DOI: 10.1590/1413-812320172211.26352015

Survival of patients with AIDS and co-infection with the tuberculosis bacillus in the South and Southeast regions of Brazil

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Abstract *The study investigates the survival of patients with co-infection AIDS-TB through a retrospective study of a cohort of individuals aged 13 or more and the diagnosis of AIDS reported in the years 1998-99 and following 10 years. Of the 2,091 AIDS cases, 517 (24.7%) had positive diagnosis for tuberculosis, and 379 (73.3%) were male. The risk among co-infected patients was 1,65 times the not co-infected. Have been compared the exposed and non-exposed through the Kaplan-Meier and Cox method. The variables associated with longer survival were: female gender (HR = 0.63), educational level ≥ eight years (HR = 0.52), CD4 diagnostic criteria (HR = 0.64); and shorter survival: age ≥ 60 years (HR = 2.33), no use of HAART (HR = 8.62), no investigation to Hepatitis B (HR = 2.44) and opportunistic infections ≥ two (HR = 1.97). The average survival rate, related to TB infection was 69 months for the Southeast region and 73 months for the South. AIDS and tuberculosis require monitoring and treatment adherence and they are markers of the quality of care and survival of patients in Brazil.*

Key words *AIDS, Survival analysis, Tuberculosis*

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Introduction

The survival and evolution of AIDS patients' clinical and laboratorial conditions improved considerably after Brazil's Health Ministry started offering Highly Active Antiretroviral Therapy (HAART) in 1996. In addition, it has been noticed a decrease in internment of people living with HIV/AIDS, as well as fewer opportunistic infections and an increase in chronic diseases, such as hepatic, cardiovascular, renal, among others[1-5].

Despite the positive impact in patients' survival, the lack of access to medication, to health care – mainly specialized assistance – and difficulties referring to treatment adhesion still have a negative impact in case outcomes, influenced by socioeconomic situation[1,6,7]. Besides social and medical-assistance factors, opportunistic infections also relate to AIDS prognostic, such as tuberculosis and comorbidities.

The study on survival of people with AIDS is a way to evaluate the epidemic situation, particularly the impact of intervention policies and measures. In a *cohort* of patients, from south and southeast regions, diagnosed in 1998 and 1999, 59,4% of the adults survived 108 months[2]. These estimates were greater than what have been found in a national study of notified patients from 1996, with mean survival of 58 months[3], and even greater if compared to estimated survival of 5,1 months back in the beginning of the epidemic, from 1982 to 1989, before the antiretroviral therapy[8].

AIDS-Tuberculosis co-infection cases are often reported in several places worldwide[9], particularly in regions with high prevalence of tuberculosis, reaching mainly marginalized and poor segments from society[10,11].

The Brazil presented the highest number of tuberculosis (TB) cases in Latin America in 2013. Although a TB morbidity and mortality decrease tendency has been observed, the country[12-14] presented an incidence of 46 cases *per* 100.000 inhabitants in that year[15].

It is possible to consider that AIDS pandemic resulted in a great impact in TB epidemiology. The co-infection is of great concern due to the fact that HIV is the greatest risk factor for TB development[10,16], a disease yet to be controlled in developing countries, even there being means to diagnose and cure.

Among AIDS related diseases, TB is particularly important because it is contagious, treatable, and frequently one of the earliest clinical manifestations of immunologic deficiency. Upholds itself as one of the main AIDS defining diseases, topping pneumonia caused by *Pneumocystis jiroveci* since 2001 [17].

There are, in Brazil, great differences in TB incidence and mortality, particularly higher in regions with greater prevalence of HIV infections [18,19]. Besides, AIDS-Tuberculosis co-infection is identified as an associated factor in TB internment cases [20]. Other variables have been considered for co-infection prognostic better understanding, particularly CD4 levels in other regions of the world [13,14,21,22].

Tuberculosis is a high prevalence disease in Brazil. However, there are few population based studies about associated factors on patient survival with co-infection and its mortality impact [6,23-25].

The objective of this study was to analyze patient survival time with AIDS-Tuberculosis co-infection, according to sociodemographic, epidemiologic, clinical, and health care use traits in South and Southeast regions of Brazil.

Method

This is a retrospective cohort study of medical records sample of individuals with an AIDS diagnosis of 13 years or more, reported to Notification Harm Information System (SINAN) in 1998 and 1999, with a 10-year following.

