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An epidemiological study of tuberculosis in vulnerable populations in a municipality of Southeastern Mato Grosso during the COVID-19 pandemic

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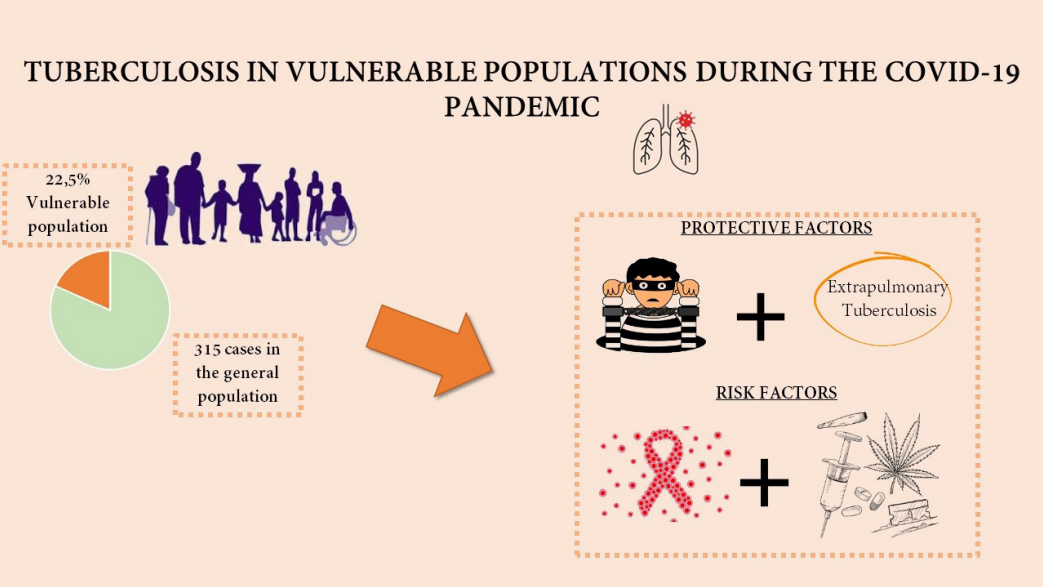
Graphical Abstract



Highlights

- *Tuberculosis is an infectious and contagious disease with social determinants and is considered a serious public health problem.*
- *This study aimed to analyze tuberculosis cases among vulnerable populations during the COVID-19 pandemic.*
- *The outcomes of tuberculosis cases differ across populations, highlighting the need for the implementation of specific health promotion strategies.*

Abstract

Tuberculosis is an infectious disease with social determinants and is considered a serious public health problem. This study aimed to analyze tuberculosis (TB) cases among vulnerable populations during the COVID-19 pandemic in Rondonópolis, Mato Grosso, Brazil. This is an analytical, retrospective epidemiological study using secondary data from tuberculosis cases reported to Epidemiological Surveillance between March 2020 and March 2023. Vulnerable populations were defined as individuals deprived of liberty, people experiencing homelessness, and beneficiaries of government income transfer programs. Logistic regression models were used to assess the relationship between vulnerability and unfavorable treatment outcomes. Among the 315 tuberculosis cases reported in the general population, 22.5% were classified as belonging to vulnerable groups. Being deprived of liberty and presenting the extrapulmonary form were identified as protective factors for successful outcomes (adjusted OR = 0.16; 95% CI = 0.03–0.75) and (adjusted OR = 0.24; 95% CI = 0.07–0.86), respectively, whereas HIV/AIDS co-infection and illicit drug use were found to be risk factors for unsuccessful outcomes (adjusted OR = 2.4; 95% CI = 1.85–6.78) and (adjusted OR = 3.65; 95% CI = 1.06–12.53). The outcomes of tuberculosis cases differed among the studied populations, emphasizing the need for implementing specific health promotion strategies.

Keywords: Tuberculosis. Vulnerable Populations. Homelessness. Incarceration. COVID-19.

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INTRODUCTION

Tuberculosis (TB) is an infectious disease caused by the Mycobacterium *tuberculosis bacillus* and remains a major public health problem. It is estimated that one-quarter of the global population has been infected with the *bacillus*[1]. Several factors contribute to the prevalence of TB, including social determinants such as income[2], education, social assistance, housing[3], employment[4], and access to healthcare[2] conditions of social inequality that facilitate disease transmission[5].

Studies addressing the epidemiological relationship between TB and the social and economic contexts of population groups are essential. The World Health Organization (WHO) Global Report indicated that the global incidence of TB decreased from 7.1 million in 2019 to 5.8 million in 2020, a reduction associated with the disruption of essential TB services during the COVID-19 pandemic. This decrease was related to difficulties in active case finding and diagnosis among the general population, including vulnerable groups[6].

Resolution No. 709/2023 of the Brazilian National Health Council defines the populations most vulnerable to TB as impoverished communities, Black populations, people experiencing homelessness (PEH), incarcerated individuals (PPL), people living with HIV/AIDS, migrants, refugees, Indigenous groups, and individuals who abuse alcohol and other drugs. It recommends implementing strategies integrated with other public policies to effectively address the needs of these populations and strengthen TB control[7].

