

ASSOCIATION BETWEEN CIGARETTE SMOKING AND PULMONARY TUBERCULOSIS

Seyed Mohammad Alavi¹, Somayeh Ershadian²

ABSTRACT

Objectives: To determine the association between cigarette smoking and pulmonary tuberculosis.

Methodology: In this retrospective study which was carried out in Razi hospital, in Ahvaz a city southwest Iran, medical charts of patients with tuberculosis between 2005 and 2007 were reviewed. Sixty one patients aged 15-96 years with documented pulmonary tuberculosis (smear positive) were selected as cases and 122 age and sex matched persons without tuberculosis (patients hospitalized in surgery and orthopedic wards) were selected randomly as controls. Data on smoking status, quantity of cigarette smoked, and duration of smoking was collected from medical charts. The data in the two groups were statistically compared with SPSS version 16. The chi square test was used to compare the frequency of cigarette smoking in two groups. Ninety-five percent confidence intervals were calculated when appropriate. Differences with a P value of <0.05 were considered significant.

Results: Of total 61 case, 42 (68.9%) were smoker, while, of total 122 controls 22(18%) were smoker. The estimated odds ratio (OR) of the relation between smoking and tuberculosis was 10.1 [(95% confidence interval (CI) 4.3 to 23.5), P<0.001]. The mean of pocket -year of smoked cigarette (20/pocket) in cases and controls were 15.9±13.7 and 13.5±9.1, respectively (P=0.5).

Conclusion: This study showed that pulmonary tuberculosis is associated to cigarette smoking. The association is not dose-dependent. Smoking may be a risk factor for TB acquisition

KEYWORDS: Tuberculosis, Cigarette smoking.

Pak J Med Sci October - December 2009 (Part-II) Vol. 25 No. 6 912-915

How to cite this article:

Alavi SM, Ershadian S. Association between cigarette smoking and pulmonary tuberculosis. Pak J Med Sci 2009;25(6):912-915.

1. Dr. Seyed Mohammad Alavi, MD. Associated Professor of Medical College.
2. Dr Somayeh Ershadian,
- 1,2: Joundishapour Infectious and Tropical Diseases Research Center, Infectious Disease Ward, Razi Hospital, Joundishapour University of Medical Sciences, Ahvaz, Iran,

Correspondence:

Dr. Seyed Mohammad Alavi
No: 52, West 11 Avenue,
Kianabad, Ahvaz, Iran
Email: alavi1329dr@yahoo.com

- * Received For Publication: April 30, 2009
- * Revision Received: September 24, 2009
- * Revision Accepted: October 21, 2009

INTRODUCTION

Smoking during exposure to tubercle bacilli is likely to produce tuberculosis (TB).¹ TB with 27-50 per 100 000 population incidence rate is the most important endemic infectious disease in Iran.^{2,3} Although directly observed treatment (DOT) strategy has decreased TB transmission and its prevalence, but, in Iran, TB is yet a major public health.^{4,5} Chronic exposure to tobacco impairs the normal clearance of secretions on the tracheobronchial mucosal surface and may thus allow the causative organism, *Mycobacterium tuberculosis*, to escape the first level of host defenses, which prevent bacilli from reaching the alveoli.⁶

Smoke also impairs the function of pulmonary alveolar macrophages, which are not only the cellular target of *M. tuberculosis* infection but also constitute an important early defense mechanism against the bacteria.⁷ Recent work has suggested a novel mechanism for this effect; nicotine is hypothesized to act directly on nicotinic acetylcholine receptors on macrophages to decrease intracellular tumor necrosis factor- α production and thus impair intracellular killing of *M. tuberculosis*.⁸ Predisposing to smoking complication such as cancer, cardiovascular and infection is related to amount of cigarette smoked, which is expressed in pack-year. These complications are more prevalent in heavy smokers (>25 pack-years) than light smokers (<25 pack-years).⁹

There is no consensus whether smoking increase risk of TB.¹⁰ Previous studies on the association between smoking and clinical TB disease showed that there was a significantly increased risk of clinical TB among smokers regardless of AFB positivity, adjustment for ages and socioeconomic status, type of study, or choice of controls.¹¹⁻¹⁹ Cigarette smoking is increasing in Iran where TB is already a problem.^{2-4,20,21} It is important for Iranian health policy makers to further develop strategies for controlling cigarette use in order to reduce the impact of TB in Iran. Since limited studies have evaluated the impact of smoking on TB and the lack of studies supporting the association between smoking and TB in the region of study, we conducted this retrospective study in Ahvaz a city south west Iran. We undertook this study to answer this question whether cigarette smoking has influence on tuberculosis in our population. Meaning of this and probable role of smoking as a risk factor will help us to decrease TB morbidity and mortality by reducing smoking rate.