The regions studied were South and Southeast, which have populations of 29.016.114 and 85.115.623 inhabitants, and territorial area of 576.773,368 km^2 and 924.616,968 km^2, respectively[26]. The Studied cohort was assembled through sortition of cities from the regions, where there have been more than 40 cases through the year, totaling 33 and 90 cities, respectively, in the South and Southeast regions [2].

As a study inclusion criteria, should be pointed out the case confirmation according to current definition stated by Brazil's Health Ministry, by the time of this study conduction, that is, an adapted *Center of disease control (*CDC), Rio de Janeiro/Caracas, CDC Exceptional Criteria, Death Exceptional Criteria, Antiretroviral Exceptional use Criteria (ARC) + Death and T-CD4 cell count (less than 350/mm^3, independent of symptoms)[27]. These criteria observation was verified during medical records analysis.

Were excluded from investigation pregnant women with AIDS notifications, cases which defining criteria was death in less than seven days,

cases first diagnosed because of death, ARC criteria + death and ignored criteria.

Were identified 29.600 and 8.979 cases, distributed through 90 and 33 cities in Southeast and South regions, respectively. Sample sizes planned for Southeast and South regions were of 1.484 and 898 patients. These numbers would allow to consider statistically significant differences of 5 and 9 months of median survival between groups compared in each region. An uneven sharing of the sample by strata (region) was chosen in order to lower differences between sample fractions[2].

In each region, sampling by gathering was utilized in two stages: cities (or city groups) and patients. The sample primary units sortition was made with proportional probability to notification number. Cities that did not have a minimal notification number were grouped to larger ones.

The sample fractions were of 1/13,369 to Southeast region, and of 1/6,873 to South region, being picked 18 primary sample units in the Southeast and 10 in the South, corresponding to 14 and 9 cities, respectively. To compensate for different selection probabilities in the regions, data collected were pondered, being that the weight for each patient was given by the inverse sample fraction of the region he or she belonged.

The medical reports analysis granted registry of sociodemographic variables, skin color, schooling in years, age group; epidemiological: HIV exposure category, sexual practice, mates number. Clinical variables were also utilized, such as comorbidity presence, antiretroviral regular use, AIDS defining criteria, a cancer diagnose, opportunistic diseases. Some variables related to use and clinical follow up: presence of multiprofessional team, beyond nurses and physicians, Hepatitis B serum markers collection, TB and Pneumonia by *Pneumocystis jiroveci* prophylaxis, at the health care service where the patient was taken care of.

Cases were classified according to TB diagnose presence in any clinical form. To calculate survival were considered AIDS diagnosis date, death date (fail), follow up drop off (censorship) and end of study (programmed censorship)[29].

The information was collected by healthcare professionals (nurses and physicians) linked to services where patients were taken care of. The information was checked by research field coordinators and revised by the research team regarding to inclusion criteria, diagnosis criteria, and data consistency concerning the study. After data compilation, data base elaboration and inconsistencies correction, the data was explored regarding patient survival with AIDS-tuberculosis co-infection and co variables of interest possibly associated to mortality.

Initially, were compared cases with or without death outcome, between groups with the co-infection or without it. The lethal coefficient in the studied population was estimated taking as numerator deaths, and as denominator the amount of individuals at the beginning of the co-infected and non co-infected cohorts followed in the study[28]. Pearson chi-squared association tests were utilized and Fisher exact test, when necessary, with a 5% significance. For survival analysis, it was considered as response variable time spent from AIDS notification to death or drop off event, or end of the study, the others being predictor variables.

After checking the proportionality of the selected variables by the "Log minus Log" test, the analysis of the survival curves was performed using the Kaplan-Meier method and Log-rank test[29], with significance level of 5%, with accumulated survival probability in months, according to each variable of interest. To calculate hazard ratio (HR), Mantel Hanzel analysis was utilized. After univariate analysis, Cox multiple regression model was adjusted, with trust interval of 95%. It was assumed that HR for an independent analysis is proportional through time[29], thus allowing inclusion of several simultaneous co variables in survival time modeling[30].

For all tests of survival comparing and analysis, all "no information" categories of all study variables were ignored. For survival calculation according to skin color, whites and blacks/browns were compared, ignoring other referred categories due to reduced number of individuals. Because there were patients with more than one type of TB diagnosed, severe cases were considered of survival curve calculation related with disease clinical form.

