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Linkage to primary health care for new tuberculosis cases diagnosed in secondary and tertiary health care

Vinculação à atenção primária de casos novos de tuberculose diagnosticados na atenção secundária e terciária

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ABSTRACT

Objective: to examine the association between linkage to primary care, sociodemographic characteristics, and treatment outcomes of new pulmonary tuberculosis cases diagnosed in secondary and tertiary care services. **Method:** this cross-sectional epidemiological study was conducted in a capital city in southern Brazil, using data from 344 new pulmonary tuberculosis cases reported between 2015 and 2020. Statistical analysis included Student's t-test, Pearson's chi-square test, and Fisher's exact test, with a significance level of 5%. **Results:** linkage to primary care was associated with individuals under 30 years of age (p=0.005), health care workers (p=0.044), and treatment outcomes such as cure and medication use for at least one month (p<0.001). Conversely, non-linkage was associated with homeless individuals (p=0.016), diagnoses in 2019 and 2020 (p<0.001), and outcomes such as death and early treatment discontinuation (p<0.001). **Conclusion:** Linkage to primary care is related to socioeconomic factors and better treatment outcomes.

***Descriptors*:** Tuberculosis, Pulmonary; Neglected Diseases; Public Health; Continuity of Patient Care; Health Information Systems.

RESUMO

Objetivo: verificar a associação entre a vinculação à atenção primária, as características sociodemográficas e o desfecho do tratamento de casos novos de tuberculose pulmonar diagnosticados em serviços de atenção secundária e terciária. **Método**: estudo epidemiológico transversal realizado em uma capital do sul do Brasil, com dados de 344 casos novos de tuberculose pulmonar notificados entre 2015 e 2020. Foram utilizados os testes t de Student, qui-quadrado de Pearson e exato de Fisher, com nível de significância de 5%. **Resultados:** a vinculação à atenção primária foi associada a pessoas com menos de 30 anos (p=0,005), profissionais da saúde (p=0,044) e desfechos de cura e uso da medicação por pelo menos um mês (p<0,001). Já a não vinculação foi associada a pessoas em situação de rua (p=0,016), diagnóstico nos anos de 2019 e 2020 (p<0,001), desfechos de óbito e interrupção precoce do tratamento (p<0,001). **Conclusão**: A vinculação à atenção primária está relacionada a variáveis socioeconômicas e a melhores desfechos no tratamento.

Descritores: Tuberculose Pulmonar; Doenças Negligenciadas; Saúde Pública; Continuidade da Assistência ao Paciente; Sistemas de Informação de Agravo de Notificação.

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INTRODUCTION

Tuberculosis (TB) is an infectious disease that remains one of the leading causes of death worldwide, despite its well-established clinical course, treatment guidelines, and cure criteria. This makes TB a persistent public health challenge. It is estimated that more than 10 million people fall ill with TB every year, and timely diagnosis and complete treatment are essential to break the transmission chain of the disease.[1]

Some countries have managed to reduce the TB burden to fewer than 10 cases and fewer than one death per 100,000 inhabitants per year.1 However, in Brazil, the incidence in 2021 was 34.9 cases per 100,000 inhabitants, and mortality reached 2.38 deaths per 100,000 inhabitants, with a rising trend in death rates over the past few years.[2] These figures highlight the need for reflection on access to diagnosis and treatment for TB.

Priority actions for TB control are concentrated in Primary Health Care (PHC) and aim to identify symptomatic individuals to ensure timely diagnosis and treatment. However, PHC services face challenges in adequately detecting TB cases, so hospital and pre-hospital care services have become the main points of entry, especially in large urban centers. This shift is due to weaknesses in patient reception, difficulties in building patient-provider relationships, limited access, and low problem-solving capacity in PHC, leading patients to seek higher-technology care services.[3,4]

Thus, even though TB programmatic care is focused on PHC,4 medium- and high-complexity services play a strategic role in TB control. When TB is diagnosed in urgent care units or hospitals, it is crucial to ensure continuity of care by transitioning the patient to different levels of the Health Care Network (HCN).

