Original article

Association between treatment outcome, sociodemographic characteristics and social benefits received by individuals with tuberculosis in Salvador, Bahia, Brazil, 2014-2016*

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Kaio Vinicius Freitas de Andrade[1] – orcid.org/0000-0002-4603-9109
Joilda Silva Nery[2] – orcid.org/0000-0002-1576-6418
Gleide Santos de Araújo[2] – orcid.org/0000-0001-5256-755X
Mauricio Lima Barreto[2] – orcid.org/0000-0002-0215-4930
Susan Martins Pereira[2] – orcid.org/0000-0001-5291-454X

[1]Universidade Estadual de Feira de Santana, Departamento de Saúde, Feira de Santana, BA, Brasil
[2]Universidade Federal da Bahia, Instituto de Saúde Coletiva, Salvador, BA, Brasil

Abstract

Objective: to analyze association between tuberculosis treatment outcome, sociodemographic characteristics and receipt of social benefits. **Methods:** this was a cohort study conducted in Salvador, Bahia, Brazil, in the period 2014-2016; we analyzed bivariate associations between treatment outcome, sociodemographic characteristics and social benefits. **Results:** 216 individuals were followed, of whom 79.6% were cured; higher cure proportion was associated with schooling >9 years (87.5%; p=0.028), marital union (86.3%; p=0.031), and household density ≤2 individuals/bedroom (84.1%; p=0.013); we took as our reference individuals with schooling ≤9 years, not in marital union, and housing density >2 people/bedroom; higher cure proportion was also found among recipients of government and non-government benefits (90.5%), and among those who only received direct benefits (81.6%). **Conclusion:** schooling >9 years, marital union, and household density ≤2 individuals/bedroom were associated with higher cure; this outcome was more frequent among individuals receiving government and non-government benefits, and among individuals receiving only direct benefits.

Keywords: Tuberculosis; Public Policy; Government Programs; Social Determinants of Health; Treatment Outcome; Cohort Studies.

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Correspondence:
Kaio Vinicius Freitas de Andrade – Avenida Transnordestina, S/N, Novo Horizonte, Feira de Santana, BA, Brazil. Postcode: 44036-900
E-mail: kaiovinnicius@yahoo.com.br

Introduction

Tuberculosis (TB) continues to be an important public health problem both in Brazil and worldwide. In 2017, 69,569 new cases were notified in Brazil, corresponding to an incidence coefficient of 33.5 cases/100,000 inhabitants. In Salvador, a city in the Brazilian state of Bahia, this coefficient was 48.5 cases/100,000 inhab. in the same year, with a low cure proportion among new cases (66.3%) and a high proportion of treatment abandonment (12.1%), considering the national and international parameters for these indicators.[1]

According to the World Health Organization (WHO), TB infection has the highest mortality caused by a single agent in the world, surpassing HIV/AIDS.[2] Due to its high disease burden, Brazil is one of the 30 priority countries for eliminating TB as a public health problem by 2035.[2,3] In recognition of the emblematic social determination of TB, WHO proposes, among the most important measures to end this global epidemic, the consolidation of bold policies and support systems focusing on social protection and other actions to reduce poverty.[2-4]

> *Social protection encompasses a broad set of strategies that can contribute to the reduction of socioeconomic inequalities and poverty, with positive impacts on diseases related to social status, especially TB.*

The strong influence of socioeconomic characteristics on increased vulnerability to TB is well documented in the literature.[5-8] Social inequalities, urbanization and accelerated population growth go hand in hand with individual factors such as age, education level, ethnicity/skin color, comorbidities, use of alcohol and other drugs, as well as other determining factors, such as food and nutritional insecurity, poor housing conditions and difficulties in accessing health services, thus impacting on the transmission chain of the infectious agent, disease progression and treatment outcomes.[7,9]

