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# Factors associated with abandonment of tuberculosis treatment: a cross-sectional study between 2014 and 2019

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## Abstract

**Introduction:** tuberculosis (TB) is a public health problem. Brazil is among the group of 22 countries responsible for 90% of the world's TB cases. High proportions of abandonment of treatment may contribute to this epidemiological scenario that is difficult to control.

**Objective:** to analyze the factors associated with abandonment of tuberculosis treatment (ATT).

**Methods:** this is a cross-sectional study of individuals diagnosed with tuberculosis in Brazil between 2014 and 2019 whose cases had been reported to the Notifiable Diseases Information System. Poisson regression of robust variance was used according to hierarchical levels.

**Results:** a total of 508,787 cases were reported, and 59,871 patients (16.4%) abandoned treatment. The prevalence of abandonment was higher in homeless individuals (PR 2.75; 95%CI 2.10-3.61), black race/skin color (PR 1.79; 95%CI 1.46-2.20), HIV/AIDS (PR 1.59; 95%CI 1.30-1.93), alcoholics (PR 1.38; 95%CI 1.14-1.68), illicit drug use (PR 1.85; 95%CI 1.49-2.28), and in individuals who resumed treatment after abandonment (PR 1.91; 95%CI 1.54-2.37).

**Conclusion:** social vulnerability is associated with the abandonment of tuberculosis treatment.

**Keywords:** tuberculosis, abandonment of tuberculosis treatment, social vulnerability, cross-sectional studies.

**Authors summary**

**Why was this study done?**
Tuberculosis is one of the world's leading infectious and deadly diseases. Brazil has not yet achieved the goals set by the World Health Organization for the control and eradication of the disease. Abandonment of tuberculosis treatment may contribute to the spread and maintenance of the chain of disease transmission. Thus, this study aimed to analyze the factors associated with abandonment of tuberculosis treatment to contribute to formulating strategies for reducing abandonment and controlling the disease.

**What did the researchers do and find?**
A cross-sectional study was conducted with individuals diagnosed with tuberculosis in Brazil between 2014 and 2019, reported in the Notifiable Diseases Information System (Sistema de Informação de Agravos de Notificação - SINAN). Factors associated with the abandonment of tuberculosis treatment were assessed. There was a prevalence of 16.4% of patients who resumed treatment. The prevalence of abandonment was higher among homeless individuals, black ethnicity/skin color, people living with HIV, alcoholics, illicit drug use, and individuals who re-entered treatment after abandoning it. Individuals who underwent the directly observed treatment had the lowest prevalence of the abandonment of tuberculosis treatment.

**What do these findings mean?**
Social and economic vulnerability is present among individuals affected by tuberculosis and is associated with abandonment of treatment. Therefore, it is necessary to implement educational strategies in health, to implement street clinics with a greater focus on tuberculosis treatment, and to increase the supply of directly observed treatment to reduce ATT.

**Highlights**
The prevalence of abandonment of tuberculosis treatment (ATT) in Brazil between 2014 and 2019 was 16.4%, higher than the 5% recommended by the World Health Organization (WHO). Socioeconomic vulnerability is present among individuals affected by tuberculosis and is associated with ATT. The prevalence of abandonment was higher among homeless individuals, black race/skin color, people living with HIV, alcoholics, illicit drug users, and individuals who resumed treatment after abandonment. Individuals who underwent directly observed treatment (DOT) had the lowest prevalence of ATT.

## INTRODUCTION

According to the World Health Organization (WHO), tuberculosis (TB) is the most curable infectious disease in the world[1]. In 2020, TB affected about 9.9 million people worldwide[1]. Brazil is among the group of 22 countries responsible for 90% of TB cases[1-3]. In the country, an average of 68,000 new TB cases and around 4,000 deaths are recorded[2,3] per year. The proportions of abandonment may contribute to this epidemiological scenario that is difficult to control[4,5]. In 2020, an abandonment rate of 12.9% was recorded in Brazil, 2.6 times higher than the 5% target set by the WHO[1,3].

Identifying the profile of TB patients vulnerable to abandonment of tuberculosis treatment and the factors that can trigger such an outcome becomes an essential tool for establishing actions and strategies involving the management and organization of services, aiming at adherence and control of the disease since abandonment helps in the cycle of spread and contagion of the disease, increased costs, drug resistance, morbidity, and mortality[1-6]. Given this problem, this study aims to analyze the factors associated with the abandonment of TB treatment.

