



Monaldi Archives for Chest Disease

eISSN 2532-5264

<https://www.monaldi-archives.org/>

Publisher's Disclaimer. E-publishing ahead of print is increasingly important for the rapid dissemination of science. The **Early Access** service lets users access peer-reviewed articles well before print / regular issue publication, significantly reducing the time it takes for critical findings to reach the research community. These articles are searchable and citable by their DOI (Digital Object Identifier).

The **Monaldi Archives for Chest Disease** is, therefore, e-publishing PDF files of an early version of manuscripts that have undergone a regular peer review and have been accepted for publication, but have not been through the typesetting, pagination and proofreading processes, which may lead to differences between this version and the final one.

The final version of the manuscript will then appear in a regular issue of the journal.

E-publishing of this PDF file has been approved by the authors.

All legal disclaimers applicable to the journal apply to this production process as well.

Monaldi Arch Chest Dis 2024 [Online ahead of print]

To cite this Article:

Coutinho SE, Lima de Braga RC, Santos AK, et al. **Smoking cessation among tuberculosis patients during the coronavirus disease-2019 pandemic.** *Monaldi Arch Chest Dis* doi: 10.4081/monaldi.2024.2970

 ©The Author(s), 2024
Licensee [PAGEPress](#), Italy

Note: The publisher is not responsible for the content or functionality of any supporting information supplied by the authors. Any queries should be directed to the corresponding author for the article.

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article or claim that may be made by its manufacturer is not guaranteed or endorsed by the publisher.



Smoking cessation among tuberculosis patients during the coronavirus disease-2019 pandemic

Sandra Eugênia Coutinho,¹ Raimunda Sinthia Lima de Braga,² André Külzer Santos,²
Joanna Scopel Velho,² Denise Rossato Silva,¹⁻³

¹Postgraduate Program in Pulmonary Sciences, Federal University of Rio Grande do Sul (UFRGS), Porto Alegre; ²Faculty of Medicine, Federal University of Rio Grande do Sul (UFRGS), Porto Alegre; ³Clinical Hospital of Porto Alegre, Brazil

Correspondence: Denise Rossato Silva, Federal University of Rio Grande do Sul (UFRGS) – 2350 Ramiro Barcelos Street, room 2050, Postal Code 90035-903, Porto Alegre, RS, Brazil.
Tel.: +55 51 33598241.
Fax: +55 51 33598000.
E-mail: denise.rossato@terra.com.br

Contributions: SEC, conceptualization, methodology, investigation, data curation, project administration, writing - original draft; RSLB, AKS, JSV, conceptualization, methodology, investigation, writing - review and editing; DRS, conceptualization, methodology, investigation, data curation, project administration, supervision, writing - original draft.

Conflict of interest: the authors have no conflicts of interest to declare.

Ethics approval and consent to participate: the study was approved by the Ethics Committee of Hospital de Clínicas de Porto Alegre in June 3rd, 2020 (number 180540).

Informed consent: all patients gave written consent for publication.

Funding: this work was supported by Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) – grant number: 422759/2018-0.

Availability of data and materials: the datasets used during the current study are available from the corresponding author on reasonable request.

Abstract

Smoking has been recognized as a significant risk factor for COVID-19 and mortality. The World Health Organization (WHO) has recommended smoking cessation to reduce the impact of COVID-19. This study aimed to evaluate the smoking cessation rate of patients starting tuberculosis (TB) treatment at six months using motivational interviewing based on the WHO "five steps to quit" model. In addition, we assessed the knowledge about smoking and the barriers to smoking cessation. We conducted a retrospective cohort study. Outpatients aged >18 years, smokers, and those who are starting TB treatment in two outpatient TB clinics were invited to participate. Patients received information about the importance of smoking cessation, especially in TB patients, and standardized advice based on guidelines. This information was repeated during phone calls during the second and fourth months of treatment. During the study period, 111 patients were included. The primary outcome was the smoking cessation rate at the end of the sixth month of treatment, which was 26.8% (19/71). The barriers to smoking cessation described by the patients were anxiety/depression (47.4%), seeing someone smoking (38.5%), drug use (19.2%), and alcohol abuse (2.6%). The assessment of knowledge about smoking showed that patients had some information gaps. In conclusion, TB smokers who tried to quit smoking during the COVID-19 pandemic faced many challenges. Despite this, we demonstrated a reasonable smoking cessation rate with a nurse-conducted motivational interview.

Key words: tuberculosis, smoking, COVID-19, smoking cessation, anxiety, coronavirus.

