ASSOCIATION BETWEEN PERSONAL HABITS AND PULMONARY TUBERCULOSIS: A CASE CONTROL STUDY

Medical Science

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ABSTRACT

Background The risk of progression from infection to disease, or the risk of death among tuberculosis patients in smokers & alcoholics is less clear.

Objective To evaluate association between personal habits & pulmonary tuberculosis.

Materials & method This was case control study carried out in tertiary care hospital & urban field practice area from July 2010 to November 2012. Total 150 cases, 150 hospital control & 150 community controls were included in the study according to predefined inclusion and exclusion criteria.

Results On univariate analysis for smoking, cases versus hospital controls (OR = 3.29, p = 0.0002) and cases versus community controls (OR = 2.88, p = 0.0008). Alcohol intake was identified as a significant risk factor associated with pulmonary tuberculosis.

Conclusion Smoking & alcohol intake was identified as a significant risk factor associated with pulmonary tuberculosis on analysis with hospital as well as community the control groups.

KEYWORDS

smoking, alcohol, tuberculosis

INTRODUCTION

It is found that 50% of deaths from tuberculosis among Indian men was attributed to smoking. Association between smoking and tuberculosis disease has been shown in various studies. Risk of Mycobacterium tuberculosis infection, the risk of progression from infection to disease, or the risk of death among tuberculosis patients in smokers is less clear. (1)

Knut Lönnroth et al in their systemic review concluded that consumption of more than 40 g alcohol per day, and/or having an alcohol use disorder is associated with a three-fold risk increase of active TB. This could be due to both increased risk of infection related to specific social mixing patterns associated with alcohol use, as well as influence on the immune system of alcohol itself and of alcohol related conditions. These findings have implications for TB control strategies globally, particularly in countries where a high proportion of TB can be attributed to alcohol use. (2)

Very important tool to detect the strength of association of risk factors with a disease is the case control study. Present study was carried out to evaluate association between personal habits & pulmonary tuberculosis. Results were drawn with two sets of controls separately i.e. hospital controls and community controls to find out an appropriate control group in case control studies.

Objective

To evaluate association between personal habits & pulmonary tuberculosis.

Materials & method
Study design: Case-control study

Study participants:
Cases: New cases of smear positive pulmonary tuberculosis attending TB & Chest OPD.

Hospital controls: Patients attending Medicine OPD.

Community controls: Residents of Urban Health Field Practice Area.

Duration of study period: July 2010 to November 2012

Study setting:
For cases: TB and Chest OPD of the Medical College & Hospital.

For Hospital controls: Medicine OPD of the Medical College & Hospital.

For Community controls: Urban Health Field Practice Area of the Medical College.

Selection of cases and controls :
Case definition : A ≥ 15 years old patient with c/o cough for more than 2 weeks and found to be positive for tubercle bacilli on sputum smear examination[2].

Control definition : A person matched for age (± 5 years) and sex who were not having c/o cough for more than 2 weeks and were ≥ 15 years old. Two controls were taken against every case, one hospital control from Medicine OPD and the other community control from the Urban Health Field Practice Area. One to one age & sex matching was done.

Inclusion criteria : The participants who fulfilled the criteria mentioned in case and control definitions.

Exclusion Criteria : Persons having H/O tuberculosis were excluded from the study.

Sample Size Estimation (2):
On the basis of findings of pilot study, proportion of exposure (history of contact with case of tuberculosis) in cases was found to be 18% and in hospital controls it was 8%.

p_1 – Proportion of exposure in the diseased population = 0.18
p_2 – Proportion of exposure in the control population = 0.06
$q_1 = 1 - p_1$
$q_2 = 1 - p_2$
α – level of significance = 0.05
β – claiming that exposure is not associated with disease when in fact it is = 0.01
$Z_\alpha = 1.96$, $Z_\beta = 1.28$
Sample size was determined by the following formula:
$N = (Z_\alpha + Z_\beta)^2 (p_1 q_1 + p_2 q_2) / (p_2 - p_1)^2$
$N = 137$

METHODOLOGY

Approval from institutional ethics committee and Maharashtra University of Health Sciences (MUHS), Nashik was taken before commencing the study. After informed and written consent was sought, the study participants were interviewed and examined according to the preformed and pretested proforma in the respective OPDs.