## METHODS

### Study design and context

This is a cross-sectional study of individuals diagnosed with TB in Brazil between 2014 and 2019 whose cases had been reported to the Notifiable Diseases Information System (SINAN) of Brazil, in which TB notification is mandatory and its feeding is regularly carried out by all federated entities with information from individuals with suspected or diagnosed diseases and conditions of interest[7].

Tuberculosis treatment sensitive to standard drugs lasts at least six months, with a minimum follow-up period which may be extended due to associated diseases or clinical evolution. Thus, individuals are followed longitudinally throughout the treatment, in which periodic information is obtained at different times[2,7].

### Participants

The study included individuals over 18 years of age whose diagnoses of tuberculosis sensitive to the drugs used in the treatment cases had been reported to SINAN, following national recommendations[2].

Individuals with postmortem notification and treatment termination status ignored or blank were excluded, as were those with information on changes in regimen, treatment failure, change in diagnosis, drug-resistant tuberculosis, and death from tuberculosis or other causes.

### Variables

The situation at the end of treatment was the dependent variable obtained from the tuberculosis follow-up report at the end of treatment, in which it was reclassified as abandonment of treatment (abandonment and primary abandonment) and cure.

b) Contextual, level II: Geographic region (southeast/northeast/central-west/south/north); Area of residence (urban/rural/peri-urban); Population deprived of liberty (no/yes); Healthcare professional (no/yes); Homeless population (no/yes); Immigrants (no/yes); Beneficiary of income transfer or government aid (no/yes).

c) Associated diseases, level III: Human immunodeficiency virus infection/acquired immunodeficiency syndrome (no/yes); Alcoholism (no/yes); Illicit drug use (no/yes); Smoking (no/yes); Diabetes mellitus (no/yes); Mental disorder (no/yes).

d) Current tuberculosis treatment, level IV: Type of notification (new cases/recurrence/resumption after abandonment/transfer/does not know); Clinical form of tuberculosis (pulmonary/extrapulmonary/pulmonary

+ extrapulmonary); Sputum smear microscopy results (negative/positive/not performed); Initial culture results (negative/positive/progress/not performed); Chest X-ray (not suggestive of tuberculosis/suggestive of tuberculosis); Directly observed treatment (no/yes).

### Data Sources

Data on individuals with tuberculosis were obtained from the Notifiable Diseases Information System (SINAN) provided by the National Tuberculosis Control Program.

### Statistical methods

Initially, the absolute and relative frequencies of TB treatment were calculated for each explanatory variable. In the bivariate analysis, Poisson regression of robust variance was used to obtain measures of association between the explanatory variables and the abandonment of TB treatment.

The variables with a p-value <0.20 in the bivariate analysis were introduced into the Poisson regression model of robust variance according to the hierarchical levels proposed by Maciel and Reis-Santos: level I (sociodemographic), level II (contextual), level III (associated diseases/comorbidities) and level IV (current clinical situation related to TB)[8]. The variables were maintained at the following levels as an adjustment in the model if the p-value was < 0.05. The association of each factor of abandonment of TB treatment is interpreted as adjusted for the variables of the hierarchical levels above it and also of the same level.

The results were expressed by the measure of the association of prevalence ratio (PR) and 95% confidence intervals (95%CI). Statistical analyses were performed using Stata v. 14.0 (StataCorp, CollegeStation, TX, USA).

### Ethical procedures

This study was approved by the Human Research Ethics Committee of the Health Sciences Center of the Federal University of Espírito Santo (UFES), under the registration opinion number: 2,088,338, according to Resolution No. 466/2012.

### ■ RESULTS

Between 2014 and 2019, 508,787 cases of tuberculosis were reported in individuals over 18 years of age in Brazil. A total of 18,142 (3.5%) cases of death from tuberculosis, 21,366 (4.2%) cases of death from other causes, 31,940 (6.2%) cases of transfers, 3,542 (0.7%) due to change of diagnosis, 5,199 (1.1%) due to drug-resistant tuberculosis, 2,690 (0.5%) due to change of treatment regimen, and 373 (0.1%) due to treatment failure, were excluded from the study. The final population consisted of 364,440 individuals, of whom 59,871 (16.4%) abandoned tuberculosis treatment.

