (smoking ≥ 20 c/d) among patients with tuberculosis (50.1% in men and 11.4% in women) than in controls (43.4% in men and 2.4% in women) [2]. In a review of the literature, Davies et al. have also shown that the incidence of TB increases with the consumption of tobacco, the risk is multiplied by 2 or 4 if the number of cigarettes smoked per day is over 20 [3].

Clinical signs in tuberculosis are more important when associated with smoking [4–5]. Cough and dyspnea are more common in smokers [6]. But other studies have not shown any significant difference [7].

The time to diagnosis is longer in the smoker group, the main reasons for this delay are divided into system factors and patient factors: Alcoholism, smoking, other intoxications, mild symptoms, absence of hemoptysis and existence of a chronic respiratory disease [8]. The majority of Moroccan pneumologists believe that there is a consultation delay in smoking-related TB patients most likely explained by the link that the patient has between respiratory symptoms and smoking chronic bronchitis [9].

Initial radiological lesions of tuberculosis are larger and more frequent in smokers than in non-smokers [7]. According to the study of H. Racil in Tunisia, lesions (nodules, infiltrates and excavations) are more important in smokers compared to non-smokers (85% of cases versus 47%, p < 0.001) [1]. Other published data have shown that the lesions are more diffuse in smokers with tuberculosis compared to non-smoking population, with more cavitary lesions, nodular and miliary aspects [4–5]. These results corroborate those found in our series. These extension radiological lesions can be explained by a poor cellular immunity in the local inflammatory site related to lymphopenia (CD4), impaired function of macrophages secondary to smoking, which are the cause of an increase in the disease [10].

Among the risk factors for poor compliance among TB patients, Chang et al. demonstrated in their study that smoking is one of these factors (OR = 3.00; 95% CI 1.41–6.39) [11]. The study by Wang et al. performed in Taiwan in 523 new TB patients also showed there was a positive association between smoking (current or former) and poor adherence to treatment [5].

The response to treatment is estimated by improved clinical symptoms, weight gain and bacteriological conversion. The smoking impact on the clinical course of such patients’ weight gain has not been evaluated in the literature, our study has clearly emphasized this aspect. Regarding the bacteriological conversion, Metanat showed that smoking is significantly associated with negativity delay of sputum smear p < 0.001 (negativation retardation in 53% of smokers versus 10% of non-smokers) [12].

Finally, smoking is linked to an increased risk of tuberculosis mortality among smokers. A case-control study realized by Sitas et al. in South Africa, showed a positive association between smoking (current and former) and mortality from tuberculosis disease (pulmonary and extrapulmonary) with an odds ratio of 1.61 (95% confidence intervals: 1.23–2.11). The fraction of TB deaths related to smoking was 20% [13]. The meta-analysis of Bates et al. including five studies, has also found a positive association between smoking and tuberculosis mortality with a RR of 2.15 [14].

**Conclusions**

Increase in smoking in developing countries is an additional risk factor for developing TB. The smoked tobacco delays the time for the diagnosis of TB, aggravates radiological damage and delays clinical improvement and bacteriological negativity, thus it is important to integrate smoking control in the national TB program.

**Conflicts of interest**

The authors declare no conflict of interest.

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