Linkage to and continued use of PHC are fundamental for ensuring care, treatment, and follow-up until the completion of treatment. Upon hospital discharge or release from emergency services, it is essential to ensure that patients are prepared to manage their health condition and are referred to continue treatment within PHC.[5,6] This is vital for strengthening the integration of HCN services, as inefficiencies in referral and counter-referral systems have hindered the implementation of TB elimination strategies.[3,4]

Brazil has a TB treatment dropout rate of 14%,2 which exceeds the 5% limit recommended by the World Health Organization.1 Nonadherence to treatment has serious consequences for both the patient and their contacts, as the individual remains contagious, and the transmission chain is not interrupted. Additionally, persistent infection may lead to drug resistance and disease recurrence, complicating recovery and increasing both the duration and cost of treatment.[7] This underscores the importance of strategies aimed at ensuring continuity of care and improving clinical outcomes.

Expanding the role of nurses has been identified as a key strategy for eliminating TB, as they are involved in case follow-up from diagnosis to the completion of treatment.[8] Studies show that nurse-led hospital discharge planning programs contribute to TB patients' self-care and improve clinical outcomes.[6]

Given the high rates of treatment interruption and the demand for medium- and high-complexity services in a system that focuses TB control efforts in PHC, there is a need for knowledge that can support discussions on strategies to ensure linkage and continuity of care within PHC, promoting both treatment and cure. There is a gap in the literature regarding the linkage to PHC following TB diagnosis in hospitals and emergency services, which justifies the need for this study.

This raises the following research questions: "What are the sociodemographic characteristics of TB patients diagnosed in secondary and tertiary care associated with PHC linkage?" and "Is there an association between PHC linkage and TB treatment outcomes in patients diagnosed in secondary and tertiary care?"

OBJECTIVE

To investigate the association between linkage to primary care and sociodemographic characteristics, as well as treatment outcomes, of new pulmonary TB cases diagnosed in secondary and tertiary care services.

METHOD

This is a descriptive, cross-sectional, epidemiological, quantitative study based on the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) tool. The study was conducted in Porto Alegre, the Brazilian capital with the highest rate of pulmonary TB treatment discontinuation (31.1%), followed by Porto Velho (30.6%) and Fortaleza (24.4%).[2]

Data were provided by the Municipal Health Department, specifically the Health Surveillance sector, and collected from the notification module of the National System of Notifiable Diseases (SINAN). Data collection took place between June and July 2022.

The study population included TB cases reported in Sinan between 2015 and 2020, the most recent year with consolidated data available at the time of collection. Initially, 3,241 cases were identified. The sample size was calculated using the formula for proportion estimates, with a 5% margin of error and a 95% confidence level, assuming a 50% prevalence to maximize the sample size. Thus, 344 cases were randomly selected using electronic lottery.

Inclusion criteria were: new pulmonary TB cases diagnosed in urgent care units (secondary care) or hospitals (tertiary care) among individuals aged 18 or older and residing in Porto Alegre. Excluded were cases of extrapulmonary TB, drug-resistant TB, and notifications with the following entry types: relapse, re-entry after treatment interruption, unknown entry, transfer, or post-mortem diagnosis.

Data were collected by using a spreadsheet generated by the notification platform. Cases were selected based on the following filters: a) Year: 2015 to 2020; b) Reporting unit: National Health Establishment Registry (CNES) numbers for urgent care units and hospitals; c) Municipality of residence; d) Entry type: new cases; e) TB form: “pulmonary” or “pulmonary and extrapulmonary.” After applying these filters, the following variables were collected: health unit responsible for treatment, sex, age, race/ethnicity, belonging to special populations, participation in income transfer programs, education level, TB type, and case closure status.

Linkage was defined as the continuous use of PHC by the patient until the end of treatment, as recorded by the Municipal Epidemiological Surveillance in the case closure notification. Treatment discontinuation was considered when the patient used medication for at least one month and then stopped for more than 30 days. Primary discontinuation was defined as stopping treatment before completing 30 days of TB medication use, according to the notification form. The term “abandonment” was replaced in line with guidelines promoting person-centered, non-stigmatizing language.[3] The dependent variable was the patient’s linkage to PHC, identified from the CNES of the health unit responsible for treatment. Other variables were considered independent.

