

# Tobacco use and nicotine dependence among newly diagnosed pulmonary tuberculosis patients in Ballabgarh tuberculosis unit, Haryana

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## ABSTRACT

**Introduction:** This study was conducted to estimate the burden of tobacco use and nicotine dependence among newly diagnosed pulmonary tuberculosis patients to help inform effective implementation of tobacco cessation strategies among tuberculosis patients to improve treatment outcomes. **Materials and Methods:** This was a cross-sectional study conducted among 211 consecutive newly diagnosed pulmonary tuberculosis patients between July 2018 till January 2019 at Ballabgarh tuberculosis unit (TU) in Faridabad district of Haryana, India. All participants were administered a pre-tested questionnaire to assess tobacco use and the Fagerstrom test for nicotine dependence (FTND) to assess nicotine dependence. Current tobacco users were defined as those who smoked in the past 7 days. Nicotine dependence was classified as low, moderate, or high for the FTND score of 0-3, 4-6, and 7-10, respectively. **Results:** Majority of the participants (71.1%) were male, aged 26-50 years (45.5%), and married (65.4%). Fifty (23.7%, CI: 18.0-29.4) participants were currently using tobacco; 29 (13.7%, CI: 9.1-18.4) reported smoking tobacco while 23 (10.9%, CI: 6.7-15.1) reported using smokeless tobacco. In the last month, the proportion of patients who attempted to quit smoking and smokeless tobacco was 31% and 26.1%, respectively. 86.2% of the smokers and 69.6% smokeless tobacco users reported moderate to a high level of nicotine dependence. **Conclusion:** High prevalence of tobacco use, a higher level of nicotine dependence and inability to quit despite an attempt among a large number of tuberculosis patients, necessitates the inclusion of routine tobacco cessation advice and nicotine replacement therapy in tuberculosis care.

**Keywords:** India, nicotine dependence, smoking, tobacco, tuberculosis

## Introduction

Tobacco use is the most common preventable risk factor for premature mortality and morbidity.<sup>[1]</sup> Worldwide, tobacco use is associated with 5.4 million deaths every year which is likely to increase to 8.3 million in 2030.<sup>[2]</sup> Though the risk of dying due to tobacco use will decline by 9% between 2002 and 2030 in high-income countries, it is likely to double from 3.4 million deaths to 6.8 million deaths in low- and middle-income

countries and most of the deaths in these countries will be in the economically productive age groups.<sup>[2]</sup> According to the Global Adult Tobacco Survey (GATS 2, 2016–2017), there were about 266.8 million tobacco users in India.<sup>[3]</sup> Tobacco consumption will be responsible for 13% of all causes of mortality by 2020 in India.<sup>[4]</sup> Smoking is one of the important risk factors for tuberculosis (TB).<sup>[5-7]</sup> A case-control study assessing the association between smoking and mortality among nationally representative mortality data in India found that TB was the leading cause of excess deaths among smokers, as compared with non-smokers among both women (risk ratio 3.0; 99% CI: 2.4–3.9) and men (risk ratio 2.3; 99% CI: 2.1–2.6).<sup>[8]</sup> A dose-response relationship was evident between smoking and mortality due

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to TB among men. A meta-analysis found smoking to have increased the risk of latent TB by a factor of 1.9 that of active TB by 2.0 and that of death from TB by 2.6 after adjustment for socioeconomic status.<sup>[9]</sup>

