

## Impact of Tobacco Smoke on Tuberculosis: A Case Control Study

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**Abstracts:** Background: Smoking increase the risk of tuberculosis 2-4 times, In our country half of tubercular death in men is attributed to smoking, around 17% smokers and 1/3 tubercular patients of the world reside here. Objective: To study the impact of smoking on sputum status and clinico radiological profile of tubercular patients. Method: We did a case control study, comprises in two groups, study and control group, a total of 120 Tubercular (Pulmonary & Extra-pulmonary) patients were studied in which 65 were smoker (study group), 55 non smoker (control group). Detailed clinico-radiological study was done during the period of 9 months. Result: The prevalence of tuberculosis (Pulmonary & extra pulmonary) among smokers is 23.63%, out of them prevalence of pulmonary tuberculosis 80% (odd ratio OR 4.8), cough (98.4%), and Dyspnoea (93.8%) was prominent clinical symptoms in study group, as well as cavitations (98.07%), & fibrosis (98.07%) radiologically significant presentation in smokers besides this relapse as well as re infection was higher among smoker's (64.61%). Sputum positivity was high for heavy smokers (86.7%). Extra-pulmonary tuberculosis low (20%) in study group (0.21). Conclusion: Smoking is a significant risk factor for pulmonary tuberculosis as well as it aggravates the severity and relapse of diseases. [Agarwal V K et al. NJIRM 2011; 2(3): 38-42]

**Key Words:** India, Tuberculosis, Smoking,

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**Introduction:** Smoking prevalence is high in western countries as in USA 20% of adults are smokers<sup>1</sup>, comparative figure from India varies from 15-50% among men<sup>2</sup>. 17% of total smokers and 1/3 tubercular patient of the world reside in our country<sup>3</sup>, Smokers are 2-4 times more prone to get tubercular infection<sup>1</sup> as well as it increase the T.B. mortality by nine fold, around 50% of death due to tuberculosis in Indian men attributed to smoking<sup>4</sup>. Tuberculosis with smoking is a double trouble as it helps in spreading the infection, change the latent tuberculosis in clinically active stage, as well as aggravates the severity also<sup>4,5</sup>. It was also reported that extra pulmonary tuberculosis more prevalent in smokers<sup>5,6</sup>. Therefore a case control study was done to assess the impact of tobacco smoke on sputum status as well as clinico radiological profile of tubercular patient.

**Material and Methods:** The study was carried out in the Department of Chest & Tuberculosis after taking the permission of Ethical committee of Rohilkhand Medical College & Hospital Bareilly U.P. We included patients belonging to the region of Rohilkhand and those visited to chest OPD as well as admitted in chest ward. Period of study was 9

month Jan 2010- Sep 2010. Sputum smear positive pulmonary tuberculosis as well as extra pulmonary tuberculosis with smoking habit taken as case, and sputum smears positive pulmonary as well as extra pulmonary non smokers as a control. HIV positive, Diabetic, ischemic heart disease, patient with renal failure and pregnant women were excluded from the study. Informed consent was taken from all subjects. Approval for this study was also obtained from ethical committee of our institution. History of smoking was taken as per predesigned questionnaire, as type of smoking, duration of smoking, no of bidi/cigarette per day, current smoking status, age of starting smoking. besides this smoke check was done by smoke check machine (Bedfont-England, Smokerlyzer) procedure was standard, subject were asked to inhale deeply then hold the breath for 15 seconds and exhale completely in a device, reading appear on screen was noted and stratified the patient according to the breath CO (Carbon mono oxide) level in ppm (0-6 non smoker, 7-10 light smoker, 11-20 heavy smokers, > 20 very heavy smokers)<sup>7</sup>. Extensive clinical and radiological status was studied in both the groups. All routine and specific investigation was done as per requirement,

sputum examination was done in RNTCP accredited microscopy center in our department

**Result:** A total of 120 subject were enrolled in which 65 case and 55 were control Total new cases (excluding the patient not fit in inclusion criteria) visited to chest OPD during the period of study were 687 in which , 275 smokers ,were screened out of them 65 were tubercular ( Pulmonary & Extra pulmonary) 23.63% , 52 ( 80%) sputum positive and 13 ( 20%) were sputum negative extra pulmonary,(1 sputum positive as well as extra pulmonary tuberculosis included in sputum positive pulmonary case), rather in control group

45.45% were pulmonary tuberculosis ( OR 4.8) and 54.5% extra-pulmonary tuberculosis (OR 0.21) . Hence prevalence of Pulmonary tuberculosis among smokers is high and statistically significant (<0.001).