Data analysis was performed using SPSS version 28.0. Quantitative variables were described by means and standard deviations, and categorical variables by absolute and relative frequencies. Student’s t-test was used to compare means. Pearson’s chi-square or Fisher’s exact test was used to compare proportions. For polytomous variables, adjusted residual analysis was applied to identify statistically significant differences. The significance level adopted was 5% ($p<0.05$).

The study complied with the ethical principles established by the Brazilian National Health Council Resolution No. 466 of December 12, 2012. The project was approved by the Ethics Committee of the Federal University of Rio Grande do Sul (UFRGS), under opinion No. 5.336.832, and by the Ethics Committee of the Municipal Health Department of Porto Alegre, under opinion No. 5.399.136.

RESULTS

Linkage to PHC for continued treatment after diagnosis in hospital and emergency services occurred in 203 cases (59%). The average age of the patients was 43.9 years (±16), with a higher average age among those without linkage to PHC. A significant association was found between patients under 30 years of age and linkage to PHC (Table 1).

Among the sample, 219 (63.7%) were male, and 217 (63.1%) identified as white. Regarding education, 108 cases (31.4%) had unknown or unreported education levels. No significant associations were found between linkage to PHC and sex, race/ethnicity, or education variables.

Table 1. Association between PHC linkage and sociodemographic characteristics of users diagnosed with pulmonary tuberculosis in secondary and tertiary care (n=344). Porto Alegre (RS), Brazil, 2015-2020.

Variables	Total Sample (n=344; 100%)	With Linkage (n=203; 59%)	Without Linkage (n=141; 41%)	p
Age (years) – mean ± SD	43.9 ± 16.0	41.3 ± 16.0	47.7 ± 15.3	**<0.001**†
Age group – n (%)				**0.005**‡
< 30 years	80 (23.3)	61 (30.0)*	19 (13.5)	
30 to 39 years	73 (21.2)	44 (21.7)	29 (20.6)	
40 to 49 years	77 (22.4)	40 (19.7)	37 (26.2)	
50 to 59 years	52 (15.1)	28 (13.8)	24 (17.0)	
60 years or more	62 (18.0)	30 (14.8)	32 (22.7)	
Sex – n (%)				0.952‡
Male	219 (63.7)	130 (64.0)	89 (63.1)	
Female	125 (36.4)	73 (36.0)	52 (36.9)	
Race/Ethnicity – n (%)				0.164‡
White	217 (63.1)	126 (62.1)	91 (64.5)	
Black	82 (23.8)	45 (22.2)	37 (26.2)	
Asian	3 (0.9)	3 (1.5)	0 (0.0)	
Mixed race	41 (11.9)	29 (14.3)	12 (8.5)	
Ignored	1 (0.3)	0 (0.0)	1 (0.7)	

Education level – n (%)				0.137‡
Illiterate	11 (3.2)	6 (3.0)	5 (3.5)	
Incomplete primary school (1st to 4th grade)	16 (4.7)	11 (5.4)	5 (3.5)	
Completed primary school	5 (1.5)	2 (1.0)	3 (2.1)	
Incomplete middle school (5th to 8th grade)	73 (21.2)	44 (21.7)	29 (20.6)	
Completed middle school	69 (20.1)	35 (17.2)	34 (24.1)	
Incomplete high school	10 (2.9)	7 (3.4)	3 (2.1)	
Completed high school	37 (10.8)	30 (14.8)	7 (5.0)	
Incomplete higher education	5 (1.5)	4 (2.0)	1 (0.7)	
Completed higher education	10 (2.9)	6 (3.0)	4 (2.8)	
Ignored	108 (31.4)	58 (28.6)	50 (35.5)	
Imprisoned individuals – n (%)				0.199‡
Yes	23 (6.7)	17 (8.4)	6 (4.3)	
No	321 (93.3)	186 (91.6)	135 (93.7)	
Homeless individuals – n (%)				**0.016**‡
Yes	36 (10.5)	14 (6.9)	22 (15.6)*	
No	308 (89.5)	189 (93.1)	119 (84.4)	
Health care workers – n (%)				**0.044**§
Yes	7 (2.0)	7 (3.4)*	0 (0.0)	
No	337 (98.0)	196 (96.6)	141 (100)	
Immigrants – n (%)				1.000§
Yes	1 (0.3)	1 (0.5)	0 (0.0)	
No	343 (99.7)	202 (99.5)	141 (100)	
Income transfer program beneficiary – n (%)				0.061‡
Yes	12 (3.5)	11 (5.4)	1 (0.7)	
No	329 (95.6)	190 (93.6)	139 (98.6)	
Ignored	3 (0.9)	2 (1.0)	1 (0.7)	
Type of tuberculosis – n (%)				0.980‡
Pulmonary	282 (82.0)	167 (82.3)	115 (81.6)	
Pulmonary + extrapulmonary	62 (18.0)	36 (17.7)	26 (18.4)	
Year of diagnosis – n (%)				**<0.001**‡