Computer programs Microsoft Excel 2013 and Software IBM SPSS Statistics 21 for windows were utilized for statistical analysis.

The study was approved by São Paulo State Secretary`s Reference and Training in STD/AIDS Center Research Ethics Committee and by Unicamp Research Ethics Committee - Campinas Campus.

Results

Of the 2091 studied cases of 13 year old or older individuals, 517 (24.7%) had TB diagnosed

with at least one of the infection clinical forms, being 379 (73.3%) males. Men/women ratio was 2,7:1 among co-infected, and 1,6:1 among not co-infected. It was noticed a higher percentage of deaths among patients that showed at least one clinical form of TB (Table 1).

As to age group, even though most cases were between 26 and 39 years old at the moment of diagnosis, no difference between co-infected and not co-infected was noticed. (Table 1).

As to referred skin color, comparing whites to blacks/browns, there was a greater share of whites among not co-infected, 853 (54.2%) ($p < 0,01$). Significant differences were seen with greater proportion among women, schooling greater than 8 years, sexual transmission and homossexual practice among not co-infected individuals (Table 1).

The Table 2 displays some clinical variables of use by health care services. It was noticed that a large amount of people was in regular use of ART in both groups, higher than 85%. As to diagnostic criteria for AIDS, CD4 counting, percentage among co-infected, 203 (39.3%), was inferior to not co-infected, 931 (59.1%).

Frequency of cancer diagnosis wasn't different between groups ($p = 0.18$), however, it was observed a greater percentage of opportunistic diseases among patients with TB diagnosis ($p = 0.03$) (Table 2).

Variables associated to patient follow up and access to other professionals are presented in Table 2. It was noticed that 1.020 (64.8%) of not co-infected patients received care by other professionals, not only physicians and nurses, less frequent that co-infected patients (74.3%). As to hepatitis B, there was no statistical difference in exam request. (Table 2).

Kaplan Meier survival curve analysis (Figure 1-A) suggests that co-infected patients had lower survival up to 60 months after AIDS diagnosis compared with not co-infected ones. Accumulated survival was of 70% for not co-infected and 58% for co-infected. Survival curves comparison using Log-rank (Mantel-Cox) survival distribution equality test showed a difference between groups ($p < 0,01$).

After adjusting Cox multiple model, accumulated survival was of 71% for co-infected and 81% for not co-infected after 60 months of diagnosis (Figure 1-B). Mean survival related to TB co-infection was of 69 months for Southeast region and 73 months for South region.

The Table 3 presents risk estimator in univariate and multiple analysis using Cox model, via *stepwise*. Risk among AIDS-tuberculosis co-infected was of 1.65 (IC95%: 1.30-2.08) times the not infected in multiple model.

Variables presented in positive association to greater survival were: female sex (HR = 0,63 and IC95%: 0.50–0.81), schooling greater than five years (HR = 0.68 and IC95%: 0,51–0,91), CD4 diagnosis criteria (HR = 0.64 IC95%: 0.49–0.85). Variables associated negatively with survival were: age group greater than 60 years old (HR = 2.33 IC95%: 1.13–4.84), non regular use of ART (HR = 8.62 IC95%: 6.11–12.17), no hepatitis B investigation (HR = 2.44 IC95%: 1.94–3.06), TB diagnosis (HR = 1.65 IC95%: 1.30–2.08) and two of more opportunistic diseases (HR = 1.97 IC95%: 1.46–2.66) (Table 3).

Lower accumulated survival was noticed in 60 months in patients presenting clinical form of disseminated/extrapulmonary/not cavitary TB infection (55%). Followed by cavitary pulmonary tuberculosis (58%), ganglionar/non specific TB (68%). Comparison between curves using Log-rank test showed no difference among them ($p < 0,00$) (Figure 2).

Discussion

This study has shown that survival of diagnosed patients in 1998 and 1999, in 10 years, was superior to patients diagnosed before this period of time[6,8]. It was registered lethality of 46.8% and 32.5% in patients with and without co-infection, respectively ($p < 0,01$). In both regions, mortality among co-infected topped that of not co-infected. Groups also presented distribution differences in sociodemographic, epidemiological, clinical and health care use variables.