Social protection encompasses a broad set of strategies that can contribute to the reduction of socioeconomic inequalities and poverty, with positive impacts on diseases related to social status, especially TB.[10] Recently, results of a meta-analysis showed that such strategies are associated with curing TB and reducing the risk of treatment abandonment in low- or middle-income countries or in countries that have a high disease burden.[11]

In Brazil, social protection provided by the State is structured within Social Security and made effective through policies and programs linked to Social Work, Social Security and Public Health.[12] In the last decade, social programs, especially those based on conditional income transfer, have gained greater visibility throughout the world. Recent studies have demonstrated that the Bolsa Família Program (PBF) has contributed to the reduction in TB[13] incidence and a greater proportion of cure among people affected by TB in Brazil.[14,15] An example of this is the success achieved in the treatment of individuals living in Rio de Janeiro, one of Brazil's state capitals with the worst TB indicators.[16]

Although PBF assists approximately 14 million Brazilian families, it is not aimed at people with TB: slightly more than 13% of individuals affected by the disease are beneficiaries of the program.[14] In fact, there is no government benefit specifically for this population group at the national level.[12]

Data on the provision of social benefits to people with TB in Brazil are still scarce. In 2015, the National Tuberculosis Control Program (NTCP) found that out of 181 priority municipalities for TB control, only 81 (44.7%) provided some type of social benefit or incentive for adherence to treatment. It was also found that the provision of such benefits was not universal and, in many cases, there was discontinuity in their delivery.[17]

This study aimed to analyze the association between TB treatment outcome, sociodemographic characteristics and social benefits received by patients.

Methods

This is a cohort study conducted in the municipality of Salvador in Bahia state, where the population was estimated to be 2,953,986 inhabitants in 2017. Salvador is the most populous municipality in the Northeast region of Brazil and is the country's fourth largest state capital.[18] TB care in Salvador is decentralized in Brazilian National Health System (SUS) primary health care units (PHU) and Family Health Units (FHU) which are responsible for TB diagnosis, treatment and case follow-up. Secondary TB care services are responsible only for more complex cases. Other TB patients diagnosed in secondary care are referred to treatment and follow-up in primary health care services.[19]

The population we studied was drawn from a cohort of individuals with pulmonary TB living in Salvador. We selected only new cases that received social benefits during treatment and follow-up in Primary Health Care – PHUs and FHUs – between September 2014 and October 2016.

The study's eligibility criteria were: (i) minimum age of 15 years old; (ii) new cases diagnosed with pulmonary TB using clinical criteria, confirmed with the rapid molecular test for TB (Xpert MTB/RIF) introduced in the municipality in October of 2014, sputum smear microscopy, culture and/or x-rays; (iii) absence of history of multidrug-resistant TB (MDR-TB); (iv) receipt of at least one social benefit during treatment; and (v) monitoring by the municipality's public primary health care services (PHU/FHU).

Based on the inclusion criteria described above, we selected only the 216 participants of the original cohort who received social benefits during treatment. This subsample provided a statistical power of 70% to detect a difference of 15% between the comparison groups – patients exposed to government benefits versus non-government benefits; patients exposed to direct vs. indirect benefits –, with a significance level of 5%.[20]

Data collection for the cohort was based on questionnaires with a consecutive sample of individuals diagnosed at a hospital unit and also at 10 primary health care units, which together accounted for the treatment of more than 60% of cases reported in the municipality in 2014, distributed over nine of Salvador's 12 municipal health districts.[19] Data on socioeconomic variables and data relating to social benefits were obtained through interviews. Data on case closures were either obtained through interviews carried out at the end of the 6th month of treatment, or from FHU/PHU medical records and/or the Tuberculosis Notifiable Diseases Information System (SINAN-TB) at the Municipal Health Department.

The team of interviewers was trained according to the guidelines contained in an operational procedures manual developed by experienced researchers. The data collection instrument, previously tested with 20 TB patients, was also evaluated by experts. The forms were filled in electronically using Motorola Xoom 2 Media Edition MZ607 16GB® portable computers (tablets). Soon after they were filled in, all forms were automatically forwarded to an electronic database, reviewed and checked for any inconsistencies by researchers responsible for the study.