Introduction

Tuberculosis (TB) remains a public health problem and a top killer worldwide. In 2022, an estimated 7.5 million people fell ill with TB, and there were 1.3 million deaths. Among the many risk factors for TB, smoking was identified as a serious aggravating factor, especially in developing countries. It is estimated that more than 20% of TB cases are attributable to smoking [1]. In fact, smoking was associated with a twofold increase in risk of active TB [2]. Smokers may also have delayed 2-month sputum culture conversion [3]. In addition, tobacco smoking increases the chance of unfavorable treatment outcomes [4], with high mortality rates (up to nine times more than never smokers) [5].

During the coronavirus 2019 (COVID-19) pandemic, studies [6,7] have shown changes in smoking behaviors. One study [6] demonstrated that, one year after the pandemic started,

21.6% of smokers increased the amount of tobacco they consumed, and 24.3% relapsed smoking. In another study [7], 25% of smokers had increased smoking at home, especially those with higher nicotine dependence. These findings are very concerning since smoking has been recognized as a significant risk factor for severe COVID-19 disease and mortality [8]. Even for this reason, the World Health Organization (WHO) has recommended smoking cessation to reduce the impact of COVID-19 [9]. However, to the best of our knowledge no studies so far have evaluated smoking cessation in TB patients during the COVID-19 pandemic.

Therefore, the aim of this study was to evaluate the smoking cessation rate at 6 months, using a motivational interviewing based on WHO 'five steps to quit' model [10], in patients starting TB treatment. In addition, we assessed the knowledge about smoking and the barriers to smoking cessation during COVID-19 pandemic.

Material and Methods

Study design and location

We conducted a prospective cohort study in two outpatient TB clinics in Porto Alegre, RS, Brazil. Porto Alegre has a TB incidence of 70.7 cases/100,000 inhabitants [11]. The study was approved by the Ethics Committee of Hospital de Clínicas de Porto Alegre in June 3rd, 2020 (number 180540).

Patients

Outpatients aged > 18 years, smokers and who are starting TB treatment (less than 30 days ago) were invited to participate in the study. Non-smokers and those under treatment for more than 30 days were excluded. Pulmonary TB was diagnosed according to the Brazilian Guidelines for Tuberculosis [12].

Data collection

After signing informed written consent enrolled subjects were interviewed using a standardized questionnaire. The following data were collected: demographic data (sex, age, homelessness), and medical history (smoking history, TB symptoms, presence of comorbidities, alcohol abuse, drug use, directly observed treatment [DOT]). In addition, the level of nicotine dependence was assessed using the Fagerstrom Scale. This scale classifies the degree of dependence on smoking as: very low, low, medium, high, very high [13,14]. The motivation to stop smoking was assessed using the Richmond Scale, a 4-item instrument with total score ranging between 0 and 10 (0-4: low motivation; 5-6: moderate motivation; 7-10: high motivation to quit) [15].

Knowledge about smoking was also recorded using 10 true or false questions already used in a previous study [4].

After the initial interview and data collection, patients received information about the importance of smoking cessation, especially in patients with TB, and standardized advice based on guidelines [10], consisting of five procedures summarized here: 1-Ask: ask whether the patient smokes; 2-Assess: assess the degree of dependence and motivation to stop smoking; 3-Advise: advise to stop smoking; 4-Prepare: patients who are ready to quit smoking should be encouraged to set a date to stop smoking, and 5-Follow-up: follow-up with patients who have stopped smoking. In addition, educational materials on smoking and tuberculosis were distributed. The patient received a phone call during the second and fourth month of treatment, where the guidelines of the first conversation were repeated. All motivational interviews were made by a nurse.

The primary outcome was the smoking cessation rate at the end of the 6th month of treatment. Smoking cessation was measured through self-reported abstinence by the patient and also verified biochemically through the measurement of exhaled carbon monoxide (Pico Plus Smokerlyzer, Bedfont Scientific Ltd., Maidstone, UK), using a cutoff value of 10 ppm (parts per million). Treatment outcome [cure, dropout, death]) was collected at the end of treatment.

Statistical analysis

Data analysis was performed using IBM SPSS Statistics, version 22.0 (IBM Corporation, Armonk, NY, USA). Data were presented as number of cases, mean \pm standard deviation (SD), or median with interquartile range (IQR). Categorical comparisons were performed by chi-square test using Yates's correction if indicated or by Fisher's exact test. Continuous variables were compared using the *t*-test or Wilcoxon test. A two-sided *p* value < 0.05 was considered significant for all analyses.

The calculation of the sample size was based on a previous study [16], which considered a smoking cessation rate of 21.5% in the intervention group. Thus, with an alpha error of 5% and a power of 80%, it would be necessary to include at least 34 patients in the study.