After 60 months of AIDS diagnosis, no difference was observed in accumulated survival between South and Southeast regions. Mortality among AIDS-tuberculosis co-infected patients was greater in both regions, 39.5% in South region and 42% in southeast region. The association between these diseases justify the statement that, in all patients with TB, HIV must be tested for. On the other hand, for every patient with HIV infection, TB must be tested[9].

The amount of patients with AIDS-Tuberculosis infection was about 1/4 the population studied, 517 (24.7%). A similar co-infection percentage has been seen in a Rio de Janeiro hospital cohort[7]. Studies in Southeast region point to a 34.5% AIDS-tuberculosis co-infection prevalence in Belo Horizonte, MG, 52.5% in São José

Table 1. Distribution of AIDS cases with and without tuberculosis, according to death (lethality), sociodemographic variables, exposure category, sexual practice, blood transmission and number of partners, South and Southeast regions, Brazil 1998-2008 cohort.

		Tuberculosis						
		No (N = 1574)		Yes (N = 517)		Total (N = 2091)		
		Freq	%	Freq	%	Freq	%	p-value
Death	Yes	511	32.5	242	46.8	753	36.0	
	No	1063	67.5	275	53.2	1338	64.0	0.00*
Gender	Male	978	62.1	379	73.3	1357	64.9	
	Female	596	37.9	138	26.7	734	35.1	0.00*
Age in years	13-25	186	11.8	46	8.9	232	11.0	
	26-39	892	56.7	318	61.5	1210	57.9	
	40-59	464	29.5	144	27.9	608	29.1	
	≥ 60	32	2.0	9	1.7	41	2.0	0.17
Race-referred	White	853	54.2	242	46.8	1095	52.4	
	Black	104	6.6	53	10.3	157	7.5	
	Yelow	3	0.2	1	0.2	4	0.2	
	Brown	180	11.4	82	15.9	262	12.5	
	Indigenous	2	0.1	2	0.4	4	0.2	
	No information	432	27.4	137	26.5	569	27.2	0.00
Schooling	≤ 4 years	870	55.3	307	59.4	1177	56.3	
	5 ≤ 8 years	305	19.4	78	15.1	383	18.3	
	> 8 years	129	8.2	22	4.3	151	7.2	
	No information	270	17.2	110	21.3	380	18.2	0.00*
Exposure Category	Sexual	1105	70.2	283	54.7	1388	66.4	
	Sanguine	282	17.9	158	30.6	440	21.0	
	No information	187	11.9	76	14.7	263	12.6	0.00*
Sexual practice	Homosexual	211	13.4	46	8.9	257	12.3	
	Bisexual	119	7.6	40	7.7	159	7.6	
	Heterosexual	995	63.2	313	60.5	1308	62.6	
	No information	249	15.8	118	22.8	367	17.6	0.09
Blood transmission	IDU	266	16.9	154	29.8	420	20.1	
	Others***	13	0.8	2	0.4	15	0.7	
	No information	1295	82.3	361	69.8	1656	79.02	0.00
Number of Partners	One	245	15.6	58	11.2	303	14.5	
	Multiple	690	43.8	233	45.1	923	44.1	
	No information	639	40.6	226	43.7	865	41.4	0.30

* The Pearson's Chi-Square statistic is significant at the 0.05 level. ** The Fisher's Exact Test statistic is significant at the 0.05 level. For the Chi-Square calculation of race-referred, the white and black / brown groups were compared. *** The other forms of blood transmission that were considered: hemophilia, history of transfusion and work accident with biological material.

do Rio Preto, SP, 17.5% in Campinas, SP, and 14.5% in Vitória, ES[25,31-33].

The infection reactivation by *Mycobacterium tuberculosis* due to immunity drop, as well as new infections can occur in individuals with AIDS.

Unequal distribution of deaths between co-infected and not co-infected was seen at the period, with lethality of 46.8% and 32.5%, respectively ($p < 0,01$). Groups also displayed distribution differences in sociodemographic, epidemiological, clinical and health care use variables.

Survival at 60 months was similar between both South (78%) and Southeast (79%) regions, given that for those with TB diagnosis, in both regions, the survival dropped at the period, even in the presence of co variables. Particularly among patients with disseminated/extrapulmonary/not cavitary TB co-infection, survival at 60 months was significantly lower, agreeing with

Table 2. Percentage distribution of AIDS cases with and without tuberculosis according to clinical variables (diagnostic criteria, antiretroviral use, presence of cancer and opportunistic diseases) and variables of use and follow-up in health services, South and Southeast regions, Brazil 1998-2008 cohort.