India contributes the highest number of TB cases in the world. In 2018, India contributed 27% of the new TB cases.<sup>[10]</sup> The End TB strategy and the National Strategic Plan (NSP) for TB in India have set a target to eliminate TB by the years 2030 and 2025, respectively.<sup>[11,12]</sup> These goals include a reduction in mortality and incidence of TB compared to 2015.<sup>[11,12]</sup> The use of tobacco among TB patients is associated with higher odds of unfavorable outcomes (pOR 1.23), delayed smear/culture conversion (pOR 1.55), and loss to follow-up (pOR 1.35).<sup>[13]</sup> There are proposed interventions and collaboration of the National Tobacco Control Programme (NTCP) and Revised National Tuberculosis Programme (RNTCP) for tobacco control among TB patients.<sup>[12,14]</sup> However, to implement tobacco cessation or control strategy effectively, it is necessary to know the burden of tobacco use and the level of nicotine dependence among TB patients. There are only a few studies that reported the prevalence of tobacco use among TB patients as ranging from 9.8 to 80%, but information on nicotine dependence is lacking.<sup>[15-18]</sup> All these studies were limited to the southern part of India. Therefore, we conducted this study to estimate the prevalence of tobacco use and nicotine dependence among newly diagnosed pulmonary TB patients in the tuberculosis unit (TU) Ballabgarh, Haryana.

## Materials and Methods

This was a cross-sectional study conducted at TU Ballabgarh in the Faridabad district of Haryana, India. Ballabgarh is one of the nine TUs in the Faridabad district of Haryana. Faridabad district has a population of around 1.8 million. Two hundred and eleven newly diagnosed pulmonary TB patients 18 years or more were recruited from Ballabgarh TU at the time of diagnosis. Data were collected using a structured pretested questionnaire in the local language Hindi regarding the sociodemographic details and tobacco use between July 2018 and January 2019. Current tobacco use was defined as either tobacco smoking or the use of smokeless tobacco in the last 7 days. Patients who reported current tobacco use were further assessed regarding the product type, frequency, age at initiation of tobacco use, duration of use, and attempt to quit in the last 1 month. We also assessed the current tobacco users for nicotine dependence using the revised Fagerstrom Test for Nicotine Dependence (FTND) for smokers<sup>[19]</sup> and smokeless tobacco users.<sup>[20]</sup> FTND consists of various items, and their sum produces a score ranging from 0-10.

Data were entered in Microsoft Excel and were analyzed using Stata13. Descriptive analysis was done for the prevalence and pattern of tobacco use. The prevalence of tobacco use was reported with a 95% confidence interval. Nicotine dependence was reported in the category of low, moderate, and high. A score of 0–3 was considered as low dependence, 4–6 as moderate

dependence, and 7–10 as high dependence.<sup>[17]</sup> We used bivariable and multivariable logistic regression to assess the determinants of tobacco use and high nicotine dependence (FTND score  $\geq 7$  was considered as high). All the potentially significant factors ( $P$  value  $< 0.2$ ) in the bivariable analysis were considered for the multivariable logistic regression model. During the multivariable and bivariable analysis, the most predominant form of tobacco was selected for patients who were using tobacco in both forms (smoke and smokeless). Ethical clearance was taken from the All India Institute of Medical Science (AIIMS) ethics committee (IEC ref.—IEC/396/6/2017) 25<sup>th</sup> August 2017.

## Results

A total of 211 newly diagnosed pulmonary TB patients were included in the study. Majority of the participants were male (71.1%), in the age group 26–50 years (45.5%), were married (65.4%), semiskilled, and unskilled workers (45.5%), educated up to secondary level (41.7%) and had a total per month family income between INR 5001–10,000 (52.9%) [Table 1]. A total of 50 patients (23.7%, CI: 18.0–29.4) were currently using tobacco in smoke or smokeless form, and all were males. Of the current tobacco users, 29 patients (13.7%, CI: 9.1–18.4) reported smoking tobacco while 23 patients (10.9%, CI: 6.7–15.1) reported using smokeless tobacco. Two patients were using both smokeless and smoked tobacco. All those patients who smoked tobacco reported using *bidi* alone, no one reported using

**Table 1: Sociodemographic profile of the study participants with newly diagnosed pulmonary tuberculosis in Ballabgarh, Haryana (n=211)**