The study variables were grouped in two ways:

a) Socioeconomic characterization of beneficiaries
- sex (male; female);
- age (in years: 15-19; 20-59; 60 and over);
- ethnicity/skin color (black or brown; white/yellow/indigenous);
- education level (in years of study: up to 9; more than 9);
- marital status (not in marital union; in marital union);
- has children (yes; no);
- occupation (yes; no);
- monthly per capita family income in monthly minimum wages (categorized in accordance with national income criterion for the definition of people in a situation of poverty: up to 1/2 monthly minimum wage; more than 1/2 monthly minimum wage);[21] and
- household density (number of residents per bedroom: up to 2; more than 2).

b) Social benefits characterization
- benefit identification;
- paying source (government, non-government; both); and
- benefit category (direct; indirect; both).

Monetary benefits provided directly to the respective beneficiaries were classified as direct: Bolsa Família Program, retirement pension, sickness allowance (*Auxílio-doença*), invalidity pensions and other financial aid.

Non-monetary benefits were classified as indirect: e.g. basic food baskets, free public transport, electricity tariff discount, posting correspondence at reduced rates, exemption from registration fees for civil service recruitment tests, housing program, popular telephone tariffs, food purchasing program and others.[21]

Initially, we carried out a descriptive analysis of the socioeconomic characteristics and variables relating to social benefits. Then we carried out association tests (Pearson's chi-squared test and Fisher's exact test, with a significance level of 5%) between the sociodemographic characteristics, the social benefits received and the outcome "TB cure", the latter being considered to be (i) when an individual has completed treatment and had two negative sputum smear microscopy results or, in the absence of these results, (ii) when an individual has completed treatment with remission of symptoms accompanied by an additional examination with a negative result.[1,4,17,19] The data were processed and analyzed using Stata® version 12.0.

The study project was approved by the Universidade Federal da Bahia (UFBA) Institute of Collective Health Ethics Research Committee under Report No. 181,078

(Certification of Submission for Ethical Appraisal – CAAE – No. 11792912.2.0000.5030). All participants were invited to sign a Free and Informed Consent Form and people under 18 years of age were included in the study with the consent of their legal representative, in accordance with the consent form and the law.

Results

Among the 216 participants there was a predominance of individuals of the male sex (60.6%), people aged 20 to 59 (71.3%), with black or brown ethnicity/skin color (92.6%), with up to 9 years of schooling (63.0%), not in marital union (single/separated or divorced/widowed: 56.0%) and who had children (72.2%); the majority (73.6%) had a monthly per capita income of up to half a monthly minimum wage, had an occupation (60.6%), and lived in households with up to two people per bedroom (69.9%) (Table 1).

In relation to social benefits, government benefits (76.9%) and direct benefits (70.4%) prevailed. We found a greater proportion of individuals without an occupation among those who received only non-government benefits (69.0%) or who received both government and non-government benefits (52.4%). The other socioeconomic characteristics showed similar distribution, in the crude and stratified analysis, according to paying source and social benefit category (Table 1).

Among individuals who received government benefits (n=166), 85,6% received only direct benefits, 10.2% received both direct and indirect benefits and 4.2% received only indirect benefits. Bolsa Família Program (66.2%), retirement (23.9%) and sickness allowance (*Auxílio-doença*) (8.5%) prevailed as benefit paying sources for those who received only direct benefits (n=142). Still in relation to the total number of participants, we found that 13.4% (n=29) received only non-government benefits, among which indirect benefits prevailed (65.5%). Only 9.7% (n=21) of participants received both government and non-government benefits (Table 2).