		Tuberculosis				
		No (N = 1574)		Yes (N = 517)		
		Freq	%	Freq	%	p-value
Diagnostic criteria for AIDS	RJ Caracas	262	16.6	186	36.0	
	CDC Modified	348	22.1	120	23.2	
	CD4	931	59.1	203	39.3	
	No information	33	2.1	8	1.5	0.00*
ART Use	Regular	1366	86.8	442	85.5	
	Irregular	116	7.4	54	10.4	
	No information	92	5.8	21	4.1	0.03*
Cancer**	Yes	58	3.7	26	5.0	
	No	1516	96.3	491	95.0	0.18
Opportunistic Diseases***	None	864	54.9	250	48.4	
	One	491	31.2	182	35.2	
	Two or more	219	13.9	85	16.4	0.03*
Examination for Hepatitis B	Realized	815	51.8	273	52.8	
	Unrealized	275	17.5	98	19.0	
	No information	484	30.7	146	28.2	0.65
PCP Prophylaxis****	Realized	637	40.5	247	47.8	
	Unrealized	937	59.5	270	52.2	0.00*
Tuberculosis Prophylaxis	Realized	67	4.3	43	8.3	
	Unrealized	1507	95.7	474	91.7	0.00*
Multidisciplinary team*****	Yes	1020	64.8	384	74.3	
	No	554	35.2	133	25.7	0.00*

* The Pearson's Chi-Square statistic is significant at the 0.05 level. ** Forms of cancer that were considered: invasive cervical cancer, non-Hodgkin lymphoma, primary lymphoma of the brain and Kaposi's sarcoma. *** The opportunistic diseases that were considered: candidiasis (esophagus, trachea, bronchi and lung), cytomegalovirus (in place other than the eye, liver, spleen, lymph nodes), extrapulmonary cryptococcosis, cryptosporidiosis, mycobacterium disease (other than tuberculosis) Mucosal herpes simplex, disseminated histoplasmosis, isosporiasis, progressive multifocal leukoencephalopathy, neurotoxoplasmosis, *Pneumocystis jiroveci* pneumonia, cytomegalovirus retinitis, salmonellosis, pneumonia (except *Pneumocystis jiroveci* pneumonia). **** Prophylaxis for *Pneumocystis jiroveci* pneumonia. ***** Other health professionals who were considered: psychologist, dentist, social worker, psychiatrist, physiotherapist, nutritionist, occupational therapist (except physician infectologist and nurse).

severity and disease spread on an immunosuppressive state.

Kaplan-Meier curves, as well as multiple model, showed significant differences in patient survival with and without co-infection. TB aside, the presence of opportunistic diseases also abbreviated the studied population survival[5,6].

An hypothesis to explain lower survival among AIDS-Tuberculosis co-infected is TB treatment drop off due to adverse events: drug interaction from combined therapies, as well ass alcohol, smoking, opportunistic diseases, T-CD4 count lower than 200/mm^3 as TB treatment drop off predictors, dealing prognostic impact to the patient[13,24].

Cases of AIDS with or without TB diagnosis are more prevalent among males, as seen in other studies[1-3,19]. The strong relation with poverty, low schooling and TB may explain the greater risk of dying among individuals up to four years of