Variable	Frequency (%)
Sex	
Male	150 (71.1)
Female	61 (28.9)
Age in years	
18-25	73 (34.6)
26-50	96 (45.5)
$\geq 51$	42 (19.9)
Marital Status	
Currently married	138 (65.4)
Currently not married	73 (34.6)
Occupation	
Unemployed	25 (11.9)
Professionals	10 (4.7)
Semiskilled and unskilled workers	96 (45.5)
Farmer	5 (2.4)
Economically inactive*	75 (35.5)
Education	
No education	53 (25.1)
Primary	28 (13.3)
Secondary	88 (41.7)
Higher secondary and above	42 (19.9)
Monthly family Income in INR (n=210) <sup>§</sup>	
0-5000	27 (12.9)
5001-10000	111 (52.9)
10001-15000	47 (22.3)
$\geq 15000$	25 (11.9)

\*Economically inactive included students /homemakers/retired/patients with no job/ dependents. <sup>§</sup>One participant denied providing the data regarding monthly family income

cigarettes or hookah. The mean quantity of *bidi* used per day was 10.5 (SD- 8.2) and ranged from 1 to 25. The mean age of starting smoking was 20.1 years (SD-8.4), and the mean duration (years of smoking) was 25.3 years (SD- 11.4). Among the current smokers, 31% (n = 9) of the patients reported that they attempted to quit smoking in the last month. Among the patients reported using smokeless tobacco (n = 23), all reported using tobacco in chewing form (22 used *gutka/ khaini* and one reported using *paan*). The mean quantity of smokeless tobacco used per day was 1 packet/*paan* (SD-1.1) and ranged from 1/6<sup>th</sup> of packet/day to 4 packets/day. The mean age of starting smokeless tobacco use was 25 years (SD- 11.9), and the mean duration (years of using smokeless tobacco) was 11.3 years (SD- 12.3). Among the current smokeless tobacco users, 26.1% (n = 6) of the patients reported that they attempted to quit smokeless tobacco in the last month.

The mean FTND score among smokers and smokeless tobacco users was 5.3 (SD-2.2) and 4.7 (SD-2.1), respectively [Table 2]. Most of the tobacco users were moderately nicotine dependent. High nicotine dependence was found in 22% (n = 11) of tobacco users (24.1% of smokers and 17.4% of smokeless tobacco users). In the multivariable regression, age and occupation were

significantly associated with tobacco use; patients aged  $\geq 51$  years were 4.2 times more likely to be tobacco users compared to the age group of 18–25 years. Patients who were economically inactive (students/homemakers/retired/dependents/without a job) were 96% less likely to be tobacco users compared to the patients in the professional occupation [Table 3]. None of the factors viz. age, age at initiation of tobacco use, duration of tobacco use, education, occupation, and monthly family income were significantly associated with high nicotine dependence [Table 4].

## Discussion

In this study, we reported the prevalence of current tobacco use among TB patients to be 23.7%; 13.7% were using smoked tobacco, while 10.7% were using smokeless tobacco.

The prevalence of current smoking (13.7%) among pulmonary TB patients was similar to the results reported other studies; Jali *et al.* from a tertiary hospital in Karnataka (13.4%),<sup>[16]</sup> Pradeepkumar *et al.* among male TB patients in Kerala (9.3%)<sup>[21]</sup> and Mahishale *et al.* in Karnataka (16.8%).<sup>[15]</sup> The prevalence of smokeless tobacco use among TB patients was similar to a study done by Mariappan *et al.* which reported the prevalence of smokeless tobacco and smoking as 9.8% and 35.3%, respectively.<sup>[17]</sup> The prevalence of tobacco use was low compared to a study done by Kanakia *et al.* (80%) in a tertiary hospital in Puducherry.<sup>[18]</sup> The observed difference could be due to the difference in the operational definition used by Kanakia *et al.* (tobacco use was considered if tobacco was used in the past 1 month) and it could also be due to the difference in the study setting, as severe TB cases are referred to the tertiary hospitals from various other

**Table 2: Level of nicotine dependence for smokers (n=29) and smokeless tobacco users (n=23) among newly diagnosed pulmonary tuberculosis patients in Ballabgarh, Haryana**

