Original Article

# Prevalence of tobacco consumption and smoking and its effect on outcome among microbiologically confirmed new pulmonary tuberculosis patients on daily regimen of DOTS in Amritsar city

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## Abstract

**Background:** Tobacco consumption and smoking are causative factors that can create a favorable environment for tuberculosis and increase the morbidity and mortality attributed to it. Tobacco use is the leading global cause of preventable death (6 million deaths per year). This study compares the treatment outcome in pulmonary tuberculosis patients on DOTS daily regimen with respect to consumption of tobacco and smoking. **Aims:** 1. To study the prevalence of tobacco consumption and smoking among microbiologically confirmed new pulmonary tuberculosis patients. 2. To study the effect of tobacco consumption and smoking on the outcome of microbiologically confirmed new pulmonary tuberculosis patients. **Material and Method:** The prospective observational study was conducted on microbiologically confirmed new pulmonary tuberculosis patients enrolled during the first quarter of the year 2019 (i.e., from 01/01/2019 to 03/31/2019) at the four selected DMCs of Amritsar City. In total, 197 patients were included in the study depending on the inclusion and exclusion criteria. The prevalence of tobacco consumption and smoking at the start of treatment was noted and the effect on outcome was observed. **Results:** Prevalence of tobacco consumption and smoking was found to be 24.37% and 21.83%, respectively. In addition, 93.96% of non-tobacco consumers and 94.15% of non-smokers had favorable outcomes as compared to 83.34% of tobacco consumers and 81.4% of smokers, which is statistically significant. **Conclusion:** Tobacco consumption and smoking have significantly higher chances of unfavorable outcomes (loss to follow up, change in treatment regimen, and death) as compared to non-consumption and non-smoking.

**Keywords:** Environmental tobacco smoke, smoking, tobacco, tuberculosis

## Introduction

More than 20% of global tuberculosis incidence can be attributed to smoking.[1] The risk of tuberculosis infection and disease is increased due to the exposure to airborne pollutants released due to the combustion of tobacco.[2] Second-hand tobacco smoke is a specific risk factor for children. Smoking leads to faster progression and poor prognosis of tuberculosis.[3] Worse treatment outcomes and relapse are associated with tobacco smoking.[1] Tobacco is a strong risk factor for poor adherence and higher mortality as well as defaulter rate.[4] Among Indian men, 50% of deaths from TB are attributable to smoking.[1]

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In India, 28.6% (266.8 million) of all adults use tobacco in some form or the other and 38.7% of adults are exposed to secondhand smoke at home.[5] The percentage of Indian women and men between 15 and 49 years of age who smoke tobacco is 2.9% and 24.3%, respectively. In addition, 18.4% of women and 32.9% of men chew tobacco.[6] TB patients are three times as likely to be smokers than the rest of the population.[3] In Punjab, 7.3% of adults smoked tobacco and 8% used smokeless form.[6]

The relevance of tobacco and smoking as a challenge to tuberculosis control cannot be undermined.

There is a paucity of studies conducted in this part of the country that compare the treatment outcome in pulmonary tuberculosis patients on DOTS daily regimen with respect to consumption of tobacco and smoking. The present study attempts to fill this gap.

## Material and Methods

This prospective observational study was conducted on microbiologically confirmed new pulmonary tuberculosis patients enrolled during the first quarter of the year 2019 (i.e., from 01/01/2019 to 03/31/2019). One designated microscopy center (DMC) having the maximum patient load in the previous year (2018) was selected from each of the four tuberculosis units (TU) of Amritsar City.

Approval of the institutional ethical committee was obtained before starting the study. Patients of all ages and both sexes were enrolled fulfilling the inclusion and exclusion criteria. All patients who gave an informed written consent/assent and were residents of Amritsar city were included in the study. All patients who did not give consent or non-cooperative patients, those who were not available at home even on the third repeated visit, and those who were residing out of Amritsar City were excluded from the study.

A predesigned and semi-structured questionnaire was administered to the patients participating in the study. The possible outcomes of the microbiologically confirmed new pulmonary TB patients under NTEP that can be cured, treatment completed, died, failure, defaulted, or transferred out were considered. For statistical analysis, these outcomes were divided into two categories. Cured and treatment completed were included under favorable outcome, whereas lost to follow up, death, and treatment regimen changed were included under unfavorable outcome.