The number of confirmed and reported TB cases has declined in recent years: 281,101 cases were recorded in Brazil from 2017 to 2019, compared to 227,947 between 2020 and 2022. In the Central-West region, 13,356 cases were reported between 2017 and 2019 and 10,287 between 2020 and 2022. During the initial pandemic period (2020–2022), there were 103,529 cases in the Southeast, 58,744 in the Northeast, 28,396 in the North, and 26,991 in the South. In Mato Grosso, 4,357 cases were reported between 2017 and 2019, and 3,090 between 2020 and 2022[8].

The preventive quarantine decrees imposed during the COVID-19 pandemic led to the reduction or suspension of non-essential services, profoundly impacting the socioeconomic context. Individuals with lower incomes were often unable to adhere to social distancing measures due to the need to maintain their family income[9].

Within this pandemic scenario, in which social inequities were accentuated, TB-related vulnerabilities may have worsened. Furthermore, physical distancing measures led to decreased access to healthcare services, and COVID-19 disrupted TB care worldwide. Data from 24 countries revealed a drop in reported TB cases from 32,898 in 2019 to 16,396 in 2020, with a sharp decline in March 2020, reflecting restrictions on mobility and reduced healthcare service hours, which hindered access to TB care[10].

Considering Brazil's persistent social inequality, the growing number of people experiencing homelessness and incarceration, the effects of TB on socially at-risk populations, challenges in treatment adherence, and the global plan prioritizing TB incidence reduction, ensuring adequate care for individuals in vulnerable situations is a relevant research priority[11].

Moreover, studies investigating the impact of poverty on TB outcomes and how targeted interventions may mitigate disease risk are still emerging[12].

Therefore, this research is justified by the importance of understanding the behavior of TB cases among vulnerable populations in relation to newly diagnosed TB cases in Rondonópolis, recognizing the value of interdisciplinary studies on neglected tropical diseases in the context of the COVID-19 pandemic. Given the scarcity of research published during this period on TB in this endemic municipality, this study offers original and relevant contributions to the development of strategies aimed at reducing TB incidence.

This study aimed to analyze tuberculosis cases among vulnerable populations during the COVID-19 pandemic in Rondonópolis, Mato Grosso, Brazil.

MATERIALS AND METHODS

Study Design

This is a cross-sectional, analytical, and retrospective study with a quantitative approach.

Study Setting and Period

The study was conducted in Rondonópolis, Mato Grosso (MT), using secondary data on tuberculosis (TB) obtained from the Epidemiological Surveillance system. The study period spanned from March 2020 to March 2023, corresponding to the duration of the COVID-19 pandemic.

Rondonópolis is located in the southeastern mesoregion of the state of Mato Grosso, in the Central-West region of Brazil. The municipality has a territorial area of 4,824.020 km² and an estimated population of 239,613 inhabitants[13,14]. Rondonópolis serves as an important regional hub for health, education, transportation, and workforce qualification for the southeastern municipalities of the state. The municipality has a Human Development Index (HDI) of 0.75[13].

TB notifications originated from primary healthcare units, the municipal TB reference center, specialized HIV/AIDS care services, private, public, and philanthropic hospitals, public emergency care units, and the prison healthcare outpatient service.

Data Collection

The data used in this study were secondary and collected from the Epidemiological Surveillance Department of Rondonópolis (MT), after obtaining prior authorization for data access, between June and July 2023.

The study population comprised all TB cases reported and recorded in the local database, extracted as an Excel spreadsheet from the TABNET data tabulation tool of the Department of Informatics of the Brazilian Unified Health System (DATASUS). All cases classified according to the International Statistical Classification of Diseases and Related Health Problems (ICD-10 A16.9 – Respiratory tuberculosis, unspecified, without mention of bacteriological or histological confirmation) were included.

Inclusion criteria were: reported TB cases and residency in the municipality under study. Exclusion criteria were: duplicate records, blank, and/or ignored data.

In this study, vulnerable populations were defined as individuals who were deprived of liberty (PPL), experiencing homelessness (PEH), or beneficiaries of government income transfer programs (PTR), categorized according to the variable "special situations," recorded in the Tuberculosis Notification/Investigation Form of the SINAN system at the time of disease notification.

The following variables were analyzed: number of TB cases reported monthly over the three-year period; sociodemographic variables (sex, age, race/skin color, education level, pregnancy status, and healthcare professional status); clinical variables (type of case entry, clinical form, diagnostic methods, sputum smear microscopy, rapid molecular testing, culture, drug susceptibility testing [DST], histopathology, chest X-ray, HIV testing, smoking, illicit drug use, AIDS, diabetes *mellitus*, mental illness, and other comorbidities); and outcome variables (treatment abandonment, cure, death from TB, death from other causes, and transfer).

During the study period, 326 TB cases were reported. Ten duplicate cases (reported by different healthcare units) and one case involving a resident of another municipality who had been hospitalized in Rondonópolis were excluded, resulting in a final sample of 315 TB cases.

For logistic regression analysis, outcome categories were grouped into treatment success (cure) and treatment failure (all other outcomes).

Data analysis

Cases were described according to their sociodemographic and clinical characteristics and grouped by population type: total population (all reported cases), incarcerated (PPL) and non-incarcerated individuals, people experiencing homelessness (PEH) and non-homeless individuals, and beneficiaries and non-beneficiaries of government income transfer programs (PTR). Descriptive statistics were performed using Microsoft Excel, and the results were presented in tables.