The TB & Chest OPD was visited daily for cases. Visit was given to the Medicine OPD for matched controls. The community controls were taken within 7 days of the interview of the cases. The proforma included detailed information about personal habits (Alcohol Intake, Smoking, Tobacco Chewing and other Drug Abuse).

STATISTICAL ANALYSIS:

Statistical analysis was done by percentages, odds ratio, 95% confidence intervals, and chi square test as a test of significance. P Value < 0.05 was taken as statistically significant. Software Epiinfo version 7.1 was used for statistical analysis.

RESULTS & OBSERVATIONS

Table 1: Association of Pulmonary Tuberculosis with Smoking

Smoking	Cases N (%)	Hospital controls N (%)	Community controls N (%)
Yes	41 (38.32)	17 (15.89)	19 (17.76)
No	66 (61.68)	90 (84.11)	88 (82.24)
Total	107 (100)	107 (100)	107 (100)

Cases v/s controls	OR	95% CI	p value
Cases v/s hospital controls	3.29	1.72 – 6.29	x^2 = 13.62, df = 1 p = 0.0002
Cases v/s community controls	2.88	1.53 – 5.41	x^2 = 11.21, df = 1 p = 0.0008

In table 1of the 107 cases, history of smoking was given by 41 (38.32%) males. Of the 107 hospital controls, history of smoking was given by 17 (15.89%) males. Of the 107 community controls, history of smoking was given by 19 (17.76%) males.

On analysis of cases versus hospital controls & community controls, smoking was found to be associated with risk of pulmonary tuberculosis and this association was found to be statistically significant (OR = 3.29, 95% CI 1.72 – 6.29, p = 0.0002), (OR = 2.88, 95% CI 1.53 – 5.41, p = 0.0008) respectively.

Table 2: Association of Pulmonary Tuberculosis with Present Status of Smoking(4)

Smoking	Cases N (%)	Hospital controls N (%)	Odds ratio	Community controls N (%)	Odds ratio
Never	66 (61.68)	90 (84.11)	1	88 (82.24)	1
Past	5 (4.67)	2 (1.87)	3.41	3 (2.80)	2.2
Current	36 (33.65)	15 (14.02)	3.27	16 (14.96)	3
Total	107 (100)	107 (100)		107 (100)	
p value		x^2 for trend = 13.02, df = 1 p = 0.0003		x^2 for trend = 11.2, df =1 p = 0.0008	

Table 2A shows that significant increasing trend in risk of pulmonary TB was observed according to present status of smoking of study participants when cases were compared to hospital controls (x^2 for trend = 13.02, p = 0.0003).

A significant increasing trend in risk of pulmonary TB was observed according to present status of smoking of study participants when cases were compared to community controls (x^2 for trend = 11.2, p = 0.0008).

Dose-response relationship between smoking and pulmonary tuberculosis (5)

Smokers were categorized as mild (1–10 cigarettes/day), moderate (11–20/day), and heavy smokers (>20/day) on the basis of the mean number of cigarettes/bidis smoked per day.

An interesting and statistically significant trend was observed in dose-response relationship of pulmonary TB with smoking. When compared to never-smokers, the estimates of odds ratios were found to increase from mild to moderate smokers, but then dropped down for heavy smokers among hospital controls and community controls as well.

On analysis of cases versus hospital controls, the odds ratios for mild, moderate, and heavy smokers were 2.85, 8.18 and 2.05 respectively (x^2 for trend = 10.28, df = 1, p = 0.0013).

On analysis of cases versus community controls, the odds ratios for mild, moderate, and heavy smokers were 2.04, 8 and 4 respectively (x^2 for trend = 12.49, df = 1, p = 0.0004).

Cumulative effect of smoking on occurrence of pulmonary tuberculosis on the basis of duration of smoking (5)

On analysis of cases versus hospital controls, odds ratios for <10 years, 11–20 years, and >20 years were 0.87, 8.18 and 7.5 respectively (x^2 = 9.825, df = 1, p = 0.0017).