Regarding treatment outcome, 79.6% (n=172) of individuals were cured, 17.6% (n=38) abandoned treatment, 2.3% (n=5) died and 0.5% (n=1) had treatment failure. Cure was found to have statistically significant association with more than 9 years of schooling (87.5%), marital union (86.3%) and household density of up to 2 people per bedroom (84.1%) (Table 3).

Despite the lack of statistical significance in the associations between TB cure and social benefits, higher proportions of this outcome were observed in participants who received government and non-government benefits (90.5%); and also among those who received only direct benefits (81.6%). A smaller proportion of cure (65.5%) was observed among those who received only non-government benefits (Table 3).

Discussion

This is the first study conducted in Brazil with primary data about the receipt of social benefits by people with TB in one of the country's priority state capital cities for TB control. A greater proportion of cure was found among participants with better schooling (>9 years), living in marital union and living in households with low density of people per bedroom (up to 2 individuals).

The proportion of cure among the study participants (79.6%) was higher than the average proportion of 65% registered in Salvador, Bahia, in the same period (2014-2016). However, this indicator is below the target recommended by WHO, namely at least 85% of new cases cured.[1,22,23] The proportion of treatment abandonment corresponded to approximately twice the average proportion registered in Salvador in the same period (approximately 9%), reaching values above the 5% recommended by WHO and by the Ministry of Health.[2,4]

The demographic profile of the majority of the individuals studied reflected the persistent and known relationship between TB and poverty.[9,24] In Brazil, TB markedly affects people in a situation of social vulnerability, especially Black people, individuals with low income, illiterate or with low schooling level.[1,2,12] In Salvador, about 80% of the population are of African descent and approximately 40% have per capita monthly income of up to half a monthly minimum wage.[18] A systematic review of 11 studies with individualized data showed a positive association between TB incidence and male sex, age between 30 and 54, illiteracy, low income or non-fixed income, marital status (single, separated or divorced), among other factors.[5]

Table 1 – Socioeconomic characteristics of individuals with pulmonary tuberculosis who were receiving social benefits (crude and stratified according to paying source and category of social benefits), Salvador, Bahia, 2014-2016

Socioeconomic characteristics (N=216) - n (%)		Benefit paying source - n (%)			Benefit category - n (%)		
		Government 166 (76.9)	Non-government 29 (13.4)	Both 21 (9.7)	Direct 152 (70.4)	Indirect 28 (12.9)	Both 36 (16.7)
Sex							
Male	131 (60.6)	97 (58.4)	22 (75.9)	12 (57.1)	90 (59.2)	21 (75.0)	20 (55.6)
Female	85 (39.4)	69 (41.6)	7 (24.1)	9 (42.9)	62 (40.8)	7 (25.0)	16 (44.4)
Age group (in years)							
15-19	13 (6.0)	10 (6.0)	–	3 (14.3)	9 (5.9)	1 (3.6)	3 (8.3)
20-59	154 (71.3)	113 (68.1)	25 (86.2)	16 (76.2)	104 (68.4)	23 (82.1)	27 (75.0)
≥60	49 (22.7)	43 (25.9)	4 (13.8)	2 (9.5)	39 (25.7)	4 (14.3)	6 (16.7)
Ethnicity/skin color							
Black or brown	200 (92.6)	157 (94.6)	25 (86.2)	18 (85.7)	144 (94.7)	23 (82.1)	33 (91.7)
White/yellow/indigenous	16 (7.4)	9 (5.4)	4 (13.8)	3 (14.3)	8 (5.3)	5 (17.9)	3 (8.3)
Education level (in years of schooling)							
≤9	136 (63.0)	102 (61.5)	19 (65.5)	15 (71.4)	95 (62.5)	18 (64.3)	23 (63.9)
>9	80 (37.0)	64 (38.5)	10 (34.5)	6 (28.6)	57 (37.5)	10 (35.7)	13 (36.1)
Marital status							
Not in marital union	121 (56.0)	83 (50.0)	22 (75.9)	16 (76.2)	78 (51.3)	20 (71.4)	23 (63.9)
In marital union	95 (44.0)	83 (50.0)	7 (24.1)	5 (23.8)	74 (48.7)	8 (28.6)	13 (36.1)
Has children							
Yes	156 (72.2)	125 (75.3)	18 (62.1)	13 (61.9)	113 (74.3)	16 (57.1)	27 (75.0)
No	60 (27.8)	41 (24.7)	11 (37.9)	8 (38.1)	39 (25.7)	12 (42.9)	9 (25.0)
Occupation							
Yes	131 (60.6)	112 (67.5)	9 (31.0)	10 (47.6)	105 (69.1)	17 (60.7)	21 (58.3)
No	85 (39.4)	54 (32.5)	20 (69.0)	11 (52.4)	47 (30.9)	11 (30.3)	15 (41.7)
Per capita income without benefits (in monthly minimum wages: MMW)							
≤1/2 MMW	159 (73.6)	118 (71.1)	24 (84.8)	17 (81.0)	106 (69.7)	22 (78.6)	31 (86.1)
>1/2 MMW	57 (26.4)	48 (28.9)	5 (17.2)	4 (19.0)	46 (30.3)	6 (21.4)	5 (13.9)
Household density (people per bedroom)							
≤2	151 (69.9)	117 (70.5)	24 (82.8)	10 (47.6)	102 (67.1)	25 (89.3)	24 (66.7)
>2	65 (30.1)	49 (29.5)	5 (17.2)	11 (52.4)	50 (32.9)	3 (10.7)	12 (33.3)