Majority of the cases in study group were Male ( 95.38%) and statistically significant, in control group male were only 34.28%, middle age group affected predominantly in study group ( mean age/sd 46.42+/- 12.08) rather in control ( mean age/sd 36+/- 12.2)early age group affected significantly (Table 1).

**Table 1. Socio-demographic characteristics in case and control groups**

		CASE [total number=65]		CONTROL [total number=55]		Pvalue
		no.	%	no.	%	
SEX	MALE	62	95.38%	19	34.54%	p>0.001
	FEMALE	03	4.61%	36	65.45%	
RELIGION	HINDU	52	80%	40	72.72%	
	MUSLIM	13	20%	15	27.27%	
	OTHERS	0		0	0%	
AGE IN YEARS	10-20	03	4.61%	12	22.85%	NS
	21-30	05	7.69%	13	23.63%	
	31-40	13	20%	14	25.71%	
	41-50	20	30.76%	6	11.42%	
	51-60	14	21.53%	8	14.28%	
	>60	10	15.38%	2	2.85%	
EDUCATION	ILLETERATE	31	47.69%	34	62.85%	NS
	1-4 CLASS	1	1.5%	2	3.6%	
	5-8 CLASS	17	26.15%	6	10.9%	
	9-12 CLASS	14	21.5%	5	9%	
	>12 CLASS	2	3%	8	14.54%	
MARITAL STATUS	YES	56	86%	41	74.54%	NS
	NO	9	14%	14	25.45%	
RESIDENCE AREA	RURAL	41	63%	36	65.45%	0.06
	URBAN	24	37%	19	34.54%	
OCCUPATION	BUSINESS	19	29.23%	4	7.2%	NS
	STUDENT	1	1.5%	8	14.54%	
	FARMER	35	53.84%	8	14.54%	
	OTHER	08	12.3%	31	56.36%	
	NONE	02	3%	4	7.2%	
FAMILY HISTORY OF TB	PRESENT	16	24.6%	11	20%	0.2736
	ABSENT	49	75.38%	44	80%	

According to present study light smokers 65.69% were more affected than heavy smokers 24.61% , But sputum positivity was high among heavy smokers group, (Table 5). 3+ sputum in smokers was 57.9% rather in control 24% (  $p < 0.01$ ). (Tab 3) hence they were in more severe stage. Symptomatic study reveal that cough ( 93.9%) and dyspnoea ,( 93.9%) was prominent symptoms in smokers tuberculosis ( $p < 0.001$ ) (Tab 7) . Other features like fever, chest pain, anorexia also more prominent in smokers but they were statistically non significant. .

**Table 2: Patient according to prevalence of diseases**

	Case ( n= 65)		Control ( n= 55)		P value
Pulmonary Tuberculosis	52*	80 %*	25	45.45%	<0.001
Extra pulmonary tuberculosis	13	20%	30	54.5%	

\* One case pulmonary with extrapulmonary included in pulmonary tuberculosis

**Tab 3: Distribution of patient according to sputum positivity (Grading) status**

Sputum status for pulmonary tuberculosis	Case (N=52)*		Control (N =25)*		P value
+ 3	30	57.9 %	6	24%	< 0.01
+2	9	17.3%	2	8%	NS
+1	12	23.07%	14	56%	<0.01
Scanty	1	1.9%	3	12%	

\* Pulmonary tuberculosis only

Radio logically cavitatory ( 98.07%) lesion appear significantly high in cases (  $p < 0.02$ ) , besides this fibrosis also predominantly observed in cases (98.07%)(Table6). History of repeated antitubercular therapy also high in case 64.61% rather in control it is 45.71% (  $p < 0.05$ ).Hence

**Table 5: Distribution of patient on basis of Breath CO ( carbon monoxide) level and sputum status in smokers**

Pulmonary tuberculosis ( n= 52 *)												
CO level ( Breath analysis)	7-10 ppm ( n= 32) ( Light Smoker)				11-20 (n= 15) (Heavy Smoker)				20+ ( n= 5) ( Very Heavy Smoker)			
	3+	2+	1+	Scanty	3+	2+	1+	scanty	3+	2+	1+	Scanty
<b>Sputum grading</b>	3+	2+	1+	Scanty	3+	2+	1+	scanty	3+	2+	1+	Scanty
<b>No. of pt.</b>	12	8	11	1	13	1	1	00	5	00	00	00
<b>%</b>	<b>37.5</b>	25	34.3	3.1	<b>86.7</b>	6.7	6.7	00	<b>100</b>	00	00	00

\* One pulmonary + extra pulmonary tubercular case included

relapse as well as re infection is high among smokers.