On analysis of cases versus community controls, odds ratios for <10 years, 11–20 years and >20 years were 0.62, 8 and 14.67 respectively (x^2 = 18.70, df = 1, p = 0.0001).

TABLE 3: Association of Pulmonary Tuberculosis with Alcohol Intake

Alcohol intake	Cases N (%)	Hospital controls N (%)	Community controls N (%)
Yes	62 (57.94)	34 (31.78)	43 (40.19)
No	45 (42.60)	73 (68.22)	64 (59.81)
Total	107 (100)	107 (100)	107 (100)

Cases v/s controls	OR	95% CI	p value
Cases v/s hospital controls	2.96	1.69 – 5.18	x^2 = 14.81, df = 1 p = 0.0001
Cases v/s community controls	2.05	1.19 – 3.54	x^2 = 6.75, df = 1 p = 0.0094

In table 3 on analysis of cases versus hospital controls, alcohol intake was found to be associated with risk of pulmonary tuberculosis and this association was statistically significant (OR =2.96, 95% CI 1.69 – 5.18, p = 0.0001). Also, on analysis of cases versus community controls, alcohol intake was found to be associated with risk of pulmonary tuberculosis and this association was statistically significant (OR = 2.05, 95% CI 1.19 – 3.54, p = 0.0094).

TABLE 4: Association of Pulmonary Tuberculosis with Present Status of Alcohol Intake (6)

Alcohol intake	Cases N (%)	Hospital controls N (%)	Odds ratio	Community controls N (%)	Odds ratio
Life time abstainer	45 (42.06)	73 (68.23)	1	64 (59.81)	1
Former drinker	11 (10.28)	5 (4.67)	3.57	1 (0.94)	15.64
Current drinker	51 (47.66)	29 (27.10)	2.85	42 (39.25)	1.73
Total	107 (100)	107 (100)		107 (100)	
p value		x^2 for trend = 13.07, df = 1 p = 0.0003		x^2 for trend = 39.04, df = 1 p = 0.0482	

Table 4 shows that on analysis of cases versus hospital controls, odds ratios life time abstainers, former and current drinkers were 1, 3.57 and 2.85 respectively (x^2 for trend = 13.07, p = 0.0003).

On analysis of cases versus community controls, odds ratios life time abstainers, former and current drinkers were 1, 15.64 and 1.73 respectively (x^2 for trend = 39.04, p = 0.0482).

TABLE 5: Association of Pulmonary Tuberculosis with Tobacco Chewing

Tobacco chewing	Cases N (%)	Hospital controls N (%)	Community controls N (%)
Yes	60 (40)	51 (34)	60 (40)
No	90 (60)	99 (66)	90 (60)
Total	150 (100)	150 (100)	150 (100)

Cases v/s controls	OR	95% CI	p value
Cases v/s hospital controls	1.29	0.81 – 2.07	x^2 = 1.16, df = 1 p = 0.2818
Cases v/s community controls	1	0.63 – 1.59	x^2 = 0.00, df = 1 p = 1

Table 6 shows that on analysis of cases versus hospital controls, habit of tobacco chewing was not found to be significantly associated with pulmonary tuberculosis (OR = 1.29, 95% CI 0.81 – 2.07, df = 1, p = 0.2818).

On analysis of cases versus community controls, habit of tobacco

chewing was not found to be associated with pulmonary tuberculosis as their number was same in both the groups (OR = 1, 95% CI 0.63 – 1.587, df = 1, p = 1)

Discussion
Smoking
On univariate analysis of cases versus hospital controls, smoking was found to be a significant risk factor associated with pulmonary tuberculosis (OR = 3.29, 95% CI 1.72 – 6.29, p = 0.0002). On univariate analysis of cases versus community controls, smoking was found to be a significant risk factor associated with pulmonary tuberculosis (OR = 2.88, 95% CI 1.53 – 5.41, P = 0.0008).

On analysis of cases versus community controls, the odds ratios for never, past and current smokers were 1, 2.2 and 3 respectively (x^2 for trend = 11.2, p = 0.0008). An interesting and statistically significant trend was observed in dose-response relationship of pulmonary TB with smoking (5).