Level of nicotine dependence	Current smokers, n (%)	Current smokeless tobacco user, n (%)
Low (0-3)	4 (13.8)	7 (30.4)
Moderate (4-6)	18 (62.1)	12 (52.2)
High (7-10)	7 (24.1)	4 (17.4)

**Table 3: Determinants of tobacco use among newly diagnosed pulmonary tuberculosis patients in Ballabgarh, Haryana**

Variables (n=211)	Tobacco users (%)	Bivariable analysis		Multivariable analysis	
		cOR (CI)	P	aOR (CI)	P
Age in years					
18-25 (n=73)	6 (12%)	1		1	
26-50 (n=96)	30 (60%)	5.1 (2-13)	<b>0.001</b>	2.1 (0.7-6.2)	0.158
$\geq 51$ (n=42)	14 (28%)	5.6 (1.9-16)	<b>0.001</b>	4.2 (1.2-14.7)	<b>0.026</b>
Education					
No education (n=53)	17 (34%)	1		1	
Primary (n=28)	10 (20%)	1.2 (0.5-3.1)	0.741	0.9 (0.3-2.9)	0.978
Secondary (n=88)	20 (40%)	0.6 (0.3-1.4)	0.224	0.7 (0.3-1.8)	0.515
Higher secondary or above (n=42)	3 (6%)	0.2 (0.04-0.6)	<b>0.007</b>	0.3 (0.1-1.1)	0.074
Marital Status					
Currently married (138)	39 (78%)	2.2 (1.1-4.6)	<b>0.035</b>	1.6 (0.7-3.8)	0.299
Currently not married (73)	11 (22%)	1		1	
Family income (n=210)					
0-5000 (n=27)	6 (12.2%)	1		Not included	
5001-10000 (n=111)	29 (59.2%)	1.2 (0.4-3.3)	0.676		
10001-15000 (n=47)	11 (22.5%)	1.1 (0.3-3.3)	0.907		
$\geq 15001$ (n=25)	3 (6.1%)	0.4 (0.1-2.1)	0.337		
Occupation					
Professionals (n=8)	3 (6%)	1		1	
Semiskilled/unskilled (n=103)	42 (84%)	1.1 (0.3-5.1)	0.856	1.5 (0.1-3)	0.489
Economically inactive* (n=100)	5 (10%)	13.1 (0-0.5)	<b>0.005</b>	0.04 (0-0.3)	<b>0.001</b>

\* Economically inactive included students /homemakers/retired/patients with no job/ dependents

**Table 4: Factors associated with high nicotine dependence (FTND score  $\geq 7$ ) among newly diagnosed pulmonary tuberculosis patients in Ballabgarh, Haryana**

Variables	Patients with high nicotine dependence	Bivariable analysis		Multivariable analysis	
		cOR (CI)	P	aOR (CI)	P
Tobacco type				Not included	
Smoke (n=28)	7 (63.6%)	1			
Smokeless (n=22)	4 (36.4)	0.7 (0.2-2.6)	0.565		
Age of starting tobacco use				Not included	
< 18 years (n=25)	4 (36.4%)	1			
$\geq 19$ years (n=25)	7 (63.6%)	2 (0.5-8.1)	0.311		
Duration of tobacco use					
<25 years (n=34)	5 (45.5%)	1		1	
$\geq 26$ years (n=16)	6 (54.5%)	3.48 (0.9-13.9)	<b>0.078</b>	1.4 (0.1-14.6)	0.779
Age in years					
18-45 (n=32)	5 (45.5%)	1		1	
$\geq 46$ (n=18)	6 (54.5%)	2.7 (0.7-10.6)	<b>0.155</b>	2.1 (0.2-20.4)	0.537
Education					
<5 <sup>th</sup> standard (n=27)	4 (36.4%)	1		1	
$\geq 6^{\text{th}}$ standard (n=23)	7 (63.6%)	2.5 (0.6-10)	<b>0.191</b>	3.9 (0.8-19.8)	0.092
Occupation				Not included	
Employed (n=45)	9 (81.8%)	1			
Economically inactive*(n=5)	2 (18.2%)	2.7 (0.4-18.4)	0.320		
Monthly family income (INR)					
<8000 (n=27)	8 (72.7%)	2.8 (0.6-12.2)	<b>0.168</b>	3.8 (0.7-21.8)	0.132
$\geq 8000$ (n=23)	3 (27.3%)	1		1	