For each variable, associations between the different population groups and control groups were analyzed using the chi-square test or Fisher's exact test. To estimate the association between incarceration, homelessness, or PTR beneficiary status and unfavorable TB outcomes, logistic regression models were fitted.

Variables with $p \leq 0.20$ in the bivariate analysis were initially included in the multivariate model to control for potential confounders and to identify those independently associated with treatment failure in TB cases. Final variable selection was conducted using the backward stepwise elimination method, retaining in the final model only those with statistical significance

($p < 0.05$). Variables with a high proportion of missing data, high collinearity with other model variables, or lack of causal plausibility were excluded from the multivariate analysis.

The final logistic regression model included only variables considered statistically significant and/or epidemiologically relevant to explain the association between social vulnerability (incarceration, homelessness, and participation in government income transfer programs) and unsuccessful TB treatment outcomes. Statistical analyses were performed using R software, version 4.4.1[15].

Ethical and legal considerations

This research project complied with all ethical principles for research involving human subjects, as established by Resolution No. 466 of December 12, 2012[16]. The study was approved by the Research Ethics Committee of the Federal University of Rondonópolis under Certificate of Ethical Appreciation (CAAE): 69006223.8.0000.0126 and approval opinion No. 6.130.934.

RESULTS

Between March 2020 and March 2023, a total of 315 TB cases were reported in the general population. Of these, 13.65% were among incarcerated individuals (PPL), 2.22% among people experiencing homelessness (PEH), and 6.67% among beneficiaries of income transfer programs (PTR). The highest number of cases in the general population occurred in March 2023 (n = 17), while the lowest was observed in January 2021 (n = 1).

Among vulnerable populations, the highest frequencies were recorded in March 2023 for incarcerated individuals (n = 5), March 2021 for people experiencing homelessness (n = 1), and January (n = 2) and March (n = 2) 2023 for PTR beneficiaries.

The sociodemographic profile of reported TB cases in the general population of Rondonópolis (MT) was predominantly male (70.79%), aged 20 to 59 years (70.16%), Brown (61.59%), with elementary education (42.54%), and mostly non-healthcare workers (93.97%).

Regarding TB cases among PPL, PEH, and PTR beneficiaries, the predominant characteristics were, respectively: male (88.37%, 85.71%, 71.44%), 20–59 years old (97.67%, 100%, 47.62%), Brown (67.44%, 71.42%, 71.44%), elementary education (74.42%, 57.14%, 47.62%), and healthcare professionals among PPL (2.33%) (Table 1).

Table 1 – Sociodemographic profile of reported tuberculosis (TB) cases in the total population (n = 315) and vulnerable population (n = 71) in Rondonópolis, Mato Grosso, Brazil, from March 2020 to March 2023.

Sociodemographic variables	Total population	Incarcerated population (PPL)	Homeless population (PEH)	Beneficiaries of income transfer programs (PTR)
	n=315 (%)	n=43 (%)	n=7 (%)	n=21 (%)
Sex				
Female	92 (29.21)	5 (11.63)	1 (14.29)	6 (28.56)
Male	223 (70.79)	38 (88.37)	6 (85.71)	15 (71.44)
Age group				
0–9	3 (0.95)	0 (0)	0 (0)	0 (0)
10–19	19 (6.03)	0 (0)	0 (0)	2 (9.52)
20–59	221 (70.16)	42 (97.67)	7 (100)	10 (47.62)
60 or older	72 (22.86)	1 (2.33)	0 (0)	9 (42.86)
Race/skin color				
Yellow	1 (0.32)	0 (0)	0 (0)	0 (0)
White	64 (20.32)	8 (18.61)	0 (0)	1 (4.76)
Indigenous	5 (1.59)	0 (0)	1 (14.29)	2 (9.52)
Brown	194 (61.59)	29 (67.44)	5 (71.42)	15 (71.44)
Black	41 (13.01)	6 (13.95)	1 (14.29)	2 (9.52)
Ignored	10 (3.17)	0 (0)	0 (0)	1 (4.76)
Educational level				
None	9 (2.86)	1 (2.33)	0 (0)	2 (9.52)
Elementary education	134 (42.54)	32 (74.42)	4 (57.14)	10 (47.62)
Secondary education	95 (30.16)	6 (13.95)	0 (0)	6 (28.56)

to be continued...

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Sociodemographic variables	Total population	Incarcerated population (PPL)	Homeless population (PEH)	Beneficiaries of income transfer programs (PTR)
	n=315 (%)	n=43 (%)	n=7 (%)	n=21 (%)
Higher education	22 (6.98)	0 (0)	0 (0)	0 (0)
Not applicable	3 (0.95)	0 (0)	0 (0)	0 (0)
Ignored	52 (16.51)	4 (9.30)	3 (42.86)	3 (14.30)
Healthcare professional				
Yes	6 (1.90)	1 (2.33)	0 (0)	0 (0)
No	296 (93.97)	41 (95.34)	7 (100)	21 (100)
Ignored	13 (4.13)	1 (2.33)	0	0 (0)

Source: TABNET/DATASUS. Prepared by the authors.