Tables 1 and 2 show the distribution of the frequency of abandonment of tuberculosis treatment by the variables analyzed in the study. In the hierarchical analysis, shown in tables 3 and 4, the prevalence ratio of the abandonment was higher in homeless individuals (PR 2.75; 95% CI 2.10-3.61), resumed treatment after the abandonment (PR 1.91; 95% CI 1.54-2.37), illicit drug use (PR 1.85; 95% CI 1.49-2.28), black race/skin color when compared to white race/color (PR 1.79; 95% CI 1.46-2.20), individuals with HIV/AIDS (PR 1.59; 95% CI 1.30-1.93), and alcoholics (PR 1.38; 95% CI 1.14-1.68). On the other hand, individuals with more than 8 years of schooling (PR 0.53; 95% CI 0.33-0.84), extrapulmonary TB (PR 0.54; 95% CI 0.38-0.77), and those who underwent DOT (PR 0.78; 95%CI 0.66-0.91) had the lowest prevalence ratios.

**Table 1:** Distribution of the frequency of abandonment of tuberculosis treatment by demographic and contextual characteristics, Brazil, 2014 to 2019

| Variable | Abandonment | |
| --- | --- | --- |
| | **Yes** | **No** |
| | **N (%)** | **N (%)** |
| Sex (n = 364,407) | | |
| Female | 14,338 (13.09) | 95,542 (86.91) |
| Male | 45,475 (17.87) | 209,002 (82.13) |
| Age (n = 364,374) | | |
| 18-19 years | 2,228 (17.24) | 10,696 (82.76) |
| 20-39 | 36,237 (19.67) | 147,987 (80.33) |
| 40-59 | 17,644 (14.84) | 101,278 (85.16) |
| ≥ 60 | 3,756 (7.78) | 44,548 (92.22) |
| Race/skin color (n = 337,599) | | |
| White | 14,989 (13.12) | 99,247 (86.88) |
| Black | 10,260 (21.72) | 36,970 (78.28) |
| Brown (Parda) | 29,268 (17.20) | 140,887 (82.80) |
| Asians/Indigenous | 728 (12.18) | 5,250 (87.82) |

**Continuation - Table 1:** Distribution of the frequency of abandonment of tuberculosis treatment by demographic and contextual characteristics, Brazil, 2014 to 2019

| | Abandonment | |
|---|---|---|
| | **Yes** | **No** |
| **Variable** | **N (%)** | **N (%)** |
| Years of study (n = 273,390) | | |
| Illiterate | 2,401 (15.19) | 13,404 (84.81) |
| 0-4 | 10,306 (17.15) | 49,794 (82.85) |
| 5-8 | 25,157 (17.94) | 115,043 (82.06) |
| > 8 | 5,116 (8.93) | 52,169 (91.07) |
| Geographic region (n = 364,440) | | |
| Southeast | 28,820 (16.36) | 147,375 (83.64) |
| South | 8,084 (18.33) | 36,013 (81.67) |
| Central-West | 2,708 (16.75) | 13,456 (83.25) |
| Northeast | 14,054 (15.68) | 75,569 (84.32) |
| North | 6,205 (16.18) | 32,156 (83.82) |
| Area of residence (n = 256,954) | | |
| Urban | 40,635 (17.73) | 188,588 (82.27) |
| Rural | 2,645 (10.58) | 22,359 (89.42) |
| Peri-urban | 421 (15.44) | 2,306 (84.56) |
| Income transfer benefit (n = 180,092) | | |
| Yes | 2,172 (14.24) | 13,080 (85.76) |
| No | 28,103 (17.05) | 136,737 (82.95) |
| Population deprived of liberty (n = 313,833) | | |
| Yes | 4,237 (11.20) | 33,606 (88.80) |
| No | 47,062 (17.05) | 228,928 (82.95) |
| Healthcare professional (n = 302,062) | | |
| Yes | 254 (5.71) | 4,196 (94.29) |
| No | 49,410 (16.60) | 248,202 (83.40) |
| Homeless population (n = 312,120) | | |
| Yes | 6,261 (54.39) | 5,250 (45.61) |
| No | 44,919 (14.94) | 255,690 (85.06) |
| Immigrants (n = 259,013) | | |
| Yes | 325 (21.10) | 1,215 (78.90) |
| No | 43,254 (16.80) | 214,219 (83.20) |