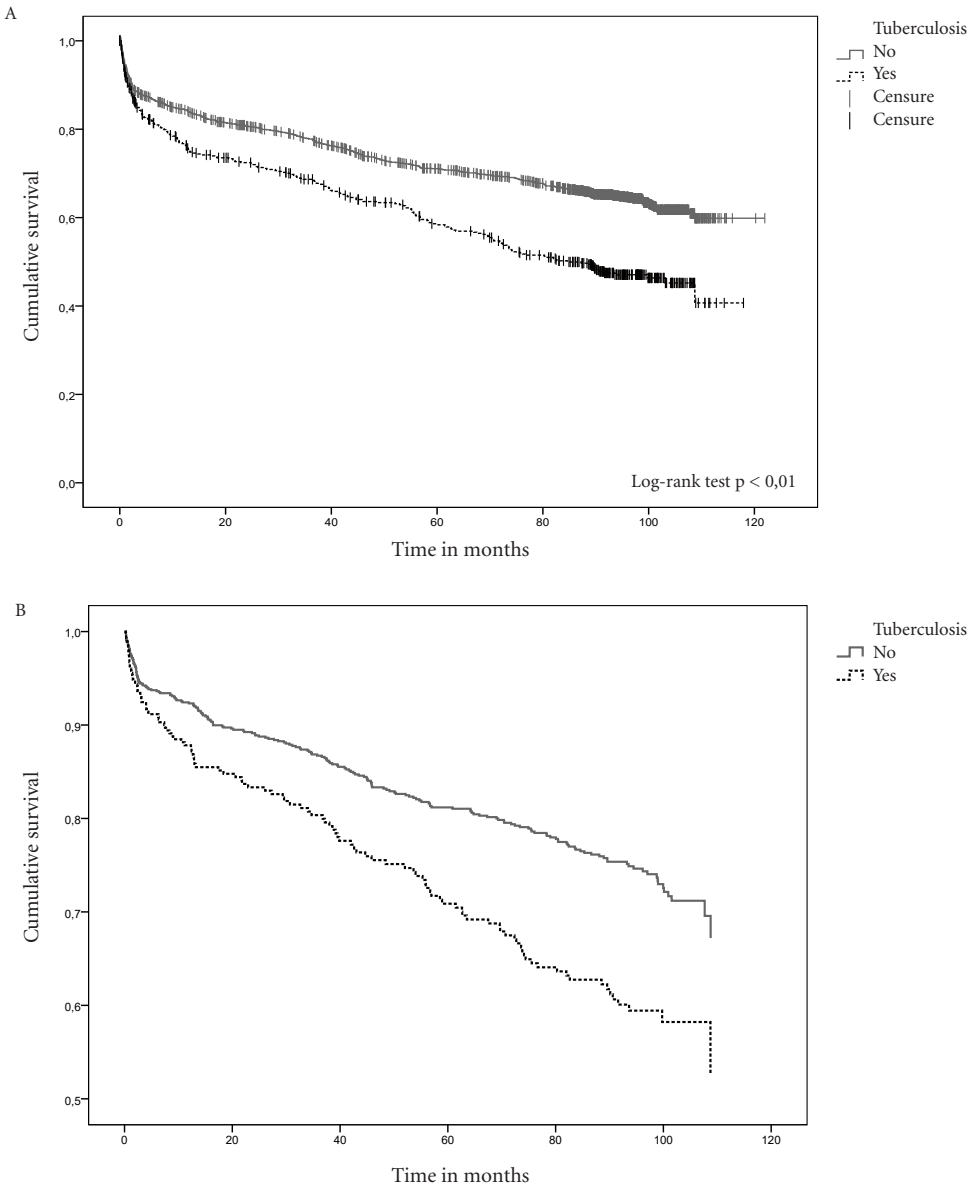

Figure 1. Kaplan-Meier survival curves according to co-infection AIDS-tuberculosis (A) and adjusted Cox model with co-variables* (B) in South and Southeast regions, Brazil 1998-2008 cohort.

* Variables adjusted in Cox multiple model were: sex, age in years, schooling, AIDS diagnostic criteria, use of ART, serology for Hepatitis B and opportunistic diseases.

study[6,12]. This variable is a socioeconomic marker of the population, even though quite frequently not available in medical records and notification files[7,9,12,34].

It is worth mentioning the differences found in referred skin color in AIDS-tuberculosis co-infected patients, being blacks/browns more prevalent. The use of race/referred skin color as an analytical variables has contributed to a better understanding of disadvantages and inequalities black people face when accessing proper health care resources. The study on women tested positive for HIV in São Paulo registered a vulnerability situation and little access to health care

Table 3. Hazard rate and ratio of variables associated with survival in univariate and multivariate model (Cox) in patients with AIDS, South and Southeast regions, Brazil 1998-2008 cohort.