On analysis of cases versus hospital controls, the odds ratios for mild (1–10 cigarettes/ day), moderate (11–20/ day), and heavy smokers (>20/ day) on the basis of the mean number of cigarettes/bidies smoked per day were 2.85, 8.18 and 2.05 respectively (x^2 for trend = 10.28, p = 0.0013). On analysis of cases versus community controls, the odds ratios for mild, moderate, and heavy smokers were 2.04, 8 and 4 respectively (x^2 for trend = 12.49, df = 1, p = 0.0004).

Cumulative effect of smoking on the basis of duration was also studied[4]. On analysis of cases versus hospital controls, odds ratios for <10 years, 11–20 years, and >20 years were 0.87, 8.18 and 7.5 respectively (x^2 = 9.825, p = 0.0017). On analysis of cases versus community controls, odds ratios for <10 years, 11–20 years and >20 years were 0.62, 8 and 14.67 respectively (x^2 = 18.70, p = 0.0001).

Alcaide J et al (1996) (7) found on MLR analysis, the active smoking was a significant risk factor for pulmonary tuberculosis (Adj OR = 3.8, 95% CI 1.5 – 9.8, p < 0.01). Dose response relationship was also assessed and found to be significant with increasing number of cigarettes smoked per day (for 1 – 20 cigarettes/ day: p < 0.05 and for 20 – 40/ day: p < 0.001). **Kolappan C et al (2002) (5)** found statistically significant dose response relationship between smoking and pulmonary tuberculosis (x^2 for trend = 18.365, p < 0.0001). Cumulative effect of smoking on the occurrence of pulmonary tuberculosis when categorized as <10 years, 11–20 years, and >20 years, gave Odds ratios of 1.72, 2.45, and 3.23, respectively (p < 0.0001). In a hospital-based case-control study conducted by **Ariyothai N et al (2004)(8)** longer duration of smoking was more likely associated with risk of pulmonary tuberculosis (OR = 2.96, 95% CI = 1.06-8.22).

Alcohol intake
On univariate analysis of cases versus hospital controls, alcohol intake was found to be associated with risk of pulmonary tuberculosis and this association was statistically significant (OR = 2.96, 95% CI 1.69 – 5.18, p = 0.0001). Also, on univariate analysis of cases versus community controls, alcohol intake was found to be associated with risk of pulmonary tuberculosis and this association was statistically significant (OR = 2.05, 95% CI 1.19 – 3.54, p = 0.0094). On analysis of cases versus hospital controls, odds ratios for life time abstainers, former and current drinkers were 1, 3.57 and 2.85 respectively (x^2 for trend = 13.07, p = 0.0003). On analysis of cases versus community controls, odds ratios for life time abstainers, former and current drinkers were 1, 15.64 and 1.73 respectively (x^2 for trend = 39.04, p = 0.0482).

Shetty N et al (2006) (4) found that on multivariable analysis, alcohol intake was not a significant factor associated with pulmonary tuberculosis (p = 0.06). In a study conducted by **Hill PC et al (2006) (9),** alcohol intake was not found to be a significant risk factor associated with pulmonary tuberculosis (OR = 2.05, 95% CI 0.79–5.32, p = 0.14). **Kolappen C et al (2007) (10)** detected that alcoholics had higher risk of contracting the disease than non-alcoholics after controlling other factors seen in the study (Prevalence OR = 1.5, 95% CI 1.2–2.0). **Gajalakshmi V et al (2009) (11)** concluded that alcohol intake, after adjustment for smoking was a statistically significant risk factor associated with pulmonary tuberculosis (Incidence Rate Ratio = 1.5, 95% CI 1.2 – 1.9, p<0.00001).

1. Tobacco chewing
There are very few studies showing the association between tobacco chewing and pulmonary tuberculosis and it was not found to have significant association in the present study too. **Pradeepkumar AS et al (2008) (12)** found that 22.3% of the participants used to chew tobacco from at least 6 months before diagnosis of tuberculosis.

CONCLUSION
Smoking & alcohol intake was identified as a significant risk factor associated with pulmonary tuberculosis on analysis with hospital as well as community the control groups.

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