The clinical characteristics of the general population were as follows: new cases (82.86%), pulmonary form (84.13%), sputum smear microscopy as the diagnostic method (39.37%), and negative HIV testing (68.57%). Regarding associated comorbidities, most were non-smokers (65.08%), did not use illicit drugs (81.90%), did not have diabetes mellitus (88.89%), and did not have mental illness (91.11%) (Table 2).

When comparing the studied vulnerable populations, the incarcerated group (PPL) presented a higher proportion of new cases (88.38%) and relapses after loss to follow-up (2.32%), a higher frequency of rifampicin-resistant cases detected by TRM-TB (6.98%), lower prevalence of HIV/AIDS co-infection (6.98%), fewer cases without HIV testing (6.98%), and a higher prevalence of mental illness (25.58%). Among people experiencing homelessness (PEH), the pulmonary form predominated (100%), with diagnostic characteristics including positive sputum smear microscopy (57.14%), no TRM-TB testing (85.71%) or drug susceptibility testing (100%), chest X-rays with suspicious findings (100%), higher HIV positivity (28.57%), and greater prevalence of smoking (85.71%) and drug use (42.56%).

Among income transfer program beneficiaries (PTR), there was a higher proportion of relapse cases (28.57%), combined pulmonary and extrapulmonary forms (4.76%), and lower prevalence of mental illness (4.76%), smoking (33.33%), and drug use (4.76%); however, diabetes *mellitus* was more prevalent in this group (4.76%) (Table 2).

Table 2 – Clinical characteristics of reported tuberculosis (TB) cases in the total population (n = 315) and vulnerable populations (n = 71) in Rondonópolis, Mato Grosso, Brazil, from March 2020 to March 2023.

Clinical variables	Total population	Incarcerated population (PPL)	Homeless population (PEH)	Beneficiaries of income transfer programs
	n=315 (%)	n=43 (%)	n=7 (%)	n=21 (%)
Type of case entry				
New case	261 (82.86)	38 (88.38)	5 (71.42)	12 (57.14)
Relapse	15 (4.76)	3 (6.98)	1 (14.29)	6 (28.57)
Re-entry after treatment abandonment	9 (2.86)	1 (2.32)	0 (0)	0 (0)
Transfer	28 (8.89)	1 (2.32)	1 (14.29)	2 (9.52)
Unknown	2 (0.63)	0 (0)	0 (0)	1 (4.76)
Clinical form				
Pulmonary	265 (84.13)	40 (93.02)	7 (100)	20 (95.24)
Extrapulmonary	48 (15.24)	3 (6.98)	0 (0)	0 (0)
Pulmonary + extrapulmonary	2 (0.63)	0 (0)	0 (0)	1 (4.76)
Chest X-ray				
Normal	4 (1.27)	1 (2.32)	0 (0)	0 (0)
Suspect	267 (84.76)	39 (90.70)	7 (100)	18 (85.72)
Not performed	39 (12.38)	3 (6.98)	0 (0)	2 (9.52)
Ignored	5 (1.59)	0 (0)	0 (0)	1 (4.76)
HIV testing				
Positive	38 (12.06)	3 (6.98)	2 (28.57)	2 (9.52)
Negative	216 (68.57)	37 (86.04)	2 (28.57)	15 (71.43)
In progress	2 (0.63)	0 (0)	0 (0)	0 (0)

to be continued...

...continuation - Table 2.

Clinical variables	Total population	Incarcerated population (PPL)	Incarcerated population (PPL)	Beneficiaries of income transfer programs (PTR)
	n=315 (%)	n=43 (%)	n=7 (%)	n=21 (%)
Not performed	59 (18.74)	3 (6.98)	3 (42.56)	4 (19.05)
Smoking status				
Yes	98 (31.11)	25 (58.14)	6 (85.71)	7 (33.33)
No	205 (65.08)	18 (41.86)	1 (14.29)	14 (66.67)
Ignored	12 (3.81)	0 (0)	0 (0)	0 (0)
Illicit drug use				
Yes	44 (13.97)	12 (27.91)	3 (42.56)	1 (4.76)
No	258 (81.90)	31 (72.09)	4 (57.14)	20 (95.24)
Ignored	13 (4.13)	0 (0)	0 (0)	0 (0)
AIDS				
Yes	38 (12.06)	3 (6.98)	2 (28.57)	2 (9.52)
No	271 (86.03)	39 (90.70)	4 (57.14)	19 (90.48)
Ignored	6 (1.90)	1 (2.32)	1 (14.29)	0 (0)
Diabetes *mellitus*				
Yes	23 (7.30)	1 (2.32)	0 (0)	1 (4.76)
No	280 (88.89)	41 (95.36)	6 (85.71)	19 (90.48)
Ignored	12 (3.81)	1 (2.32)	1 (14.29)	1 (4.76)
Mental illness				
Yes	15 (4.76)	11 (25.58)	1 (14.29)	1 (4.76)
No	287 (91.11)	32 (74.42)	6 (85.71)	19 (90.48)
Ignored	13 (4.13)	0 (0)	0 (0)	1 (4.76)

Source: TABNET/DATASUS. Prepared by the authors.