		Univariate			Multivariate		
		HR	**CI 95%**	**p-value**	**HR**	**CI 95%**	**p-value**
Gender	Male	1	-		1	-	
	Female	0.72	0.61–0.84	0.00	0.63	0.50–0.81	0.00
Age in years	13-25	1	-		1	-	
	26-39	1.12	0.87–1.43		1.20	0.81–1.78	
	40-59	1.18	0.91–1.54		1.24	0.82–1.87	
	≥ 60	2.84	1.81–4.44	0.00	2.33	1.13–4.84	0.02
Race-referred	White	1	-		-	-	
	Black / Brown	1.32	1.11–1.58		-	-	
	Indigenous / Yelow	0.62	0.15–2.47	0.00	-	-	0.12
Schooling	≤ 4 Years	1	-		1	-	
	5 ≤ 8 Years	0.60	0.49–0.75		0.68	0.51–0.91	
	> 8 Years	0.47	0.33–0.68	0.00	0.52	0.32–0.84	0.00
Exposure Category	Sexual	1	-		-	-	
	Sanguine	1.75	1.48–2.07	0.00	-	-	0.17
Sexual practice	Homosexual	1	-		-	-	
	Bisexual	1.08	0.77–1.53		-	-	
	Heterosexual	1.10	0.87–1.40	0.43	-	-	-
Number of Partners	One	1	-		-	-	
	Multiple	1.42	1.11–1.82	0.00	-	-	0.29
Diagnostic criteria for AIDS	RJ Caracas	1	-		1	-	
	CDC Modified	0.94	0.78–1.13		0.95	0.68–1.32	
	CD4	0.37	0.31–0.44	0.00	0.64	0.49–0.85	0.00
ART Use	Regular	1	-		1	-	
	Irregular	11.6	9.47–14.22	0.00	8.62	6.11–12.17	0.00
Multidisciplinary team	Yes	1	-		-	-	
	No	1.57	1.36–1.82	0.00	-	-	0.63
Examination for Hepatitis B	Realized	1	-		1	-	
	Unrealized	3.10	2.56–3.75	0.00	2.44	1.94–3.06	0.00
PCP Prophylaxis*	Realized	1	-		-	-	
	Unrealized	1.37	1.19–1.59	0.00	-	-	0.85
Tuberculosis Prophylaxis	Realized	1	-		-	-	
	Unrealized	1.11	0.81–1.53	0.50	-	-	-
Diagnosis of Tuberculosis	Negative	1	-		-	-	
	Positive	1.62	1.39–1.89	0.00	1.65	1.30–2.08	0.00
Cancer	Yes	1	-		-	-	
	No	0.66	0.49–0.90	0.01	-	-	0.16
Opportunistic Diseases	None	1	-		1	-	
	One	1.78	1.51–2.09		1.57	1.20–2.07	
	Two or more	2.23	1.84–2.70	0.00	1.97	1.46–2.66	0.00

* Prophylaxis for *Pneumocystis jiroveci* pneumonia.

services, as well as greater schooling and comprehension difficulties about the disease and exams requested[35]. Although significant in univariable model and greater prevalence of black/ brown patients among co-infected, this variable did not remain linked to death risk in the final multiple model after adjusting with "schooling years" variable, suggesting a greater socioeconomical condition relevance in survival, independently from referred skin color. It is worth mentioning the interpretation limitations and reliability of this information, particularly in medical records.