2015	60 (17.4)	40 (19.7)	20 (14.2)
2016	56 (16.3)	36 (17.7)	20 (14.2)
2017	60 (17.4)	42 (20.7)	18 (12.8)
2018	72 (20.9)	47 (23.2)	25 (17.7)
2019	56 (16.3)	21 (10.3)	35 (23.8)*
2020	40 (11.6)	17 (8.4)	23 (16.3)*

* Statistically significant association based on adjusted residual test at 5% significance level; † Student's t-test; ‡ Pearson's chi-square test; § Fisher's exact test

There was also a statistically significant association between linkage to PHC and being a healthcare professional (p=0.044), while non-linkage was significantly associated with homelessness (p=0.016) and diagnoses made in 2019 or 2020 (p<0.001).

In 2019 and 2020, there was a significant reduction in linkage to PHC compared to previous years.

Among the cases studied, 129 (37.5%) achieved a cure, 58 (16.9%) discontinued treatment after at least one month of medication, 59 (17.2%) discontinued treatment before completing 30 days of tuberculosis medication (primary discontinuation), and 34 (9.9%) progressed to death from TB. A significant association was found between linkage to PHC and cure, as well as between non-linkage and outcomes such as death, primary treatment discontinuation, and changes in diagnosis (Table 2).

Table 2. Association between primary care linkage and treatment outcomes for pulmonary tuberculosis in patients diagnosed in secondary and tertiary care (n=344). Porto Alegre (RS), Brazil, 2015-2020.

Variables	**Total Sample (n=344; 100%)**	**With Linkage (n=203; 59%)**	**Without Linkage (n=141; 41%)**	**P**
Treatment outcome – n (%)				**<0.001**†
Cure	129 (37.5)	23 (60.6)*	6 (4.3)	
Treatment interruption	58 (16.9)	45 (22.2)*	13 (9.2)	
Death due to TB	34 (9.9)	8 (3.9)	26 (18.4)*	
Primary treatment discontinuation	59 (17.2)	6 (3.0)	53 (37.6)*	
Death from other causes	29 (8.4)	9 (4.4)	20 (14.2)*	

Transfer	6 (1.7)	2 (1.0)	4 (2.8)
Diagnosis change	16 (4.7)	1 (0.5)	15 (10.6)*
TB DR	3 (0.9)	2 (1.0)	1 (0.7)
Regimen change	10 (2.9)	7 (3.4)	3 (2.1)

* Statistically significant association based on adjusted residual test at 5% significance level; † Pearson's chi-square test

DISCUSSION

This study is a pioneering effort in Brazil, examining the association between linkage to PHC, sociodemographic characteristics, and treatment outcomes of individuals diagnosed with pulmonary tuberculosis in hospitals or Emergency Care Units (UPAs) in a Brazilian capital city from 2015 to 2020.

Most TB patients diagnosed in emergency or hospital services were linked to the Porto Alegre PHC services for continued treatment. This finding differs from a study conducted in the Western Cape, South Africa, where only 36% of cases diagnosed in a referral hospital continued treatment after discharge.9 A possible explanation for the higher linkage rate in Porto Alegre PHC could be the well-established care flow between services in the HCN, although additional strategies are needed to further improve this percentage.