METHODOLOGY

This retrospective study based on existing data was carried out in Ahvaz city in south West Iran. Medical files of documented tuberculosis cases hospitalized in infectious diseases ward (cases) and hospitalized patients in orthopedic

and surgery wards without TB (controls), during two years period from 2007 to 2009 were reviewed. The study was approved by research deputy board of Medical College affiliated to Ahvaz Jundishapur University of Medical Sciences. Demographic characteristics, medical history, cigarette smoking regarding to duration and number per day, imprisonment, HIV serology status, drug addiction, underlying diseases, and other medical problems were taken from their medical files.

Sixty one TB patients as cases and one hundred twenty two age and sex matched person without TB as control, were enrolled into the study. Inclusion criteria for cases were documented TB, diagnosed based on National Tuberculosis Program (NTP). Cases with at least two sputum smear positive for acid fast bacillus (SSP-AFB) or, a chest radiography (C-X ray) suggestive of tuberculosis plus one SSP-AFB or, sputum culture positive for *M. tuberculosis* and one SSP-AFB were defined as pulmonary tuberculosis (PTB). The amount of cigarette smoked by studied patients were expressed in pack – year. Exclusion criteria were: age less than 15 years and incomplete data. The data in the two groups were statistically compared with SPSS version 16. The chi square test was used to compare the frequency of cigarette smoking in two groups. Ninety-five percent confidence intervals were calculated when appropriate. Differences with a P value of <0.05 were considered significant.

RESULTS

Sixty one cases with the mean age of 41.7 ± 17.8 years, and 122 controls with the mean age of 40.7 ± 15.8 years, were studied. Of total 61 case 42 (68.9%) were cigarette smoker. Of total 122 controls 22(18%) were cigarette smoker. The estimated odds ratio (OR) of the association between smoking and tuberculosis was 10.1 [(95% confidence interval (CI) 4.3 to 23.5), $p < 0.001$]. The mean cigarette per day in cases and controls was 8.9 ± 7.7 and 7.3 ± 7.1 , respectively ($P=0.5$). The mean of pocket –year of smoked cigarette (20/pocket) in cases and controls were 15.9 ± 13.7 and 13.5 ± 9.1 , respectively

Table-I: Underlying diseases and characteristics of cases and controls

Variables	Cases n=61 n (%)	Controls n=122 n (%)	P value
Residency : urban	50(81.9)	104(85.2)	0.35
rural	11(18.1)	18(14.8)	
HIV*	5(8.2)	2(1.6)	0.04
Imprisonment*	18(29.5)	17(13.9)	0.01
IDU*	34(55.7)	12(9.8)	<0.0001
Diabetes mellitus	7(11.5)	9(7.4)	0.25
CDS	4(6.5)	9(7.4)	0.55
Dialysis	2(3.3)	2(1.6)	0.40

HIV; Human immunodeficiency virus, IDU; Injection drug user. CDS; Cardiovascular diseases.

* Difference is significant

(P=0.5). Residency status, co morbidity and other data among studied patients are shown in Table-I. There was significant differences in HIV infection, injection drug use (IDU) and imprisonment between two groups (P<0.05).

DISCUSSION

This is the first study of its kind done in Ahvaz and probably in Iran. The present study showed that cigarette smoking may be a more important risk factor for tuberculosis than those previously documented in literature (OR, 10.1 vs. 2.3). This result therefore suggests that it is important for Iranian health policy makers to further develop strategies for controlling cigarette use in order to reduce the impact of TB in Iran.

A review of recent published reports, showed that cigarette smoking as a risk factors for TB indicated a variation of odds ratio in different area, ranging between 2.1 to 3.13.^{10-13,15-19} There is potential explanation of stronger association between smoking and TB in our study. Existence of other risk factors such as HIV infection, imprisonment and injection drug usage in our patients may be responsible for the development of TB. A previous study in Ahvaz suggested that TB prevalence and its mortality was caused by imprisonment, IDU and HIV infection.²² Thus the higher prevalence of cigarette smoking in TB patients is likely to be higher among the patients due to their life style such as addiction or spent time in prisons. Signifi-

cantly higher prevalence of smoking found in our study, is therefore not surprising. We found that TB was more prevalent in males than in females. This is in agreement with previous studies. In the region of study, males are at higher risk for cigarette smoke exposure because of their high risk behaviors. They also take part in parties or activities, putting them at higher risk of smoking. Hospitalized patients in infectious diseases ward were found to have higher risk of smoking compared with control (68.9% vs18%). This could be because the patients admitted in this ward would be expected to have higher chances of being exposed to risk factors of TB. The present study showed that the total amount of cigarette smoked had no significant effect on TB development. This finding is against previous studies that suggested increasing amount in cigarette smoked is associated with higher risk of TB. The reason of this finding is not clear and further prospective studies are needed to achieve better results. The finding that smoking is an important risk factor for TB in our region has obvious TB control implication. High prevalence smoking in TB patients requires high attention focused on fighting against cigarette smoking in population especially young people as well as TB patients.

CONCLUSION

This study showed that frequency of smoking in TB patients in the region is more prevalent than was expected. Tuberculosis is

associated to cigarette smoking. The association does not show dose-dependency. Cigarette smoking may be an important risk factor for developing tuberculosis.