Results

During the study period, 111 patients were included. Table 1 shows the patients' characteristics. The mean age of patients was 44.1 ± 12.3 years old. Most were men (64.0%) and unemployed (66.7%). Twenty-six (23.4%) were homeless. The median duration of smoking was 21 years (IQR: 16-31 years), most patients smoked more than 20 cigarettes per day, and 46.8% had already tried to quit smoking more than once. The median score on Fagerström Scale was 6 (IQR: 4-8), corresponding to a high degree of nicotine dependency.

The median score on Richmond Scale was 8 (IQR:6-9), which denotes a high motivation to quit smoking.

Table 2 shows the results for the patients' knowledge regarding smoking. A low percentage (55.9%) of patients recognized smoking as a disease. More than 20% of patients did not know that the dangers of cigarette smoking increase with dose, that smokers are at increased risk of TB, and that smokers with TB are more likely to spread the TB bacillus than non-smokers with TB.

The smoking cessation rate at the end of the 6th month of TB treatment was 26.8% (19/71). Forty patients could not be evaluated at the end of treatment due to loss to follow-up (n=36) or death (n=4). Indeed, the loss to follow-up rate of TB treatment was high (n=45, 40.5%). The barriers to smoking cessation described by the patients were anxiety/depression (47.4%), see someone smoking (38.5%), drug use (19.2%), and alcohol abuse (2.6%).

Discussion

In this prospective cohort study, we found a smoking cessation rate of 26.8% through an intervention based on WHO 'five steps to quit' model, during the COVID-19 pandemic. The most important barrier in smoking cessation was anxiety/depression in almost 50% of patients. In addition, the assessment of knowledge about smoking showed that patients had some information gaps.

Integrating TB and tobacco cessation programs is essential to reduce tobacco use and improve TB treatment outcomes. This collaboration can improve TB case detection rates, and promote earlier treatment initiation for TB, better TB treatment outcomes, and higher smoking cessation rates [17]. Unfortunately, about 30% of TB patients who smoke are never asked about their smoking habits, neither are advised about stop smoking. Most patients only receive general health messages and are not warned about the effects of tobacco smoking on TB treatment [18]. Studies have shown that even brief smoking cessation messages are important motivators to stop smoking [19,20], and can increase quitting by 1% to 3% [19]. Demers et al demonstrated that a 3- to 5-minute unstructured physician advice could positively affect smoking cessation [20]. In the present study, we found a smoking cessation rate of almost 30% with a motivational interviewing by a nurse. This result is similar to that found in a randomized clinical trial [16] that showed a self-reported 6-month sustained abstinence of 21.5% among newly diagnosed adult TB patients, after a brief motivational interviewing by a lay healthcare worker.

Smokers can face many barriers to quitting smoking. Many of these obstacles have been intensified during the COVID-19 pandemic [6–8]. Kiral et al [6] reported that the primary reason for increasing the amount of tobacco consumed during pandemic was stress among

58.8% of patients. Indeed, studies [21-24] have shown that patients have increased tobacco consumption during the pandemic to deal with anxiety, stressful situations, and boredom during lockdowns. In our study, anxiety/depression was the main factor described as a barrier to quitting smoking. Seeing someone else smoking, alcohol abuse, and drug use were other barriers to quitting cigarette smoking identified in the present study. In fact, Neubert et al [25] demonstrated that being with other smokers in their environment was an obstacle in smoking cessation. Co-use of other substances, like alcohol and drugs, have also been previously considered barriers to quitting tobacco use [26].

Lower levels of knowledge about the health risks of tobacco use can also be a barrier in smoking cessation [27,28]. We found a high percentage of patients who did not correctly answer questions about harms of smoking. Current smokers usually have lower general level of knowledge about smoking than never and former smokers [27]. In addition, misperceiving nicotine as a primary cause of smoking-related diseases was associated with lower odds of cessation success [28]. Therefore, understanding the knowledge of TB patients about smoking is a key element in smoking cessation, and should be used in order to guide the development of effective educational interventions.

This study has some limitations. First, the efficacy of a motivational interviewing in smoking cessation would be better evaluate in a randomized clinical trial. Second, due to its observational nature, we cannot exclude the presence of bias. In spite of theses concerns, this prospective cohort study was conducted in two TB centers, and demonstrated that a simple intervention can be beneficial in helping patients to quit smoking during the COVID-19 pandemic. This is the first study to evaluate smoking cessation in TB patients during the COVID-19 pandemic.