House-to-house visits were done and socio-epidemiological parameters were studied along with enquiring about the practice of tobacco consumption and smoking at the start of treatment. If a patient was using both smoke-emitting and smokeless forms of tobacco, then the patient was included under the smoke-emitting group. If a patient was using both cigarettes and bidis, then the patient was included under the more frequently used form. The age of initiation of the smoking habit and the type of consumption and frequency were enquired about. The outcome of all the patients included in the study was noted from the district tuberculosis center and it was compared with the help of cross-tables. Data management and analysis were done using Microsoft Excel and www.socscistatistics.com. Chi-square test with Yates correction was applied wherever applicable.

## Results

The present study to assess the prevalence of tobacco consumption and smoking and its effect on outcome was conducted on 197 microbiologically confirmed new pulmonary tuberculosis patients registered under the selected TUs in Amritsar city. The total sample of 197 consisted of 107 (54%) males and 90 (46%) females.

The study participants were classified according to demographic characteristics [Table 1],tobacco consumption at the start of treatment [Table 2] and distribution of non-smoker respondents vis-a-vis exposure to environmental tobacco smoke [Table 3].

It was observed that the probability of a favorable outcome in non-consumers of tobacco is significantly higher as compared to the consumers of tobacco [Table 4]. The status of tobacco consumption was recorded at the start of treatment ($P = 0.022$).

Those patients who were not smoking at the start of the treatment had significantly higher chances of a favorable outcome in comparison to tobacco smokers ($P = 0.008$) [Table 4].

It was observed that mere exposure to Environmental tobacco smoke did not lead to increased chances of an unfavorable outcome [Table 4] as hours of exposure were variable, which might have led to insufficient exposure to cause an unfavorable outcome.

No significant association was observed between the outcome of treatment and the number of packs of cigarettes and bidis smoked [Table 4]. It may be because stratification of smokers was done as <1 pack/day and ≥1 pack/day, and due to this, cigarette and bidi smokers were considered together. The number of cigarettes per pack is normally 10, and the number of bidis per pack varies by brand.

No significant association was observed between the age of initiation of the smoking habit and the treatment outcome [Table 4].

The chances of unfavorable outcomes increased significantly in patients with more years of smoking habit ($P = 0.022$) [Table 4].

## Discussion

The distribution of the study participants (respondents) according to gender and demographic variables [Table 1] was similar to other studies[7-14] as also distribution of respondents according to tobacco consumption at the start of treatment [Table 2].[15]

**Table 1: Distribution of respondents according to demographics**

| Parameter | Patients (*n*=197) | Percentage |
|---|---|---|
| Age | | |
| 1-14 | 8 | 4.06 |
| 15-29 | 85 | 43.15 |
| 30-44 | 41 | 20.81 |
| 45-59 | 40 | 20.30 |
| >60 | 23 | 11.68 |
| Marital status | | |
| Married | 116 | 58.88 |
| Unmarried | 69 | 35.03 |
| Widow/widower | 9 | 4.57 |
| Divorced | 3 | 1.52 |
| Type of family | | |
| Nuclear | 138 | 70.05 |
| Joint | 59 | 29.95 |
| Educational status | | |
| Illiterate | 48 | 24.37 |
| Primary School | 25 | 12.69 |
| Middle School | 33 | 16.75 |
| Secondary School | 43 | 21.83 |
| Senior Secondary | 39 | 19.80 |
| Graduate | 8 | 4.06 |
| Post-graduate and above | 1 | 0.50 |
| Socio-economic status* | | |
| Upper | 4 | 2.03 |
| Upper Middle | 12 | 6.09 |
| Lower Middle | 57 | 28.93 |
| Upper lower | 88 | 44.67 |
| Lower | 36 | 18.28 |