**Table 2:** Distribution of the frequency of abandonment of tuberculosis treatment by comorbidities and clinical status of tuberculosis treatment. Brazil, 2014 to 2019

| | Abandonment | |
| | Yes | No |
| Variable | N (%) | N (%) |
|---|---|---|
| HIV / AIDS (n = 326,347) | | |
| Yes | 9,153 (30.70) | 20,660 (69.30) |
| No | 43,311 (14.61) | 253,223 (85.39) |
| Alcoholism (n = 343,115) | | |
| Yes | 18,196 (27.72) | 47,435 (72.28) |
| No | 37,484 (13.51) | 240,000 (86.49) |
| Smoking (n = 311,290) | | |
| Yes | 17,120 (23.07) | 57,101 (76.93) |
| No | 33,390 (14.04) | 204,359 (85.96) |
| Illicit drug use (n = 310,839) | | |
| Yes | 17,633 (35.53) | 31,994 (64.47) |
| No | 32,841 (12.57) | 228,371 (87.43) |
| Diabetes mellitus (n = 341,671) | | |
| Yes | 2,557 (9.54) | 24,223 (90.45) |
| No | 52,540 (16.69) | 262,351 (83.31) |
| Mental disorder (n = 341,016) | | |
| Yes | 1,707 (20.61) | 6,575 (79.39) |
| No | 53,242 (16.00) | 279,492 (84.00) |
| Type of notification (n = 364,440) | | |
| New case | 38,833 (13.00) | 259,919 (87.00) |
| Recurrence | 4,493 (16.68) | 22,449 (83.32) |
| Resumption after abandonment | 15,115 (49.99) | 15,123 (50.01) |
| Does not know | 155 (22.33) | 539 (77.67) |
| Transfer | 1,273 (16.30) | 6,536 (83.70) |
| Clinical form (n = 364,432) | | |
| Pulmonary | 53,643 (17.14) | 259,363 (82.86) |
| Extrapulmonary | 4,633 (10.91) | 37,831 (89.09) |
| Pulmonary + Extrapulmonary | 1,594 (17.79) | 7,368 (82.21) |
| Sputum smear results (n = 355,090) | | |
| Negative | 10,876 (14.94) | 61,937 (85.06) |
| Positive | 32,591 (16.59) | 163,906 (83.41) |
| Not Performed | 14,977 (17.46) | 70,803 (82.54) |
| Result of the initial culture (n = 364,440) | | |
| Negative | 4,609 (12.36) | 32,677(87.64) |
| Positive | 14,312 (17.30) | 68,429 (82.70) |
| In Progress | 1,304 (20.09) | 5,186 (79.91) |
| Not Performed | 39,646 (16.66) | 198,277 (83.34) |
| Chest X-ray (n = 348,306) | | |
| Not suggestive of TB | 2,621 (12.31) | 18,678 (87.69) |
| Suggestive of TB | 41,163 (16.57) | 207,184 (83.43) |
| Not Performed | 13,486 (17.14) | 65,174 (82.86) |
| DOT (n = 129,037) | | |
| Yes | 12,725 (13.23) | 83,432 (86.77) |
| No | 6,135 (18.66) | 26,745 (81.34) |

HIV/AIDS: human immunodeficiency virus infection/acquired immunodeficiency syndrome; TB: tuberculosis; DOT: directly observed treatment.

**Table 3:** Raw and adjusted prevalence ratio of individuals who abandoned tuberculosis treatment by sociodemographic and contextual characteristics, Brazil, 2014 to 2019

