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]

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

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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 6 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.

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 COVID-19 pandemic, studies have shown changes in smoking behaviors [6,7]. One study demonstrated that, one year after the pandemic started, 21.6% of smokers increased the amount of tobacco they consumed, and 24.3% relapsed to smoking [6]. 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 approach based on the 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 the COVID-19 pandemic.

Materials and Methods

Study design and location

We conducted a prospective cohort study in two outpatient TB clinics in Porto Alegre, 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 on June 3rd, 2020 (number 180540).

Patients

Outpatients aged >18 years, smokers, and those 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). In addition, the level of nicotine dependence was assessed using the Fagerström Scale. This scale classifies the degree of dependence on smoking as: very low, low, medium, high, and very high [13,14]. The motivation to stop smoking was assessed using the Richmond Scale, a 4-item instrument with a 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: i) ask: ask whether the patient smokes; ii) assess: assess the degree of dependence and motivation to stop smoking; iii) advise: advise to stop smoking; iv) prepare: patients who are ready to quit smoking should be encouraged to set a date to stop smoking; and v) follow-up: follow-up with patients who have stopped smoking. In addition, educational materials on smoking and TB were distributed. The patient received a phone call during the second and fourth months of treatment, where the guidelines of the first conversation were repeated. All motivational interviews were conducted by a nurse.

The primary outcome was the smoking cessation rate at the end of the sixth month of treatment. Smoking cessation was measured through self-reported abstinence by the patient and 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 the number of cases, mean ± standard deviation, 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 the Wilcoxon test. A two-sided $p<0.05$ 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. Most were men (64.0%) and unemployed (66.7%). A total of 26 patients (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 the Fagerström Scale was 6 (IQR: 4-8), corresponding to a high degree of nicotine dependency. The median score on the 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 sixth month of TB treatment was 26.8% (19/71). Overall, 40 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%), seeing 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 the WHO "five steps to quit" model, during the COVID-19 pandemic. The most important barrier to 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, nor are they advised to 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 and can increase quitting by 1% to 3% [19,20]. 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 motivational interviewing by a nurse. This result is similar to that found in a randomized clinical trial 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 [16].

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*. reported that the primary reason for increasing the amount of tobacco consumed during the pandemic was stress among 58.8% of patients [6]. Indeed, studies have shown that patients have increased tobacco consumption during the pandemic to deal with anxiety, stressful situations, and boredom during lockdowns [21-24]. 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*. demonstrated that being with other smokers in their environment was an obstacle to smoking cessation [25]. Co-use of other substances, like alcohol and drugs, has also been previously considered a barrier to quitting tobacco use [26].

Lower levels of knowledge about the health risks of tobacco use can also be a barrier to smoking cessation [27,28]. We found a high percentage of patients who did not correctly answer questions about the harms of smoking. Current smokers usually have a 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 to guide the development of effective educational interventions.

This study has some limitations. First, the efficacy of motivational interviewing in smoking cessation would be better evaluated in a randomized clinical trial. Second, due to its observational

Table 1. Characteristics of study patients.

Characteristics	n (%), mean±SD or median (IQR)
Age, years	44.1±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	3 (11.7)
11-20	132 (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)
Fagerström 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)

nature, we cannot exclude the presence of bias. Despite these 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. Kıral 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 abstention 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.