The predominance of the male sex follows global TB case distribution according to sex, with higher incidence among males.[1,2] Regarding treatment outcomes, studies suggest association of low schooling (0-8 years) and low income with treatment abandonment, death and treatment failure.[5,25] In a cohort of individuals with TB in Recife, in the Brazilian state of Pernambuco (PE), age group and illiteracy was associated with treatment abandonment, with this outcome being more frequent in people aged 35 to 49.[25] In our study, unfavourable treatment outcomes (abandonment, death and treatment failure) were more frequent in young people and adults, in comparison with the elderly, although these differences were not statistically significant.

Schooling, marital status and household density are among the main TB determinants in Brazil.[7] Studies have shown that high educational level (more than 9 years of schooling), having a partner and low household density are characteristics associated with

Table 2 – Characterization of social benefits received by individuals with pulmonary tuberculosis during treatment, Salvador, Bahia, 2014-2016

Social benefits characterization (N=216)	N (%)
Government	**166 (76.9)**
Direct	**142 (85.6)**
Family Income Transfer Program (Bolsa Família)	94 (66.2)
Retirement pension	34 (23.9)
Sickness allowance (*auxílio-doença*)	12 (8.5)
Invalidity pension	1 (0.7)
Bolsa Família Program + Continual Payment Benefit (*Benefício de Prestação Continuada*)	1 (0.7)
Direct + indirect	**17 (10.2)**
Bolsa Família Program + electric energy social tariff	10 (58.8)
Bolsa Família Program + free municipal/intermunicipal transport	3 (17.6)
Retirement + free municipal/intermunicipal transport	2 (11.8)
Bolsa Família Program + exemption from registration fees for civil service recruitment tests	1 (5.9)
Bolsa Família Program + discount on National Social Security Institute contribution for people who work at home	1 (5.9)
Indirect	**7 (4.2)**
Electric energy social tariff	5 (71.4)
Free municipal/intermunicipal transport	2 (28.6)
Non-government	**29 (13.4)**
Indirect	**19 (65.5)**
Food	15 (78.9)
Food + medicines	2 (10.5)
Food + gas and electricity supply	1 (5.3)
Food + clothing	1 (5.3)
Direct (financial assistance)	**10 (34.5)**
Government + Non-government	**21 (9.7)**
Bolsa Família Program + food	19 (90.5)
Electric energy social tariff + food	2 (9.5)

a) Benefit paying source not informed by the interviewee.