| Variables | Raw Analysis PR (95%CI) | Hierarchical Analysis P value* | PR (95%CI) | P value* |
|---|---|---|---|---|
| Sociodemographic – Level I | | | | |
| Sex | | < 0.001 | | 0.078 |
| Female | 1.00 | | 1.00 | |
| Male | 1.36 (1.34-1.38) | | 1.17 (0.98-1.39) | |
| Age | | < 0.001 | | 0.001 |
| 18-19 years | 1.00 | | 1.00 | |
| 20-39 | 1.14 (1.09-1.18) | | 1.04 (0.70-1.56) | |
| 40-59 | 0.86 (0.82-0.89) | | 0.75 (0.49-1.14) | |
| ≥ 60 | 0.45 (0.42-0.47) | | 0.38 (0.23-0.65) | |
| Race/skin color | | < 0.001 | | < 0.001 |
| White | 1.00 | | 1.00 | |
| Black | 1.65 (1.61-1.69) | | 1.79 (1.46-2.20) | |
| Brown (Parda) | 1.31 (1.28-1.33) | | 1.12 (0.93-1.34) | |
| Asians/Indigenous | 0.92 (0.86-0.99) | | 0.11 (0.01-0.84) | |
| Years of study | | < 0.001 | | < 0.001 |
| Illiterate | 1.00 | | 1.00 | |
| 0-4 | 1.12 (1.08-1.17) | | 1.21 (0.80-1.83) | |
| 5-8 | 1.18 (1.13-1.22) | | 1.21 (0.81-1.82) | |
| > 8 | 0.58 (0.56-0.61) | | 0.53 (0.33-0.84) | |
| Contextual – Level II | | | | |
| Geographic Region | | < 0.001 | | < 0.001 |
| Southeast | 1.00 | | 1.00 | |
| South | 1.12 (1.09-1.14) | | 0.67 (0.54-0.81) | |
| Central-West | 1.02 (0.98-1.06) | | 0.33 (0.21-0.54) | |
| Northeast | 0.95 (0.94-0.97) | | 0.69 (0.54-0.89) | |
| North | 0.98 (0.96-1.01) | | 0.39 (0.27-0.58) | |
| Area of residence | | < 0.001 | | < 0.001 |
| Urban | 1.00 | | 1.00 | |
| Rural | 0.59 (0.57-0.61) | | 0.42 (0.26-0.67) | |
| Peri-urban | 0.87 (0.79-0.95) | | 1.03 (0.42-2.53) | |
| Income transfer benefit | | < 0.001 | | 0.112 |
| Yes | 0.83 (0.80-0.86) | | 0.61 (0.33-1.11) | |
| No | 1.00 | | 1.00 | |
| Population deprived of liberty | | < 0.001 | | 0.032 |
| Yes | 0.65 (0.63-0.67) | | 1.35 (1.02-1.78) | |
| No | 1.00 | | 1.00 | |
| Healthcare Professional | | < 0.001 | | 0.800 |
| Yes | 0.34 (0.30-0.38) | | 0.84 (0.21-3.21) | |
| No | 1.00 | | 1.00 | |
| Homeless Population | | < 0.001 | | < 0.001 |
| Yes | 3.64 (3.57-3.70) | | 2.75 (2.10-3.61) | |
| No | 1.00 | | 1.00 | |
| Immigrants | | < 0.001 | | 0.450 |
| Yes | 1.25 (1.14-1.38) | | 1.85 (0.37-9.18) | |
| No | 1.00 | | 1.00 | |

*Poisson regression; PR: prevalence ratio; 95%CI: 95% confidence interval.

**Table 4:** Raw and adjusted prevalence ratio of individuals who abandoned tuberculosis treatment by clinical characteristics and comorbidities, Brazil, 2014 to 2019.