*According to modified Kuppuswamy socioeconomic status scale

**Table 2: Distribution of respondents according to tobacco consumption at the start of the treatment**

| Tobacco | Frequency | Percentage |
|---|---|---|
| Tobacco consumption (*n*=197) | | |
| Yes | 48 | 24.37 |
| No | 149 | 75.63 |
| Form of tobacco consumption (*n*=48) | | |
| Smoke Emitting | 43 | 89.58 |
| Smokeless | 5 | 10.42 |
| Type of smoking (*n*=43) | | |
| Cigarettes | 15 | 34.88 |
| Bidi | 28 | 65.12 |
| Frequency of smoking (per day) (*n*=43) | | |
| <1 pack | 13 | 30.23 |
| 1 pack or more | 30 | 69.77 |
| Age of starting tobacco consumption (in years) (*n*=43) | | |
| <18 years | 13 | 30.23 |
| 18 years or above | 30 | 69.77 |
| Mean duration of smoking (in years) (*n*=43) | | |
| 0-5 | 4 | 9.30 |
| 5-10 | 7 | 16.28 |
| 10-15 | 7 | 16.28 |
| 15-20 | 3 | 6.98 |
| >20 | 22 | 51.16 |

Existing scientific evidence suggests that there is a positive association between smoking and tuberculosis irrespective of the treatment outcome. Numerous studies have identified smoking as a risk factor in the development of tuberculosis. "Compared with people who do not smoke, smokers have an increased risk of having a positive tuberculin skin test, of having active TB, and of dying from TB."[2] The risk of TB disease and death due to TB is more in smokers as compared to non-smokers.[1]

Exposure to second-hand smoke is known to increase the incidence of TB infection and active TB disease.[1] Smoking prevalence is generally high among TB patients.[3] Patients with poor TB treatment outcomes were 50% more exposed to smoking than patients with successful treatment.[16] Smokers are less likely to adhere to TB treatment and more likely to relapse after successfully completing treatment.[3]

Improving compliance among TB patients who are smokers is a great challenge and needs to be addressed.[4]

"Smoking has a strong influence on TB and is a major barrier towards treatment success."[1] "Prompt identification of smoking behavior and smoking cessation are critical for improving TB treatment and reducing transmission of TB."[1] Smoking cessations are an effective way to decrease treatment failure and drug resistance. Smoking increases the severity and mortality rate of tuberculosis.[1]

All smoking TB patients undergoing DOTS treatment should be exposed to public-awareness campaigns and informed about smoking cessation interventions so that the progression of the disease can be slowed, severity reduced, and antitubercular drug resistance avoided.[4]

Tobacco use may be smoked/smokeless. Active use/passive exposure causes damage to the human body in numerous ways and contributes to the pathogenesis of many diseases and is associated with adverse treatment outcomes for tuberculosis as found in our study.

Thus it is imperative that tobacco control activities should be strengthened and every opportunity taken to educate the general public and the patients about the harmful effects of tobacco.

General practitioners and primary healthcare providers should engage patients in dialogue and emphasize the negative impact of tobacco use, make the patients and their families aware of the harmful effects of environmental tobacco smoke, and make them aware of the provisions of law that give them the right to a smoke-free environment in public places and educational institutions.

## Conclusion

This study highlights the need for further studies to explore the relationship between tobacco use- smoking and smokeless, initiation of use, duration of use and quitting, and exposure to

ETS- its duration and quantity of exposure with the onset of tuberculosis disease, treatment adherence, treatment outcome and mortality due to tuberculosis and improved treatment outcomes due to quitting tobacco use.

**Table 3: Distribution of non-smoker respondents according to their exposure to environmental tobacco smoke**

| Environmental tobacco smoke | Frequency | Percentage |
|---|---|---|
| Exposure (*n*=154)* | | |
| Yes | 26 | 16.88 |
| No | 128 | 83.12 |
| Duration of exposure (IN HRS.) (per day) (*n*=26) | | |
| 0-6 | 2 | 7.69 |
| 6-12 | 11 | 42.31 |
| 12-18 | 10 | 38.46 |
| 18-24 | 3 | 11.54 |

*Smokers that were 43 in number were excluded

The relationship between the duration of exposure to environmental tobacco smoke among non-smokers and the treatment outcome of pulmonary tuberculosis also needs to be explored.

Primary care physicians and health workers should make every effort to motivate tobacco users/smokers to quit and guide them for counseling and pharmacotherapy if needed for a better treatment outcome of tuberculosis.

Thus, primary healthcare services while providing facilities for diagnosis and treatment of respiratory disease including tuberculosis should also provide tobacco cessation counseling and services and advise/education regarding the effects of ETS/second-hand smoke.