greater chances of cure and lower occurrence of unfavorable TB treatment outcomes.[26-28]

Social protection programs are strongly linked to socioeconomic conditions. There is therefore consensus that they can effectively contribute to TB elimination.[2,10] Despite scarce knowledge on access and coverage of social programs and benefits for people with TB, recent evidence has pointed to their direct[15] or indirect positive effects on the improvement of treatment outcomes of these individuals, especially the poorest ones. As these findings relate only to the Bolsa Família program,[13-16] new studies are needed to investigate the effects of other social protection benefits on TB indicators. The Bolsa Família program is the most relevant social program in Brazil and one of the largest in the world. This fact can explain the higher frequency of its beneficiaries among the study participants. The program was implemented in Brazil in 2004 and currently serves approximately 21% of the Brazilian population, by means of direct income transfer to poor and extremely poor families, as long as certain health and education stipulations are met.[29] Recently, a prospective cohort study demonstrated that the program can effectively contribute to achieving the goals to eliminate TB, considering its direct effects on increased cure, reduction of treatment abandonment and death associated with the disease.[15]

Table 3 – Association between socioeconomic characteristics and cure of individuals with tuberculosis who were receiving social benefits, in Salvador, Bahia, 2014-2016

Socioeconomic characteristics and benefit characteristics	Cure - n (%)		P - value[a]
	Yes 172 (79.6)	No 44 (20.4)	
Sex			
Male	105 (80.2)	26 (19.8)	0.813
Female	67 (78.8)	18 (21.2)	
Age group (in years)			
15-19	9 (69.2)	4 (30.8)	
20-59	123 (79.9)	31 (20.1)	0.611[b]
≥60	40 (81.6)	9 (18.4)	
Ethnicity/skin color			
Black or brown	158 (79.0)	42 (21.0)	0.535[b]
White/yellow/indigenous	14 (87.5)	2 (12.5)	
Education level (in years of schooling)			
≤9	102 (75.0)	34 (25.0)	0.028
>9	70 (87.5)	10 (12.5)	
Marital status			
Not in marital union	90 (74.4)	31 (25.6)	0.031
In marital union	82 (86.3)	13 (13.7)	
Has children			
Yes	122 (78.2)	34 (21.8)	0.402
No	50 (83.3)	10 (16.7)	
Occupation			
Yes	109 (83.2)	22 (16.8)	0.105
No	63 (74.1)	22 (25.9)	
Per capita income without benefits (in monthly minimum wages: MMW)			
12 MMW	127 (79.9)	32 (20.1)	0.882
>1/2 MMW	45 (79.0)	12 (21.0)	
Household density (people per bedroom)			
≤2	127 (84.1)	24 (15.9)	0.013
>2	45 (69.2)	20 (30.8)	
Benefit paying source			
Government	134 (80.7)	32 (19.3)	
Non-government	19 (65.5)	10 (34.5)	0.075[b]
Both	19 (90.5)	2 (9.5)	
Benefit category			
Direct	124 (81.6)	28 (18.4)	
Indirect	19 (67.9)	9 (32.1)	0.251
Both	29 (80.6)	7 (19.4)	

a) P-values obtained by the chi-square test, except for the ones highlighted with [b].
b) P-value obtained by Fisher's exact test.

The Bolsa Família program is not the only strategy for social protection in force in the country. There are approximately 15 indirect benefits available to people registered with the Single Registry of Federal Government Social Programs (CadÚnico).[20] Only four of these social programs were accessed by the participants of our study. According to National Tuberculosis Control Program data,[22] Salvador receives incentives for adherence to TB treatment. However, we found that only one municipal philanthropic hospital provided such benefits continuously (in the form of basic food baskets) for TB patients registered with and cared for by this hospital; however, we chose not to include cases treated at hospitals in our study.