Conclusions

In conclusion, TB smokers who tried to quit smoking during the COVID-19 pandemic faced many challenges. Despite this, we demonstrated a reasonable smoking cessation rate with a nurse-conducted motivational interview.

References

1. World Health Organization. Global tuberculosis report 2023. Available from: <https://www.who.int/teams/global-tuberculosis-programme/tb-reports/global-tuberculosis-report-2023>.
2. Lin HH, Ezzati M, Chang HY, Murray M. Association between tobacco smoking and active tuberculosis in Taiwan: prospective cohort study. *Am J Respir Crit Care Med* 2009;180:475-80.
3. Visser ME, Stead MC, Walzl G, et al. Baseline predictors of sputum culture conversion in pulmonary tuberculosis: Importance of cavities, smoking, time to detection and w-beijing genotype. *PLoS One* 2012;7:e29588.
4. De Vargas KR, Freitas AA, Azeredo ACV, Silva DR. Smoking prevalence and effects on treatment outcomes in patients with tuberculosis. *Rev Assoc Med Bras* 2021;67:406-10.
5. Wen CP, Chan TC, Chan HT, et al. The reduction of tuberculosis risks by smoking cessation. *BMC Infect Dis* 2010;10:156.
6. Kiral N, Fidan A, Eraslan B, et al. Effect of the COVID-19 pandemic on smoking habits in a tertiary hospital. *Eur Rev Med Pharmacol Sci* 2023;27:1170-5.
7. Zeng Y, Luk TT, Wu Y, et al. Associations of changes in smoking-related practices with quit attempt and smoking consumption during the COVID-19 pandemic: a mixed-methods study. *Tob Induc Dis* 2022;20:20.
8. Finck JM, Bohnet S, Auth K, et al. Smoking behavior and smoking cessation because of and during the COVID-19 pandemic: a brief online survey 12 months into the pandemic and during the second wave in Europe. *Int J Environ Res Public Health* 2022;19:16540.
9. World Health Organization. The importance of tobacco cessation in the context of the COVID-19 pandemic. 2021. Available from: <https://www.who.int/news-room/events/detail/2021/03/16/default-calendar/the-importance-of-tobacco-cessation-in-the-context-of-the-COVID-19-pandemic>. Accessed on: 24/03/2023.
10. World Health Organization. Toolkit for delivering the 5A's and 5R's brief tobacco interventions in primary care. 2014. Available from: https://iris.who.int/bitstream/handle/10665/112835/9789241506953_eng.pdf?sequence=1&isAllowed=y. Accessed on: 24/03/2023.
11. Ministério da Saúde. Boletim epidemiológico tuberculose. 2022. Available from: <https://www.gov.br/saude/pt-br/centrais-de-conteudo/publicacoes/boletins/epidemiologicos/especiais/2022/boletim-epidemiologico-de-tuberculose-numero-especial-marco-2022.pdf>. [Material in Portuguese].
12. Silva DR, Rabahi MF, Sant'Anna CC, et al. Diagnosis of tuberculosis: a consensus

statement from the Brazilian Thoracic Association. *J Bras Pneumol* 2021;47:e202210054.

13. Fagerstrom KO, Schneider NG. Measuring nicotine dependence: a review of the Fagerstrom tolerance questionnaire. *J Behav Med* 1989;12:159-82.
14. Heatherton TF, Kozlowski LT, Frecker RC, Fagerstrom KO. The Fagerström test for nicotine dependence: a revision of the Fagerström tolerance questionnaire. *Br J Addict* 1991;86:1119-27.
15. Richmond RL, Kehoe LA, Webster IW. Multivariate models for predicting abstinence following intervention to stop smoking by general practitioners. *Addiction* 1993;88:1127-35.
16. Louwagie GMC, Ayo-Yusuf OA. Predictors of tobacco smoking abstinence among tuberculosis patients in South Africa. *J Behav Med* 2015;38:472-82.
17. Jeyashree K, Nayak P. TB and tobacco integration: what is missing and what can we expect?. *Int J Tuberc Lung Dis* 2018;22:711.
18. Ng N, Padmawati RS, Prabandari YS, Nichter M. Smoking behavior among former tuberculosis patients in Indonesia: intervention is needed. *Int J Tuberc Lung Dis* 2008;12:567-72.
19. Stead LF, Buitrago D, Preciado N, et al. Physician advice for smoking cessation. *Cochrane Database Syst Rev* 2013;2013:CD000165.
20. Demers RY, Neale AV, Adams R, et al. The impact of physicians' brief smoking cessation counseling: a MIRNET study. *J Fam Pract* 1990;31:625-9.
21. Perski O, Theodoraki M, Cox S, et al. Associations between smoking to relieve stress, motivation to stop and quit attempts across the social spectrum: a population survey in England. *PLoS One* 2022;17:e0268447.
22. Giovenco DP, Spillane TE, Maggi RM, et al. Multi-level drivers of tobacco use and purchasing behaviors during COVID-19 "lockdown": a qualitative study in the United States. *Int J Drug Policy* 2021;94:103175.
23. Grogan S, Walker L, McChesney G, et al. How has COVID-19 lockdown impacted smoking? A thematic analysis of written accounts from UK smokers. *Psychol Health* 2022;37:17-33.
24. O'donnell R, Eadie D, Stead M, et al. 'I was smoking a lot more during lockdown because I can': a qualitative study of how UK smokers responded to the covid-19 lockdown. *Int J Environ Res Public Health* 2021;18:5816.
25. Neubert C, Nussbaum AK, Tewes N, Westwood P. Barriers to quitting smoking – a survey among 1000 adult cigarette smokers in Germany. *Qeios* 2022.
26. West JC, Peasley-Miklus C, Graham AL, et al. Impact of alcohol and drug use on smoking