In the general population, treatment success (cure) was 53.02%, while among vulnerable populations it was 67.44% for incarcerated individuals (PPL), 28.57% for people experiencing homelessness (PEH), and 38.09% for beneficiaries of income transfer programs (PTR). Treatment failure (defined as abandonment/loss to follow-up, death due to TB, death from other causes, or transfer) occurred in 33.97% of the general population, 11.64% among the incarcerated population, 71.43% among the homeless population, and 42.86% among PTR beneficiaries.

Table 3 presents the factors that remained associated with unfavorable outcomes (abandonment/loss to follow-up, death from tuberculosis or other causes, and transfer) in the vulnerable population after adjustment. Being incarcerated (adjusted OR = 0.16; 95% CI = 0.03–0.75) and having the extrapulmonary form (adjusted OR = 0.24; 95% CI = 0.07–0.86) were protective factors for successful outcomes, whereas co-infection with AIDS (adjusted OR = 2.4; 95% CI = 1.85–6.78) and illicit drug use (adjusted OR = 3.65; 95% CI = 1.06–12.53) were identified as risk factors for treatment failure.

Table 3 – Association between clinical and sociodemographic characteristics and treatment failure (abandonment/loss to follow-up, death due to tuberculosis or other causes, and transfer) among tuberculosis cases in Rondonópolis, Mato Grosso, Brazil, from March 2020 to March 2023.

Characteristics	Adjusted OR (RCa)	95% CI	p (Wald's test)	p (Likelihood Ratio test)
Sex				
Male	reference			0.207
Female	0.63	(0.30–1.31)	0.211	
Education level				
Illiterate	reference			0.927
Elementary	0.57	(0.08–4.08)	0.575	
Secondary	0.67	(0.09–4.88)	0.691	
Higher education	0.69	(0.08–6.15)	0.741	
Type of case entry				
New case	reference			0.741
Relapse	1.36	(0.18–10.16)	0.764	

to be continued...

...continuation - Table 3.

Characteristics	Adjusted OR (RCa)	95% CI	p (Wald's test)	p (Likelihood Ratio test)
Re-entry after abandonment	1.09	(0.07–15.90)	0.950	
Transfer	0.54	(0.17–1.77)	0.309	
Clinical form				
Pulmonary	reference			0.018
Extrapulmonary	0.24	(0.07-0.86)	0.028	
Incarcerated population (PPL)				
No	reference			0.006
Yes	0.16	(0.03-0.75)	0.021	
Homeless population (PEH)				
No	reference			0.421
Yes	2.97	(0.2-43.95)	0.428	
Healthcare professional				
No	reference			0.535
Yes	1.9	(0.26-13.81)	0.528	
Immigrant status				
No	reference			0.691
Yes	0.55	(0.03-10.82)	0.695	
Beneficiary of income transfer program (PTR)				
No	reference			0.456
Yes	1.57	(0.48-5.07)	0.455	
AIDS				
No	reference			0,046
Yes	2.4	(1,85-6,78)	0,049	
Diabetes *mellitus*				
No	reference			0,403
Yes	0.59	(0.17-2.09)	0.415	
Illicit drug use				
No	reference			0.035
Yes	3.65	(1.06-12.53)	0.04	
Smoking				
No	reference			0.228
Yes	0.59	(0.25-1.41)	0.235	
Chest X-ray				
Suspect	reference			0.937
Not performed	1.29	(0.27-6.24)	0.754	
Normal	1.29	(0.1-17,25)	0.845	

RCa: Adjusted Odds Ratio. Source: Prepared by the authors.

DISCUSSION

In this study, tuberculosis (TB) cases reported among incarcerated individuals (PPL) and beneficiaries of income transfer programs (PTR) peaked in March 2023. This pattern may be attributed to the introduction of the bivalent COVID-19 vaccine in February 2023, which prompted patients to resume use of healthcare services that had been severely disrupted during the pandemic[17]. Conversely, January 2021 registered the lowest number of TB cases in the general population, reflecting the impact of Brazil's second COVID-19 wave, which became evident from December 2020 onward. During this period, reinforced social distancing measures hindered treatment adherence, disrupted active case finding within communities, and limited contact tracing efforts[18,19]

The four vulnerable populations analyzed in this study displayed similar sociodemographic patterns, predominantly involving men and individuals self-identified as of mixed race (Brown). The epidemio-

logical profile of TB in Brazil — both before and during the COVID-19 pandemic — showed that, in the Central-West region, over 70% of TB cases occurred in men and more than 50% in individuals identifying as Black or Brown[20].

The 20–59-year age group was the most affected in all five Brazilian regions, demonstrating that TB mainly affects adults, followed by older adults, with lower prevalence in children and adolescents[21]. Adults represent the group most affected by TB due to higher exposure risk, as they are more frequently present in crowded environments and occupational settings that facilitate transmission[22].

In this study, incarcerated individuals accounted for 60.56% of TB cases among vulnerable groups, consistent with findings from Belo Horizonte between 2001 and 2017, where 65.11% of vulnerable TB cases were observed among the PPL population[11].