| Variables | Raw Analysis | | Hierarchical Analysis | |
|---|---|---|---|---|
| | PR (95%CI) | P value* | PR (95%CI) | P value* |
| Associated diseases – Level III | | | | |
| HIV/AIDS | | < 0.001 | | < 0.001 |
| Yes | 2.10 (2.06-2.14) | | 1.59 (1.30-1.93) | |
| No | 1.00 | | 1.00 | |
| Alcoholism | | < 0.001 | | 0.001 |
| Yes | 2.05 (2.02-2.08) | | 1.38 (1.14-1.68) | |
| No | 1.00 | | 1.00 | |
| Smoking | | < 0.001 | | 0.012 |
| Yes | 1.64 (1.61-1.66) | | 0.72 (0.56-0.93) | |
| No | 1.00 | | 1.00 | |
| Illicit drug use | | < 0.001 | | < 0.001 |
| Yes | 2.82 (2.78-2.87) | | 1.85 (1.49-2.28) | |
| No | 1.00 | | 1.00 | |
| Diabetes mellitus | | < 0.001 | | 0.366 |
| Yes | 0.57 (0.55-0.59) | | 0.82 (0.53-1.25) | |
| No | 1.00 | | 1.0 | |
| Mental disorder | | < 0.001 | | 0.433 |
| Yes | 1.28 (1.23-1.34) | | 0.82 (0.51-1.33) | |
| No | 1.00 | | 1.0 | |
| Current tuberculosis treatment - Level IV | | | | |
| Type of Notification | | < 0.001 | | < 0.001 |
| New Case | 1.00 | | 1.00 | |
| Recurrence | 1.28 (1.24-1.31) | | 0.90 (0.65-1.26) | |
| Resumption after abandonment | 3.84 (3.78-3.90) | | 1.91 (1.54-2.37) | |
| Does not know | 1.71 (1.49-1.97) | | 2.57 (0.70-9.43) | |
| Transfer | 1.25 (1.19-1.31) | | 0.82 (0.40-1.70) | |
| Clinical Form | | < 0.001 | | < 0.001 |
| Pulmonary | 1.00 | | 1.00 | |
| Extrapulmonary | 0.63(0.61-0.65) | | 0.54 (0.38-0.77) | |
| Pulmonary + Extrapulmonary | 1.03 (0.99-1.08) | | 0.85 (0.57-1.26) | |
| Sputum smear results | | < 0.001 | | 0.240 |
| Negative | 1.00 | | 1.00 | |
| Positive | 1.11 (1.08-1.13) | | 1.09 (0.88-1.33) | |
| Not Performed | 1.16 (1.14-1.19) | | 1.25 (0.96-1.63) | |
| Results of the initial culture | | < 0.001 | | 0.085 |
| Negative | 1.00 | | 1.00 | |
| Positive | 1.39 (1.35-1.44) | | 1.40 (1.01-1.95) | |
| In Progress | 1.62 (1.53-1.71) | | 1.57 (0.93-2.64) | |
| Not Performed | 1.34 (1.31-1.38) | | 1.49 (1.09-2.05) | |
| Chest X-ray | | < 0.001 | | 0.623 |
| Not suggestive of TB | 1.00 | | 1.00 | |
| Suggestive of TB | 1.34 (1.29-1.39) | | 0.87 (0.58-1.31) | |
| Not Performed | 1.39 (1.33-1.44) | | 0.96 (0.61-1.49) | |
| DOT | | < 0.001 | | 0.002 |
| Yes | 0.70 (0.68-0.72) | | 0.78 (0.66-0.91) | |
| No | 1.00 | | 1.00 | |

*Poisson regression; PR: prevalence ratio; 95% CI: 95% confidence interval; HIV/AIDS: human immunodeficiency virus infection/acquired immunodeficiency syndrome; TB: tuberculosis; DOT: directly observed treatment.

## DISCUSSION

The prevalence of the abandonment of tuberculosis treatment in Brazil between 2014 and 2019 was 16.4%, higher than the WHO recommendation of 5%. Self-declared individuals of black race/color, homeless, people living with HIV, alcoholics, illicit drug users, and resumption after the abandonment had the highest prevalence of ATT. On the other hand, individuals who received government assistance, extrapulmonary TB, and who underwent directly observed treatment had the lowest.

The information is generated by several health services, and, although the Ministry of Health standardizes the completion of the information system, the possibility of a classification different from the one recommended cannot be ruled out. However, it is believed that these limitations did not interfere with the results presented, an understanding reinforced by prior evaluations that demonstrated the quality of SINAN, and by the consistency of these results with the findings of the accumulated literature.

It was observed that black individuals had the highest prevalence of abandonment. This occurred because abandonment is linked to the social and economic vulnerability of the black population in Brazil which has less access to employment opportunities, lower income, precarious housing, and difficulty in accessing education and food[6,8-10].

Another factor linked to social vulnerability is the abuse of alcohol and other drugs. Precarious living conditions and increased risk of hepatotoxicity due to tuberculosis treatment in this group of patients may aggravate the disease and impair the therapeutic regimen, increasing the chance of abandonment[11-13]. In addition, alcohol and other drug abuse is a survival characteristic in homeless individuals[13,14]. Dependence on licit or illicit substances, the presence of other comorbidities such as HIV infection, social marginalization, and low access to public services hinder the process of caring for this population. The results show that the homeless population is especially vulnerable to the abandonment of tuberculosis treatment[14-16].