The study also revealed that users linked to PHC for continued treatment were mostly young, under the age of 30. Interestingly, the literature suggests that young adults are more likely to discontinue follow-up care, while older age tends to be a protective factor against treatment interruption.10 In line with other studies, the profile of the cases analyzed in this study showed a predominance of males in their economically active years, regardless of their linkage to PHC.11,12

White individuals made up most participants (63%), with no significant association between race/ethnicity and linkage to PHC. However, it is crucial to discuss healthcare access, as non-white individuals often face greater challenges in accessing services and tend to experience worse clinical outcomes.10 This disparity is evident in TB death notifications, where non-white populations are the majority.12

Furthermore, the accurate completion of notification forms, with a low proportion of missing data on race/ethnicity, indicates an increased awareness among healthcare professionals of the importance of recording this information.13

Homeless individuals, who represented 10.5% of the sample, showed a significant association with non-linkage to PHC. This finding is concerning, as TB is highly prevalent

among this population, which faces significant barriers to accessing healthcare and, consequently, higher risks of infection, illness, and worse clinical outcomes.10-14 Therefore, beyond the need for enhanced active case-finding and attention to the specific healthcare pathways of this group, the transition of care between HCN services must be strengthened. Nurses can play a crucial role in this process through their leadership and management practices, particularly in care coordination and advanced practice nursing.8

In this study, being a healthcare professional was associated with higher linkage to PHC for continued treatment. This may be explained by the technical training of healthcare professionals, which provides them with greater knowledge of the disease, awareness of risk, and familiarity with appropriate care pathways. Additionally, education is linked to income, which in turn improves economic conditions and facilitates access to healthcare services for this group.10

Overall, the linkage to PHC for patients diagnosed in UPAs and hospitals was successful between 2015 and 2018. However, a significant decline in linkage occurred in 2019 and 2020. One hypothesis for this drop relates to the restructuring of PHC services during this period. Between 2019 and 2020, contracted healthcare workers were dismissed and replaced by teams managed by private companies.15 This political and organizational shift, along with the characteristics of the studied territory, raises concerns about the importance of maintaining consistent staffing. Such changes could weaken continuity of care and result in the loss of accumulated knowledge about service flows. Additionally, the literature points to a decreasing role of the state in addressing neglected health issues, such as TB, a trend exacerbated by the rise of neoliberalism and unexpected challenges like the COVID-19 pandemic.16

The COVID-19 pandemic introduced new challenges to healthcare services, which began operating with fewer professionals but faced a much higher workload. PHC focused primarily on diagnosing and managing COVID-19, which negatively impacted TB control strategies, especially in terms of treatment follow-up and adherence. Additionally, the pandemic heightened social vulnerability and further limited access to healthcare services, as resources were primarily directed toward addressing COVID-19.17 The impact of the pandemic on TB outcomes was not only due to its social effects. The association between the two diseases increased the potential for morbidity and mortality from both.17,18

The treatment outcome, used in this study as an indicator, is a crucial measure for evaluating the effectiveness of tuberculosis control actions throughout the healthcare system. In this study, cure was the most frequent outcome among patients linked to PHC, and even among those who discontinued treatment, medication use was ensured for at least

30 days. This result may be linked to the well-established care pathways for TB treatment and follow-up in PHC as well as coordination with other public policies, such as social assistance programs.4 The importance of actions focused on social protection, family, and community support is also highlighted, as these initiatives together can promote treatment adherence.19

However, PHC-related treatment discontinuation was higher than the threshold recommended by WHO[1] and other studies.11-20 Treatment discontinuation has been linked to the quality of services provided, waiting times for treatment initiation, and social and behavioral factors.20,21 A study conducted in Indonesia found that negative attitudes toward treatment, lack of social support, limited economic resources, and dissatisfaction with health services were associated with treatment non-adherence.22 This highlights the need to improve the quality of TB care in health facilities, especially for the elderly, who were less likely to be linked to PHC in this study. A multicenter study in Brazil found that despite the existence of social programs targeting TB, administrative and operational barriers hinder access to these support services.23

Deaths were associated with lack of linkage to PHC, indicating the severity of health conditions in patients requiring medium and high complexity care. Hospitalized patients tend to have higher mortality rates due to their weaker clinical conditions and the presence of comorbidities.24 These findings highlight concerns about inadequate transitions of care to PHC, particularly given the negative outcomes among unlinked patients, such as higher rates of primary care discontinuation and death.