## Limitations of the study

Due to the sample size of less than 30 (n = 26) for the patients exposed to environmental tobacco smoke, adequate analysis on

**Table 4: Comparison of respondents according to the outcome**

| Tobacco Consumption (Smoke & Smokeless both) | Outcome | | | | | Total |
|---|---|---|---|---|---|---|
| | Favorable | | Unfavorable | | | |
| | Cured | T/t complete | Lost to follow up | Dead | Treatment regimen changed | |
| Tobacco Consumption and Outcome | | | | | | |
| Consumer | 23 (47.92) | 17 (35.42) | 1 (2.08) | 5 (10.42) | 2 (4.16) | 48 (100) |
| Non Consumer | 75 (50.34) | 65 (43.62) | 4 (2.68) | 5 (3.36) | 0 (0) | 149 (100) |
| Total | 98 | 82 | 5 | 10 | 2 | 197 |
| $\chi^2$=5.1993 df=1, *P*=0.022 (*P*<0.05) | | | | | | |
| Smoking and Outcome | | | | | | |
| Smoker | 19 (44.19) | 16 (37.21) | 1 (2.33) | 5 (11.63) | 2 (4.64) | 43 (100) |
| Non Smoker | 79 (51.29) | 66 (42.86) | 4 (2.60) | 5 (3.25) | 0 (0) | 154 (100) |
| Total | 98 | 82 | 5 | 10 | 2 | 197 |
| $\chi^2$=6.9418 df=1, *P*=0.008 (*P*<0.05) | | | | | | |
| Exposure to environmental tobacco smoke and outcome | | | | | | |
| Present | 10 (38.46) | 14 (53.85) | 2 (7.69) | 0 (0) | 0 (0) | 26 (100) |
| Absent | 69 (53.90) | 52 (40.63) | 2 (1.56) | 5 (3.91) | 0 (0) | 128 (100) |
| Total | 79 | 66 | 4 | 5 | 0 | 154* |
| $\chi^2$=0.1515 df=1, *P*=0.697144 (*P*>0.05) | | | | | | |
| No. of packs smoked and outcome | | | | | | |
| <1 pack | 05 (38.46) | 07 (53.85) | 0 (0) | 0 (0) | 1 (7.69) | 13 (100) |
| ≥1 pack | 14 (46.67) | 9 (30.00) | 1 (3.33) | 5 (16.67) | 1 (3.33) | 30 (100) |
| Total | 19 | 16 | 1 | 5 | 2 | 43 |
| $\chi^2$=1.47 df=1, *P*=0.23 (*P*>0.05) | | | | | | |
| Age of start of smoking and outcome | | | | | | |
| <18 years | 06 (46.15) | 03 (23.08) | 0 (0) | 3 (23.08) | 1 (7.69) | 13 (100) |
| ≥18 years | 13 (43.33) | 13 (43.33) | 1 (3.33) | 2 (6.67) | 1 (3.33) | 30 (100) |
| Total | 19 | 16 | 1 | 5 | 2 | 43 |
| $\chi^2$=0.4682 df=1, *P*=0.493828 (*P*>0.05) | | | | | | |
| Years of Smoking and Outcome | | | | | | |
| 0-5 years Row % | 2 (50) | 1 (25) | 0 (0) | 1 (25) | 0 (0) | 4 (100) |
| 5-10 years Row % | 5 (71.43) | 2 (28.57) | 0 (0) | 0 (0) | 0 (0) | 7 (100) |
| 10-15 years Row % | 4 (57.14) | 3 (42.86) | 0 (0) | 0 (0) | 0 (0) | 7 (100) |
| 15-20 years Row % | 3 (100) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 3 (100) |
| ≥20 years Row % | 5 (22.72) | 10 (45.45) | 1 (4.55) | 4 (18.18) | 2 (9.10) | 22 (100) |
| Total | 19 | 16 | 1 | 5 | 2 | 43 |
| $\chi^2$=5.1938 df=1, *P*=0.022667 (*P*<0.05) | | | | | | |

*(Here n=154 as out of 197 patients 43 patients those were active smokers were excluded)

the difference in outcome based on duration of exposure to environmental tobacco smoke could not be drawn.

Gender-based investigator bias may have crept in due to the ease of questioning the male participants regarding their tobacco habits as compared to female participants.

The status of tobacco consumption in the present study was considered at the onset of treatment and not ever tobacco users.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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## Conflicts of interest

There are no conflicts of interest.

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