Within the incarcerated population, a higher proportion of rifampicin-resistant cases detected by TRM-TB was identified compared to PTR beneficiaries. The Brazilian Ministry of Health has recognized the PPL population as a group with higher prevalence of multidrug-resistant TB (MDR-TB)[23]. Data from SINAN/BH indicated that 5% of PPL cases were MDR-TB infections. Given the importance of early diagnosis and the utility of rapid molecular testing (TRM-TB), this study's findings — showing greater TRM-TB use among PPL and PTR beneficiaries than in the general population— suggest a positive trend toward diagnostic prioritization in vulnerable populations.

Conversely, low use of TRM-TB was observed among people experiencing homelessness (PEH), with most cases lacking molecular testing. Early diagnostic testing is essential for timely TB detection and treatment, particularly among vulnerable groups who may sustain transmission chains due to barriers in accessing healthcare and challenges with treatment adherence[11].

The PEH population also exhibited higher rates of HIV positivity, smoking, and drug use. In Brazil, this population shows a high prevalence of tobacco and illicit drug use, including among individuals living with HIV/AIDS findings that align with the present study[22]. The elevated vulnerability of PEH to HIV infection is linked to a complex interplay of factors, including age and gender disparities, sexual practices, types of partnerships, substance use, and limited access to preventive interventions for sexually transmitted infections (STIs) and AIDS[24].

This study found a treatment success rate of 67.44% among incarcerated individuals, with an adjusted odds ratio (OR) of 0.16 (95% CI: 0.03–0.75) for favorable outcomes. Similar results were reported elsewhere, with an OR of 0.68 indicating that incarceration was associated with favorable outcomes (protective against treatment failure)[25].

That association was attributed to the benefits of directly observed therapy (DOT). Although this variable was unavailable in the present dataset, incarcerated individuals received ambulatory care within prison facilities, which may have facilitated better follow-up and improved outcomes. Social determinants of health are closely linked to disease risk. Health inequities limit access to preventive, diagnostic, and therapeutic services, resulting in populations with reduced access to comprehensive TB care[26].

Extrapulmonary TB was also identified as a protective factor for treatment success in this study (adjusted OR: 0.24; 95% CI: 0.07–0.86). In Rio de Janeiro, a study reported a higher likelihood of unfavorable outcomes among patients with severe extrapulmonary forms (with or without pulmonary involvement) compared to those with isolated, non-severe extrapulmonary TB[27]. Another investigation found that, although most cases resulted in cure, the cure rate remained below the WHO-recommended 85%, while treatment abandonment (6.48%) exceeded the acceptable 5% threshold[28].

Conversely, HIV/AIDS co-infection and illicit drug use were confirmed as risk factors for treatment failure among vulnerable groups. These findings underscore the role of AIDS as one of the major co-infections associated with TB, especially among younger individuals. Co-infection leads to more severe clinical forms, higher hospitalization rates, greater frequency of extrapulmonary involvement, lower cure rates, and increased mortality[29].

In Pelotas, Rio Grande do Sul, during the COVID-19 pandemic, the presence of comorbidities, HIV infection, mental disorders, and illicit substance use was associated with a reduced provision of healthcare interventions during TB treatment. Service-level challenges in maintaining treatment continuity and providing targeted follow-up for individuals requiring closer monitoring due to chronic conditions hindered both the delivery and uptake of care. The association between multimorbidity and a lower number of treatment follow-up actions reveals an important fragility in healthcare delivery, as this condition is correlated with unfavorable TB treatment outcomes[30].

The present study has limitations related to the use of secondary data, which are collected and entered by different professionals across the munici-

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pality. This process makes it difficult to ensure quality control in data collection and entry, resulting in potential inconsistencies, incompleteness, and discordance among certain variables.

Nevertheless, the use of secondary data contributes significantly to the monitoring of health indicators, the evaluation of public policies, and the identification of social and regional inequalities. Such information strengthens health management and planning and supports the development of evidence-based interventions that are essential for epidemiological surveillance and disease control[31].

CONCLUSION

The outcomes of tuberculosis (TB) cases differed among incarcerated individuals, people experiencing homelessness, and beneficiaries of government income transfer programs in this study. Protective factors for successful outcomes included incarceration and extrapulmonary TB, whereas HIV/AIDS co-infection and illicit drug use were identified as risk factors for treatment failure.

It should be noted that the absence of variables related to directly observed therapy (DOT) and time to diagnosis, as well as the small number of cases among the homeless population, may have affected statistical stability. Additionally, within the pandemic context, one of the main challenges was the underreporting of new TB cases, which limited the planning of evidence-based public health actions aligned with the real needs of the population. This underreporting may be attributed to patients' fear of attending healthcare facilities during the pandemic, which consequently hampered active case finding.

Therefore, it is recommended that strategies be implemented to address the specific needs of these vulnerable populations through collaboration with social welfare and security agencies. Health education interventions should be developed to promote TB prevention, alongside active case finding for early diagnosis and effective disease control. Moreover, strengthening social assistance and healthcare networks — through partnerships with established social organizations — is essential to improve support for the homeless population, including initiatives that guarantee access to adequate nutrition and housing.

In the current post-pandemic scenario, there is an urgent need to intensify TB prevention and control measures, with an emphasis on screening strategies within primary healthcare. Such actions are fundamental to improving TB indicators and reducing transmission. Recognizing the need for continuous monitoring and control efforts in these vulnerable populations reinforces the importance of intersectoral, inclusive, and integrated approaches for TB surveillance and prevention at the municipal level.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the workreported in this paper.