**Table 4: Distribution of Case on basis of smoking habit**

No of bidi/cigerattes per day	Case [n=65]	%
1-10	12	18.46 %
11-20	23	35.38 %
21-30	17	26.15 %
>30	13	20 %

**Discussion:** In our study the impact of tobacco smoke was studied in detail in tubercular patient without the interfering effect of HIV, diabetes, IHD, renal failure, pregnancy. In our study the prevalence of tuberculosis (Pulmonary & Extra pulmonary) among smoker was 23.63%, among them pulmonary tuberculosis was very high 80% .in comparison to non smoker 45.45% ( $p < 0.001$ ). Another study conducted by Prasad et al<sup>8</sup> in Lucknow shows Odd ratio in smoker for tuberculosis was 3.8, and Linn et al<sup>9</sup> reported that risk was 1.94 times , less than our study ( OR 4.8) .Besides these study Kolappan et al<sup>10</sup> and Leung<sup>11</sup> endorsed the risk of tuberculosis among smokers, It was reported that smoking have deep impact on respiratory system by decreasing immune response, mechanical disruption of cilia function, defect in macrophage response, decrease CD4 count and reduce lysozyme activity resultantly enhance the entrance of toxic substance and bacteria<sup>1</sup>. Nicotine also acts directly on nicotine acetylcholine receptor and decrease the production of TNF Alpha that impaired killing effect of macrophage intracellular<sup>12</sup>. Male population affected more (95.38%) among smokers, as in our country smoking habit is common in male (28.5%) rather in female it is around 2.1% only<sup>13</sup>.

**Table 6: Radiological presentation in subjects (Pulmonary tuberculosis).**

	Case (n=52)		Control (n= 25)		P value
<b>Cavitations</b>	51	<b>98.07%</b>	19	76%	<0.02
<b>Fibrosis</b>	51	<b>98.07%</b>	17	68	<0.01
<b>Consolidation</b>	8	15.38%	3	12%	
<b>Infiltration</b>	5	9.61%	2	8%	
<b>Calcification</b>	6	11.53	1	4%	

**Table 7: Analysis of patient according to symptomatology.**

	Case ( n= 65)		Control (n= 55)		P value
<b>Cough</b>	64	98.4%	40	74.2%	< 0.001
<b>Fever</b>	63	96.9%	50	91.4%	NS
<b>Dyspnoea</b>	61	93.8%	33	60.5%	< 0.001
<b>Chest pain</b>	48	73.8%	37	68.5%	NS
<b>Haemoptysis</b>	18	27.6%	19	34.2	NS
<b>Anorexia</b>	58	89.2%	44	80%	NS

It was reported that Smoking also increase the relapse as well as re infection after successful tuberculosis treatment<sup>4</sup>, in our study 64.61% smokers given previous history of tuberculosis treatment, this figure is quite less in non smokers 45.71% (p<0.05).it need more detailed study separately .Sputum positivity 3+ was high in smokers 57.9% rather in non smokers it was 24% (p<0.01), it would be due to inflammation of airway, increase Reid index, more production of mucus hence the sample was appropriate for microscopy.

All the symptoms were more aggressive amongst smokers but cough (98.4%) and dyspnoea(93.8%) were found statistically significant, A study done in Hong Kong demonstrated that cough & dyspnoea were more prominent among smokers<sup>14</sup>.Shprykov et al<sup>5</sup> reported that in smokers tuberculosis was more severe and disseminated type. Radiologically it was found that cavitary (98.07%) and fibrotic (98.07%) lesions were more prevalent in present study Another study conducted in Hong Kong reported that cavitary and millitary pattern was predominantly present in smokers tuberculosis<sup>14</sup>. Racil et al<sup>15</sup> also reported that smokers have more severe radiological sequelae rather in non smokers'. In present study extra pulmonary

tuberculosis (24.7%) was not predominantly affected the smoker's group although it was reported in few study<sup>16</sup>.

**Conclusion:** The prevalence of tuberculosis ( Pulmonary & Extra Pulmonary ) in smokers was 23.63%, among them pulmonary ( 80%) involvement was statistically significant (OR 4.8), relapse or reinfection of tuberculosis (64.61%) was common among smokers, and they were more sputum 3+ positive ( 57.9%)than control group, Cough (98.4%)and dyspnoea( 93.8%) was predominantly present in smokers', radiologically cavitations (98.07%) and fibrosis ( 98.07%) frequently appear in study group, instead of this Extra pulmonary site less commonly affected in smokers( 20% ) comparative to control group (54.5%).Therefore emphasis on tobacco control should be endorsed in national TB control programs.

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