\*Economically inactive included retired/patients with no job/dependents

hospitals. The prevalence of tobacco use in our study (23.7%) was also similar to the general population of Haryana (23.6%) as reported by the Global Adult Tobacco Survey (GATS 2).<sup>[3]</sup> We didn't find any female tobacco user in our study, which was similar to a study done by Sugavanesh *et al.* in the general population of Bengaluru.<sup>[22]</sup> As per the GATS 2 survey, the prevalence of tobacco use among women in Haryana was 6.3%<sup>[3]</sup>; the observed difference could be due to underreporting by females due to the social desirability bias. We found age  $\geq 51$  years to have higher odds (OR 4.2) of tobacco use, and the economically inactive group showed least association (OR 0.04) with the tobacco use, which was also reported by Kanakia *et al.* in TB patients and Prabhakar *et al.* in the general population, respectively.<sup>[18,23]</sup>

Our study found the level of addiction to be moderate in most of the tobacco users; and high nicotine dependence was found in 22% of tobacco users at the time of diagnosis, which was similar to a study conducted by Awaisu *et al.* in Malaysia.<sup>[24]</sup> We found high nicotine dependence compared to a study done by Mariappan *et al.* in Puducherry, which reported low nicotine dependence among most of the tobacco users and reported only 1.3% of tobacco users as highly nicotine dependent.<sup>[17]</sup> The reason could be the time of assessment, as Mariappan *et al.* assessed the nicotine dependence during the continuation phase of treatment.<sup>[17]</sup> We also found that one-third of smokers and one-fourth of smokeless tobacco users attempted to quit tobacco in the past month but failed to do so, which reflects the high nicotine dependence among tobacco users. Nicotine dependence is one of the major challenges in tobacco cessation, and it affects the outcome drastically.<sup>[25]</sup> The use of tobacco in TB is associated with a high probability of cavitory lesions,

delayed sputum conversion, high rates of relapse/defaults, and treatment failures.<sup>[15,26,27]</sup> Tobacco cessation service is a vital strategy to reduce tobacco use, and it is an integral component of WHO's MPOWER strategy. To achieve the ambitious target for TB elimination formulated by various national and international bodies, smoking and TB should be dealt at one level.<sup>[11,12]</sup>

The current study shows that one-fifth of pulmonary TB patients are current tobacco users, having high nicotine dependence and there is an urgent need for integration of tobacco cessation services and brief cessation advice in routine TB care. A primary care physician can play a vital role at the time of diagnosis by identifying the TB patients with high nicotine dependence and in providing nicotine replacement or pharmacological therapy. A trial among TB patients in India has found enhanced counseling by a health worker (includes one to one counseling using a brochures/flipcharts/posters/video/family counseling) and pharmacological therapy to be effective in tobacco cessation.<sup>[28]</sup> Studies in India have also found the integration of tobacco cessation services provided by DOTs providers in routine care to be feasible and effective.<sup>[29-31]</sup> Regular monitoring of TB patients of tobacco use and nicotine dependence can also be tried to formulate a tailored tobacco cessation plan for patients. One of the limitations of the study was the assessment of tobacco use which was self-reported by the patients; this could have led to an underestimation of the prevalence of tobacco use among TB patients due to the social desirability bias. Another limitation was that the study was underpowered to detect the association of high nicotine dependence with various risk factors.



## Conclusions

There is a substantial prevalence of current tobacco use among pulmonary TB patients with one-fifth of the patients having a high level of nicotine dependence. There is a need for integration of tobacco cessation services and brief cessation advice in routine TB care.

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## Conflicts of interest

There are no conflicts of interest.

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