People living with HIV also live in social and economic vulnerability, which influences adherence to TB treatment, as well as the use of antiretrovirals. Abandonment of antiretroviral use was associated with social and economic issues in a systematic review that assessed adherence to treatment in people living with HIV[17]. Given this, the need to intensify the follow-up of cases of TB-HIV co-infection is reinforced, as well as the incorporation of HIV serological testing in individuals diagnosed with TB[18].

The prevalence of abandonment was higher among individuals who resumed treatment. This result shows that even though treatment and access to diagnostic tests are offered, the failure to reduce social and economic vulnerabilities in the daily lives of these individuals makes them more likely to abandon treatment again.

Directly observed treatment had the lowest prevalence of abandonment of TB treatment. Monitoring daily medication intake is a strategy to protect against abandonment. The increased coverage of Family Health Strategy services strengthens the practice of DOT, with a positive impact on longitudinal care centered on individuals with TB[19,20].

The lowest prevalence of abandonment of TB treatment was among individuals with extrapulmonary disease. Corroborating our results, studies conducted with SINAN data describe the extrapulmonary form as a factor less likely to abandon treatment[21-23]. However, we suggest caution in the interpretation of these results, as the extrapulmonary form is more prone to other unfavorable outcomes, such as death and treatment failure[24].

As shown, social and economic vulnerability is present among individuals affected by tuberculosis and is associated with the abandonment of tuberculosis treatment. Therefore, it is necessary to implement educational strategies in health, implement street clinics with a greater focus on tuberculosis treatment, and increase the supply of directly observed treatment to reduce abandonment.

### Authors' contributions

All authors contributed to the manuscript. João Paulo Cola: contributed to the conception and design of the study, analysis, and interpretation of the results, writing and critical review of the content of the manuscript; Sindy Azevedo Pinto: contributed to the conception and design of the study, analysis, and interpretation of the results, writing and critical review of the content of the manuscript; Jhenniffer Santos de Souza: contributed to the conception and design of the study, analysis, and interpretation of the results, writing and critical review of the content of the manuscript; Juliana Ferreira Hertel: contributed to the conception and design of the study, analysis, and interpretation of the results, writing and critical review of the content of the manuscript; Heletícia Scabelo Galavote: contributed to the interpretation of the results, writing, and critical review of the content of the manuscript; Thiago Nascimento do Prado: contributed to the conception and design of the study, analysis, and interpretation of the results, writing and critical review of the content of the manuscript; Ethel Leonor Noia Maciel: contributed to the interpretation of the results, writing and critical review of the content of the manuscript.

### Conflicts of interest

The authors declared there is no conflict of interest.

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**Resumo**

**Introdução:** a tuberculose (TB) é um problema de saúde pública. O Brasil está dentro do grupo de 22 países responsáveis por 90% dos casos de TB do mundo. Altas proporções do abandono do tratamento podem contribuir para esse cenário epidemiológico de difícil controle.

**Objetivo:** analisar os fatores associados ao abandono do tratamento da tuberculose.

**Método:** trata-se de um estudo transversal de indivíduos com diagnóstico de tuberculose no Brasil entre 2014 e 2019, notificados no Sistema de Informação de Agravos de Notificação. Utilizou-se regressão de Poisson de variância robusta de acordo com os níveis hierárquicos.

**Resultados:** foram notificados 508.787 casos, 59.871 (16,4%) abandonaram o tratamento. A prevalência do abandono foi maior em indivíduos em situação de rua (RP 2,75 IC95% 2,10-3,61), raça/cor preta (RP 1,79 IC95% 1,46-2,20), HIV/AIDS (RP 1,59 IC95% 1,30-1,93), etilistas (RP 1,38 IC95% 1,14-1,68), uso de drogas ilícitas (RP 1,85 IC95% 1,49-2,28) e os indivíduos que reingressaram o tratamento após abandono (RP 1,91 IC95% 1,54-2,37).

**Conclusão:** a vulnerabilidade social está associada ao abandono do tratamento da tuberculose.

**Palavras-chave:** tuberculose, pacientes desistentes do tratamento, vulnerabilidade social, estudos transversais.