and cessation in socioeconomically disadvantaged young adults. *Addict Behav* 2020;110:106486.

27. Cheng HG, McBride O, Phillips MR. Relationship between knowledge about the harms of smoking and smoking status in the 2010 Global Adult Tobacco China Survey. *Tob Control* 2015;24:54-61.
28. Snell LM, Colby SM, Deatley T, et al. associations between nicotine knowledge and smoking cessation behaviors among US adults who smoke. *Nicotine Tob Res* 2022;24:855-63.

Table 1. Characteristics of study patients.

Characteristics	n (%), mean \pm SD or median (IQR)
Age, years	44.1 \pm 12.3
Male sex	71 (64.0)
Homelessness	26 (23.4)
Unemployment	74 (66.7)
Smoking history	
Duration of smoking, in years	21 (16-31)
Number of cigarettes per day	
10	13 (11.7)
11-20	32 (28.8)
21-30	39 (35.1)
31	27 (24.3)
Attempt to quit smoking ever	
Once	26 (23.4)
More than once	52 (46.8)
Never	33 (29.7)
Barriers to smoking cessation	
Anxiety/depression	37 (47.4)
See someone smoking	30 (38.5)
Drug use	15 (19.2)
Alcohol abuse	2 (2.6)
Don't know	5 (6.4)
Other smokers in the household	61 (55.0)
Fagerstrom Scale	6 (4-8)
Richmond Scale	8 (6-9)
Alcohol abuse	
Yes	61 (54.9)
No	29 (26.1)
In the past	21 (18.9)
Drug use	
Yes	21 (18.9)
No	23 (20.7)
In the past	66 (59.5)
HIV	54 (48.6)
TB symptoms	
Cough	103 (92.8)
Weight loss	70 (63.1)
Night sweats	59 (53.2)
Dyspnea	72 (64.9)
Fever	59 (53.2)
Chest pain	18 (16.2)
Hemoptysis	10 (9.0)
DOT	41 (36.9)
Treatment outcomes	
Cure	62 (55.9)
Lost to follow-up	45 (40.5)
Death	4 (3.6)

SD, standard deviation; IQR, interquartile range; HIV, human immunodeficiency virus; TB, tuberculosis; DOT, directly observed treatment.

Table 2. Patients' knowledge regarding smoking.

Affirmative	True (%)	False (%)
1. Smoking is addictive	100 (90.1)	11 (9.9)
2. Smoking is a disease	62 (55.9)	49 (44.1)
3. Smoking has the greatest negative effect on the vascular system	106 (95.5)	5 (4.5)
4. The "smoker's cough", a type of chronic bronchitis is caused by irritation of the lungs and bronchi and due to chemicals in the cigarette	98 (88.3)	13 (11.7)
5. The dangers from cigarette smoking increase with dose (number of cigarettes smoked, number of years a person smoked, and amount of smoke inhaled)	87 (78.4)	24 (21.6)
6. Smoking affected your health	103 (92.8)	8 (7.2)
7. Smokers are at increased risk of tuberculosis	83 (74.8)	28 (25.2)
8. Smokers are at higher risk of having tuberculosis more than once	81 (73.0)	30 (27.2)
9. Smokers with tuberculosis are more likely to spread the tuberculosis bacillus than non-smokers with tuberculosis	86 (77.5)	25 (22.5)
10. Smokers with tuberculosis are at higher risk of death than non-smokers	93 (83.8)	18 (16.2)