One of the strategies of the National Plan to End Tuberculosis as a Public Health Problem in Brazil[4] is to encourage the drafting of laws that contribute to patients' social protection. At the national level there are no programs of this nature specifically aimed at this population. So far, Draft Bill No. 6991/2013 intended to grant benefits of half a minimum wage to families registered on CadÚnico and affected by TB or leprosy is working its way through the House of Representatives; however, it is unknown whether this provision will be implemented.[30]

In 2015, the "government income transfer program beneficiary" variable was included on the SINAN-TB database. In that year, 7.2% of TB new cases in Salvador were benefited with income transfer; in 2016, this percentage dropped to 6.1%. In our study, 129 participants were Bolsa Família beneficiaries, corresponding to 8.7% of the average number of new cases reported in the period (n=1,489).[19] Although the presence of this variable represents a step forward, it does not include the remaining direct and indirect benefits that comprise the Brazilian social protection system.

The association between socioeconomic characteristics linked to poverty and TB treatment outcomes among individuals who received social benefits suggests that the latter may not have an immediate effect on variables which, besides acting as poverty markers, may be derived from or expand this condition.[9,23] It is believed that the positive effects of social protection arise not only from increased income, but also from expanded access to education, unemployment reduction linked to productivity increase, economic growth in the long term and health care service coverage expansion.[9,10]

The study results showed a higher proportion of cure among individuals who received government and non-government benefits during TB treatment, as well as among those who received only direct monetary benefits. These findings corroborate those of previous studies that have found positive associations of government direct income transfer programs with success/cure following treatment.[14,15,16] The association between social protection strategies and successful treatment and cure of individuals with TB was also observed in a meta-analysis of studies carried out in Brazil and in other countries with similar levels of income and disease burden.[11]

Among the limitations of our study, we include (i) the absence of data on the length of time and/or discontinuity of benefit receipt during treatment, given that such information was obtained at the time of diagnosis, (ii) the absence of measurement of the frequency of receipt of each benefit and the number of beneficiaries in each family affected by the disease and (iii) the possibility of non-response bias, since some participants were reluctant to report receipt of benefits for fear of losing them. In view of these limitations, caution is required with regard to generalization or extrapolation of the results obtained.

Despite the shortage of data on the receipt of social benefits for people with TB in the state of Bahia, the study sample size corresponded to 14.5% of the average number of new pulmonary TB cases reported in the municipality of Salvador (n=1,486) in the period from 2014 to 2016; and was higher than the annual proportions of PBF beneficiaries reported on SINAN-TB for 2015 (7.2%) and 2016 (6.1%).[18]

Reaching higher proportions of cure and reducing treatment abandonment are necessary in order for Salvador to achieve the goals proposed in the National Plan to End TB as a Public Health Problem in Brazil mentioned above. The study results suggest that higher cure rates can be found in individuals with TB who received social benefits during treatment. However, there was no statistically significant association between the "TB cure" outcome and social benefits, thus confirming the need for other studies for an in-depth investigation of this phenomenon.

Moreover, we propose that social protection strategies be strengthened at municipal level by expanding access to direct benefits. We believe that different benefit modalities may contribute to the achievement of favorable outcomes, in conjunction with other social protection strategies such as job training, microfinance and microcredit opportunities, food and nutritional security programs.

Finally, we recommend that TB be addressed by government organs not only as a public health problem,[4] but that it also be included as part of the work agendas of municipal Social Service, Education, Justice and Human Rights departments, with the aim of strengthening intra and intersectoral articulation, as well as articulation between public administration and civil society. In addition, studies are needed that assess different forms of social protection impacts on tuberculosis indicators, at national, regional and local level.

Authors' contributions

Andrade KVF participated in the conception and design of the study, analysis and interpretation of the results, writing and critical review of the manuscript. Nery JR, Araújo GS, Barreto ML and Pereira SM participated in the conception of the study, drafting and the critical review of the intellectual content of the manuscript. All the authors have approved the final version and declared themselves to be responsible for its accuracy and integrity.

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