Lack of linkage to PHC was associated with primary treatment discontinuation, i.e., patients taking the drug for less than 30 days. From an epidemiological perspective, this loss to follow-up delays elimination of the disease, allows previously detected cases to continue to spread the infection, promotes drug resistance, and wastes health care resources.1

Primary treatment discontinuation may be related to the fact that users seeking high-complexity services often face significant socioeconomic vulnerability and difficulties in accessing health care services.21 Moreover, stigma is an important predictor of early treatment discontinuation.20 PHC plays a critical role in identifying the conditions that make these patients more vulnerable, helping to prevent treatment interruption, drug resistance, and even death.4 Therefore, being diagnosed in high-complexity services and not undergoing a transition of care to PHC can negatively impact the outcome of new TB cases.

Care transition strategies implemented by hospital professionals can significantly contribute to TB control. These strategies help prevent delays in linking patients to

healthcare services, reducing the likelihood of readmission and treatment dropout, particularly when it comes to medication adherence at home. They also enhance communication between healthcare professionals and patients, reinforcing health education.25,26 Moreover, well-established care pathways between PHC services facilitate access, shorten waiting times, and allow for more timely detection of TB cases.27

On the other hand, PHC must also ensure that patients remain engaged and complete their treatment. The literature outlines several activities nurses can undertake to ensure continuity of care after hospital discharge. These include active outreach to the patient and family, scheduling and conducting home visits, training caregivers or family members, and strengthening relationships between healthcare professionals, patients, and their families.28 In TB control, factors such as welcoming and building trust, educational processes, proximity to healthcare services, home visits, Directly Observed Treatment (DOT), and incentives like monthly food baskets and daily snacks all contribute to treatment adherence and cure.4

This study acknowledges some limitations common to the SINAN system, such as underreporting of pulmonary TB cases and the potential for errors due to incomplete or inaccurate notification forms. Additionally, there are methodological limitations inherent in cross-sectional studies and statistical analysis, which can only identify associations between variables and do not allow for causal relationships to be established.

CONCLUSION

This study contributes to understanding the association between linkage to PHC, sociodemographic profiles, and the outcomes of new pulmonary TB cases diagnosed in hospitals or UPAs in a southern Brazilian capital from 2015 to 2020. The evidence presented helps inform strategies to strengthen TB management and reduce treatment discontinuation. Additionally, the study highlights the importance of continuity of care by nursing teams, particularly for patients diagnosed in medium- and high-complexity services.

Linkage to PHC was significantly associated with patients under 30 years of age, treatment outcomes such as cure, and continuation of treatment for at least 30 days. In contrast, non-linkage was associated with homeless patients, higher mortality, and primary treatment discontinuation.

These findings reveal that the lack of linkage to PHC for TB cases diagnosed in medium- and high-complexity services is concerning, especially considering the profile of non-linked patients, who exhibit higher rates of primary treatment discontinuation and death. Thus, strategies are recommended to facilitate the transition of care, including health

education initiatives during hospitalization and discharge, as well as the use of georeferencing technologies and improved communication between different levels of care, to enhance outcomes for patients linked to PHC.

CONTRIBUTIONS

Sheila Schardosin Gusmão and Aline Marques Acosta participated in the conception, planning of the study, analysis and interpretation of data, writing and critical review; Vilma Constancia Fioravante dos Santos participated in data analysis and interpretation, writing and critical review; Fabiane Soares de Souza participated in the analysis and interpretation of data; Rosana Maffacciolli, Giselda Quintana Marques and Maria Alice Dias da Silva Lima participated in critical review of the manuscript.

CONFLICTS OF INTERESTS

Nothing to declare.

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