Limitations of the study: The study has several limitations. First, our finding is based on the retrospective observational study; we can not, therefore, exclude the possibility of confounding by variables that may be associated with each of the exposures. For examples TB patients are more likely to be smokers. Second, we compared TB patients with non TB patients and frequency of smoking in each group was analyzed. Further prospective study including large population of smokers and non smokers is needed for determining the smoking as a risk factor for TB.

ACKNOWLEDGEMENTS

We wish to thank research deputy of medical college for approving this study as a medical student dissertation No. 8856 and also thank Joundishapour Infectious Disease and Tropical Medicine Research Center for technical support, infectious ward personnel and medical files archivist of Razi hospital for their kindly cooperation.

Conflicts of interest statement: This study was approved and supported by college of medicine of Joundishapour University of medical sciences and there is no conflict of interest.

REFERENCES

- Bathomley GH. Smoking and tuberculosis: a chance or causal association. *Thorax* 2005;60:527-528.
- Iranian Center of Control and Prevention of Diseases. Epidemiological situation of tuberculosis in Iran, Ministry of health, 2002.
- Alavi SM, Sefidgran GH. Tuberculin survey among school-aged children in Ahvaz, 2006. *Int J Infect Dis [pub med]* 2008;12(4):406-409.
- Mirhaghani L, Nasehi M. National Tuberculosis Program in Iran, Ministry of health, Nashre Seda 2002;15-20
- World Health Organization. Global tuberculosis control: surveillance, planning, financing, Geneva: WHO; 2005. WHO document WHO/HTM/TB/2005.349.
- Houtmeyers E, Gosselink R, Gayan-Ramirez G, Decramer M. Regulation of mucociliary clearance in health and disease. *Eur Respir J* 1999;13:1177-1188.
- Sopori M. Effects of cigarette smoke on the immune system. *Nat Rev Immunol.* 2002;2:372-377.
- Wang H, Yu M, Ochani M, Amella CA, Tanovic M, et al. Nicotinic acetylcholine receptor alpha7 subunit is an essential regulator of inflammation. *Nature.* 2003;421:384-388.
- Minna JD. Neoplasms of the lung. In: Kasper AS, Hauser SL, Longo DL, Jameson JL. (eds). *Harrison's Principles of Internal Medicine*, 16th Edition, New York, McGraw-Hill Companies 2005;115:506-516.
- Lin HH, Ezzat M, Muray M. Tobacco smoke, indoor air pollution and tuberculosis: A systemic review and meta-analysis. *Plos Med* 2007;4(6):e20.
- Lienhardt C, Fielding K, Sillah JS, Bah B, Gustafson P. Investigation of the risk factors for tuberculosis: A case-control study in three countries in West Africa. *Int J Epidemiol* 2005;34:914-923.
- Leung CC, Yew WW, Chan CK, Tam CM, Lam CW. Smoking and tuberculosis in Hong Kong. *Int J Tuberc Lung Dis* 2003; 7:980-986.
- Shetty N, Shemko M, Vaz M, D'Souza G. An epidemiological evaluation of risk factors for tuberculosis in South India: A matched case control study. *Int J Tuberc Lung Dis* 2006;10:80-86.
- Crampin AC, Glynn JR, Floyd S, Malema SS, Mwinuka VK. Tuberculosis and gender: Exploring the patterns in a case control study in Malawi. *Int J Tuberc Lung Dis* 2004;8:194-203.
- Kolappan C, Gopi PG. Tobacco smoking and pulmonary tuberculosis. *Thorax.* 2002;57:964-966.
- Tekkel M, Rahu M, Loit HM, Baburin A. Risk factors for pulmonary tuberculosis in Estonia. *Int J Tuberc Lung Dis* 2002;6:887-894.
- Gupta D, Aggarwal AN, Kumar S, Jindal SK. Smoking increases risk of pulmonary tuberculosis. *J Environ Med* 2001;3:65-70.
- Ariyothai N, Podhipak A, Akarasewi P, Tornee S, Smithtikarn S. Cigarette smoking and its relation to pulmonary tuberculosis in adults. *Southeast Asian J Trop Med Public Health* 2004;35:219-227.
- Leung CC, Li T, Lam TH, Yew WW, Law WS. Smoking and tuberculosis among the elderly in Hong Kong. *Is J Respir Crit Care Med* 2004; 170:1027-1033
- Ahmadi J, Khalili H, Jooybar R, Namazi N, Mohammadagaei P. Prevalence of cigarette smoking in Iran. *Psychol Rep* 2001;89(2):339-41.
- Ahmadi J, Khalili H, Jooybar R, Namazi N, Aghaei PM. Cigarette smoking among Iranian medical students, resident physicians and attending physicians. *Eur J Med Res* 2001;28;6(9):406-8.
- Alavi SM, Salami N. The causes of death among patients with tuberculosis in Khuzestan, Iran. *Pak J Med Sci* 2008;24(2);217-220.