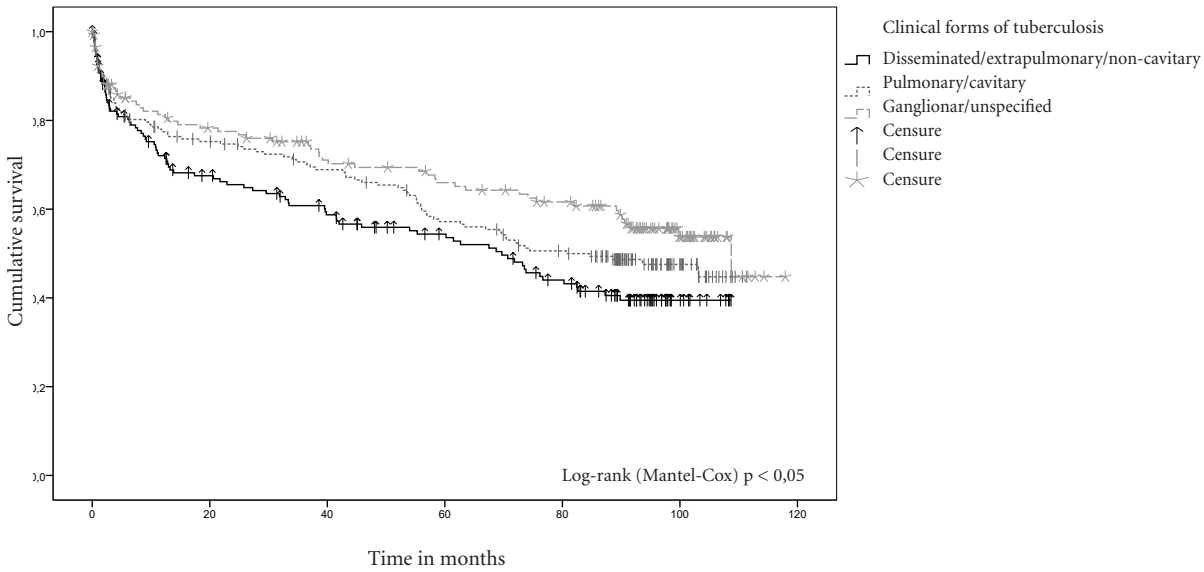

Figure 2. Kaplan-Meier survival curves of patients with AIDS aged 13 years or old, according to clinical forms of tuberculosis in South and Southeast regions, Brazil 1998-2008 cohort.

Worse life conditions make health care access, correct medication use comprehension, proper nutrition care and other general orientations more difficult[36].

A study performed in Rio de Janeiro showed that survival is strongly influenced by CD4 count above 100 cells/mm^3, lowering opportunistic diseases incidence[37]. Regular use of antiretroviral medication improved considerably, 8.62 times the life expectancy in this cohort and changed the immunologic profile of patients with TB co-infection due to immunity recovery. Similar results were registered in several regions worldwide, emphasizing the greater impact of combined antiretroviral therapies (three antiretroviral usage) since year 2000 and consequent CD4 cells recovery[5,6,38-43].

Some variables were included in this study with the objective of analyzing survival with patient care association, such as prophylaxis usage, hepatitis B serology request and multiprofessional care, which would indirectly indicate service adhesion, clinical follow up and integral patient management.

Among health care related variables, although associated to univariable analysis, only hepatitis B serology request remained as a greater survival predictor of patients with AIDS managed in the cities. The request of these exams denotes a treatment comprising other chronic diseases investigation, one of them being preventable and both being of clinic and therapeutic follow up.

A study evaluated the care of patients with AIDS in Brazil, emphasizing the heterogeneity of health care assistance and infrastructure, even though there are medication availability, clinical follow up exams, as well as infectology specialized physician in most services[44].

Although prophylaxis with isoniazida has reduced TB active infection in individuals with AIDS, treatment adhesion, drug resistance and toxicity have limited this high risk measure. Integrated care and decentralization of preventive actions, screening and TB treatment for people living with HIV can reduce co-infection and limit drug resistance.

A few limitations in this study can be evidenced, such as the quality of registered information in medical records, which are not always reliable and may vary in different regions of the country. The 10 year analysis from past decade (1998-2008) may not reflect the epidemic dynamic nowadays, considering changes in patient profiles like age group, decrease in injecting drug users, availability of new antiretroviral drugs and more powerful and easier to use associations.

However, it is a population based study with survival estimates which contribute to registration of parameters and post-HAART epidemic indicators, relevant to monitoring the disease in Brazil.

Conclusions

Patient survival post-HAART has increased among patients studied. These results show the investments made by STD/AIDS national, state and municipal programs, aiming universal access to treatment and clinical follow up of patients with AIDS. Despite advancements in policies and health care service to affected individuals, some challenges remain, such as overcoming inequalities related to early diagnosis and availability and adhesion to treatment for both AIDS and TB. AIDS and TB are two chronic diseases that demand clinical follow up and adhesion to treatment and can be analyzed as marker of difficulties to overcoming limitations still existing in patient survival in Brazil.

Collaborations

MC Melo participated in the design of the study, analysis of the data, revision of the text, discussion of the results and in the writing of the manuscript. MR Donalísio participated in the conception of the study, data collection and analysis, revision of the text, discussion of the results and in the writing of the manuscript. RC Cordeiro participated in the analysis of the data, revision of the text, discussion of the results and in the writing of the manuscript.

Acknowledgment

The research was funded by the Foundation for Research Support of the State of São Paulo (FAPESP) and the National STD-AIDS Program with resources of the United Nations Educational, Scientific and Cultural Organization (UNESCO).

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Article submitted 04/12/2015
Approved 29/03/2016
Final version submitted 31/03/2016