REFERENCES

1. World Health Organization (WHO). Global tuberculosis report 2022. Geneva: World Health Organization; 2022 [acesso em abr 18]. Disponível em: https://www.who.int/publications/i/item/9789240061729.
2. Pinheiro RS, Oliveira GP, Oliveira EXG, et al. Determinantes sociais e autorrelato de TB nas regiões metropolitanas conforme a Pesquisa Nacional por Amostra de Domicílios, Brasil. Rev Panam Salud Publica, 2013 [acesso em abr 20]; 34(6):446-451. Disponível em: https://scielosp.org/pdf/rpsp/2013.v34n6/446-451/pt.
3. Moreira ASR, Kritski AL, Carvalho ACC. Social determinants of health and catastrophic costs associated with the diagnosis and treatment of tuberculosis. J Bras Pneumol., 2020; [acesso em abr 16]; 46(5):e20200015. Disponível em: https://dx.doi.org/10.36416/1806-3756/e20200015.
4. Pereira TV, Nogueira MC, Campos EMS. Spatial analysis of tuberculosis and its relationship with socioeconomic indicators in a medium-

sized city in Minas Gerais. Rev Bras Epidemiol., 2021 [acesso em abr 19]; 24(1):1-13. Disponível em: https://www.scielo.br/j/rbepid/a/csBR85TsJqw9mCNWg35pKmN/?format=pdf&lang=en.
5. Pedro AS, Gibson G, Santos JPC, et al. TB como marcador de iniquidades em um contexto de transformação socioespacial. Rev Saude Publica, 2017 [acesso em abr 18]; 51(16):1-10. Disponível em: https://www.scielo.br/j/rsp/a/rSXhgqrCB4X8nmzpWf3z3qm/?format=pdf&lang=pt.
6. World Health Organization (WHO). Global tuberculosis report 2021. Geneva: World Health Organization; 2021 [acesso em abr 18]. Disponível em: https://www.who.int/publications/i/item/978924003702
7. Brasil. Ministério da Saúde. Conselho Nacional de Saúde. Resolução CNS nº 709, de 16 de março de 2023. Dispõe sobre diretrizes e propostas de ação relativas à vigilância, promoção, prevenção, diagnóstico, tratamento e reabilitação da tuberculose no Sistema Único de Saúde (SUS). Disponível em: https://bvsms.saude.gov.br/bvs/saudelegis/cns/2023/res0709_17_04_2023.html
8. Brasil. Ministério da Saúde. Banco de dados do Sistema Único de Saúde-DATASUS. 2022. Disponível em: https://datasus.saude.gov.br/
9. Figueiredo AM, Figueiredo DCMM, Gomes LB, et al. Determinantes sociais da saúde e infecção por COVID-19 no Brasil: uma análise da epidemia. Rev Bras Enferm., 2020 [acesso em abr 08]; 73(2):1-7. Disponível em: https://www.scielo.br/j/reben/a/H9BxWMp6bK9QNLkpPBqJhBw/?format=pdf&lang=pt.
10. Migliori GB, Thong PM, Alffenaar JW, et al. Country-specific lockdown measures in response to the COVID-19 pandemic and its impact in tuberculosis control: a global study. J Bras Pneumol., 2022 [acesso em abr 15]; 48(e20220087):1-8. Disponível em: https://dx.doi.org/10.36416/1806-3756/e20220087.
11. Freitas GL, França GEM, Souza, TR, et al. Diagnóstico e acompanhamento da TB – diferenças entre população geral e populações vulnerabilizadas. Cogitare Enferm., 2022 [acesso em abr 10]; 27(e83607):1-11. Disponível em: http://dx.doi.org/10.5380/ce.v27i0.83607.
12. Oliosi JGN, Reis-Santos B, Locatelli RL, et al. Effect of the Bolsa Familia Programme on the outcome of tuberculosis treatment: a prospective cohort study. The Lancet Glob Health, 2019 [acesso em abr 17]; 7(2):219–226. Disponível em: https://doi.org/10.1016/S2214-109X(18)30478-9.
13. Instituto Brasileiro de Geografia e Estatística. Censo Demográfico 2010. Rio de Janeiro: IBGE, 2010. Disponível em: https://censo2010.ibge.gov.br/
14. Instituto Brasileiro de Geografia e Estatística. Estimativas da população residente no Brasil e Unidades da Federação com data de referência em 1º de julho de 2021. Rio de Janeiro: IBGE, 2021. Disponível em: https://ftp.ibge.gov.br/Estimativas_de_Populacao/Estimativas_2021/estimativa_dou_2021.pdf
15. R Development Core Team. 2024. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria, 2024. Disponível em: https://www.R-project.org/.
16. Brasil. Ministério da Saúde. Conselho Nacional de Saúde. Resolução nº 466, de 12 de dezembro de 2012. Aprova diretrizes e normas regulamentadoras de pesquisas envolvendo seres humanos. Diário Oficial da União.13 jun 2013. Disponível em: https://www.gov.br/conselho-nacional-de-saude/pt-br/atos-normativos/resolucoes/2012/resolucao-no-466.pdf/view
17. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde e Ambiente. Boletim epidemiológico especial: doença pelo novo coronavírus – COVID-19. Brasília: Ministério da Saúde, 2023a. Disponível em: https://www.gov.br/saude/pt-br/centrais-de-conteudo/publicacoes/boletins/epidemiologicos/covid-19/2023
18. Brasil. Ministério da Economia. Instituto de Pesquisa Econômica Aplicada. Nota técnica. Medidas legais de distanciamento social: análise comparada da primeira e segunda ondas da pandemia da COVID-19 no Brasil. Brasília: Ministério da Economia, 2021. Disponível em: https://repositorio.ipea.gov.br/handle/11058/10572
19. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde e Ambiente. Boletim epidemiológico de TB 2023. Brasília: Ministério da Saúde, 2023b. Disponível em: https://www.gov.br/aids/pt-br/central-de-conteudo/boletins-epidemiologicos/2023/tuberculose/boletim-epidemiologico-tuberculose-2023_eletronico.pdf/view
20. Sousa SVD, Machado JA, Oliveira MFZ, et al. Comparação do perfil epidemiológico da TB antes e durante a pandemia de SARS COV II no Brasil. Rev Master Ens Pesqui Extensão, 2023 [acesso em abr 22]; 8(15):1-13. Disponível em: https://revistamaster.imepac.edu.br/RM/article/view/412/226.
21. Cunha LNA, Oliveira OS, Silva AV, et al. Perfil epidemiológico da TB de acordo com as regiões do Brasil. Braz J Infect Dis. 2022 [acesso em abr 7]; 26(1):131-132. Disponível em: https://www.sciencedirect.com/science/article/pii/S1413867021004566?via%3Dihub.
22. Macêdo Júnior AM, Pontes Neta ML, Duarte ARA, et al. Perfil epidemiológico da tuberculose no Brasil, com base nos dados provenientes do DataSUS nos anos de 2021. Research, Society and Development, 2022 [acesso em abr 13]; 11(6):1-24. Disponível em: http://dx.doi.org/10.33448/rsd-v11i6.28999.
23. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Vigilância das Doenças Transmissíveis. Manual de Recomendações para o Controle da TB no Brasil. 2. ed. Brasília: Ministério da Saúde, 2019. Disponível em: https://bvsms.saude.gov.br/bvs/publicacoes/manual_recomenacoes_controle_tuberculose_brasil_2_ed.pdf
24. Grangeiro A, Holcman MM, Onaga ET, et al. Prevalência e vulnerabilidade à infecção pelo HIV de moradores de rua em São Paulo, SP. Rev Saude Publica. 2012 [acesso em abr 15]; 46(4):674-684. Disponível em: https://www.scielo.br/j/rsp/a/Kf3wNPvQCwc5RgjsBPSQwjM/?format=pdf&lang=pt.
25. Macedo LR, Maciel ELN, Struchiner CJ. Populações vulneráveis e o desfecho dos casos de TB no Brasil. Cien Saude Colet, 2021 [acesso em abr 12]; 26(10):4749-4759. Disponível em: https://www.scielo.br/j/csc/a/L8GJjZMqtZMVbzKXxZZdgCs/?format=pdf&lang=pt.
26. Aguiar FHS, Calhau GS, Lachtim SAF, et al. Perfil da TB em populações vulneráveis: pessoas privadas de liberdade e em situação de rua. Rev Cienc Med Biol. 2021 [acesso em 2024 abr 2]; 20(2):253-258. Disponível em: https://doi.org/10.9771/cmbio.v20i2.43513.
27. Pereira AGL, Escosteguy CC, Gonçalves JB, et al. Fatores associados ao óbito e ao abandono do tratamento da TB em um hospital geral do município do Rio de Janeiro, 2007 a 2014. Rev Epidemiol Control Infect., 2018 [acesso em 2024 abr 18]; 8(2):150-158. Disponível em: https://online.unisc.br/seer/index.php/epidemiologia/article/view/10675/7197.
28. Figueiredo AVC, Duarte AO, Vieira MRV, et al. Perfil clínico e epidemiológico dos pacientes com tuberculose extrapulmonar no município de Ipatinga – MG. Braz J Surg Clin Res. 2021 [aceso em abr 9]; 35(1):18-25. Disponível em: https://www.mastereditora.com.br/periodico/20210611_074735.pdf.
29. Silva Júnior FS, Sampaio MG, Pinto IGA, et al. Perfil dos casos notificados de Tuberculose no município de Teresina-PI nos anos de 2012-2021. Braz J Surg Clin Res, 2023 [acesso em abr 21]; 6(3):9681-9696. Disponível em: https://ojs.brazilianjournals.com.br/ojs/index.php/BJHR/article/view/59795.
30. Antunes LB, Andrade RLP, Ribeiro RR, et al. Tratamento da TB durante a pandemia de COVID-19: ações ofertadas e perfil dos casos. Rev Gaucha Enferm. 2024 [acesso em abr 6]; 45(e20230127):1-13. Disponível em: https://www.scielo.br/j/rgenf/a/mMb3sXRS5QbqgMbvqNTkdTR/?format=pdf&lang=pt.
31. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde e Ambiente. Boletim Epidemiológico: Tuberculose 2023. Brasília: MS, 2023. Disponível em: https://www.gov.br/saude/

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