Characterization of deaths and therapeutic itineraries investigated by the Porto Alegre AIDS Mortality Committee, Brazil, in 2015

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Abstract

Objective: to characterize AIDS deaths eligible for Porto Alegre AIDS Mortality Committee (AIDSMC) investigation, Brazil, in 2015, and their therapeutic itineraries. **Methods:** this was a descriptive study using secondary data from surveillance information systems and AIDSMC investigation forms. **Results:** out of 336 deaths from AIDS-related causes, 113 (33.6%) were considered avoidable, of which 52 were analyzed by AIDSMC; there was predominance of males (30/52), low schooling level (29/52 incomplete elementary education), and less than 2 years between HIV infection diagnosis and death (28/52); tuberculosis was the most frequent cause of death (17/52); and in 50/52 cases at least one therapeutic itinerary inadequacy was identified. **Conclusion:** avoidable deaths of people with AIDS occurred mostly in men, those with low education level, those with recent HIV diagnosis and most deaths were due to tuberculosis.

Keywords: HIV; Acquired Immunodeficiency Syndrome; Mortality; Epidemiological Monitoring; Epidemiology, Descriptive.

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Introduction

Brazil is cited internationally for its response to the human immunodeficiency virus (HIV) epidemic, the infectious agent that causes acquired immunodeficiency syndrome (AIDS), or HIV/AIDS.[1] The reasons for this recognition include the guarantee of universal access to free of charge diagnosis and antiretroviral treatment via the Brazilian National Health System (SUS), although epidemic hotspots still exist, principally in the Northern and Southern regions of the country.

> *The endemic HIV/AIDS hotspot in Porto Alegre has peculiar characteristics, including late access to diagnosis and treatment, inequities in access to health services and the impact of tuberculosis coinfection.*

In 2018, Porto Alegre, capital of the state of Rio Grande do Sul, had the third highest AIDS case detection rate (53.7/100,000 inhabitants) among the Brazilian state capitals and Federal District, and the highest rates of (i) HIV detection in pregnant women (20.2 per 1,000 live births) and (ii) AIDS mortality (22.5 per 100,000 inhab.), as well as a higher (iii) average CD4 T lymphocyte count of (332) per mm³ of blood when infection is diagnosed.[2] Also in 2018, the AIDS mortality rate in Porto Alegre was three and five times higher than the rate for the state of Rio Grande do Sul and for Brazil as a whole, namely 4.4 and 7.8/100,000 inhab. respectively.[2]

The endemic HIV/AIDS hotspot in Porto Alegre has peculiar characteristics, including late access to diagnosis and treatment, inequities in access to health services[3] and the impact of tuberculosis coinfection.[4] In this context, the absence of accurate information on morbidity and mortality is a relevant obstacle to monitoring and evaluating local responses, in addition to preventing strategies from being prepared to reduce avoidable AIDS-related deaths.

With the aim of strengthening the response to the epidemic, Porto Alegre Municipal Heath Department was pioneer in Brazil when it set up the Municipal AIDS Mortality Committee (AIDSMC) in 2011, recognized by Municipal Law in 2013.[5] The AIDSMC was set up similarly to the Maternal[6] and Infant[7] Mortality Committees recommended by the Ministry of Health, to enable the definition of interinstitutional, intersectoral and multiprofessional articulation strategies.

The objective of this study was to characterize AIDS deaths reported in 2015 eligible for investigation by the Porto Alegre AIDSMC and their therapeutic itineraries.

Methods

This was a descriptive study using secondary data on individuals who died of AIDS in the municipality of Porto Alegre in 2015.

In 2019 Porto Alegre had an estimated population of 1,409,351 inhabitants and its human development index (HDI) was 0.805, it had a predominantly female population and the most frequent age range was 25-29 years.[8] The municipality has 143 Primary Healthcare Centers (PHC), eight municipal urgency and emergency health centers and a further eight outsourced centers;[9] it also has four specialized care services (SAE) for people with HIV/AIDS and three testing and counseling centers (CTA) for the general population.[9]

We studied all AIDS-related deaths reported in 2015 among individuals resident in Porto Alegre with eligible criteria for AIDSMC investigation. Deaths defined as eligible for AIDSMC investigation due to avoidability[10-12] through effective action of available health services are based on five criteria: (i) cases reported as "exceptional 'death'" (cases not fitting into current disease criteria and cases without information enabling the disease to be characterized when the death is reported); (ii) individuals who had tuberculosis coinfection and were under 50 years old; (iii) individuals with less than 2 years between HIV diagnosis and death; (iv) individuals aged under 30 years old; and (v) pregnant/puerperal women. Individuals who died in Porto Alegre but resided in other municipalities were not included in the study.

The AIDSMC is comprised of health professionals who represent SUS services, universities, the municipal reference laboratory, as well as nongovernmental organizations dedicated to defending the rights of people living with HIV/AIDS (PLWHA). Professionals from the Municipal Infectious Diseases Surveillance Team identify cases via the Mortality Information System (SIM) and gather additional information via

the following systems: Notifiable Health Conditions Information System - AIDS (SINAN-AIDS), Laboratory Test Control System (SISCEL) and Medication Logistics Control System (SICLOM). Each month the Infectious Diseases Surveillance Team prepares a list of cases which is sent the AIDSMC members for them to look for information on the medical records of the people whose deaths are under investigation in their respective health services. A database is generated using the data provided by the health services and data from the analysis made by the AIDSMC members. Once all the AIDSMC representatives have replied, each case is discussed and the analysis is brought to a close at the monthly AIDSMC meeting.

The information used to characterize deaths eligible for investigation by the AIDSMC corresponded to the following variables:

a) sex (male; female);
b) age (in years);
c) race/skin color (white; black; brown; indigenous);
d) schooling (none; incomplete primary school; complete primary school; incomplete middle school; complete elementary education; incomplete high school; complete high school or higher education; unknown);
e) virus transmission route (homosexual; bisexual; heterosexual; use of drugs; vertical transmission; unknown);
f) time elapsed between HIV infection diagnosis and death (in months); and
g) time elapsed between AIDS case notification and death (in months).

The data were collected from the SIM and SINAN-AIDS information systems and checked, case by case, on the SISCEL and SICLOM information systems.

In addition, the researchers prepared a questionnaire with the aim of characterizing the therapeutic itineraries[13] of the PLWHAs in the period prior to death. The itineraries were prepared based on information retrieved by reviewing the PLWHA's medical records in the Porto Alegre health services where the AIDSMC representatives work. The purpose of studying the therapeutic itineraries was to identify causes of death and possible inadequacies/intercurrences in care provided to the PLWHAs in the period prior to death. The Ministry of Health HIV/AIDS Death Investigation Protocol[14] was used to compile the data collection instrument. All AIDS deaths previously investigated by

the AIDSMC were analyzed. Once a week the research teams met with four or five AIDSMC members with experience in epidemiological surveillance and PLWHA healthcare management to collect data. When necessary the information was complemented with data from the SIM, SINAN-AIDS, SISCEL and SICLOM information systems.

The variables collected at this stage were:

a) AIDSMC investigation criteria ('death'; tuberculosis coinfection in individuals under 50 years old; time of infection less than 2 years between HIV diagnosis and death; individuals aged under 30 years old; pregnant/puerperal women);
b) cause of death (as per the International Classification of Diseases and Related Health Problems – 10th Revision [ICD-10]);
c) alteration of cause of death after case investigation (yes; no);
d) situations correlated to death (abusive use of alcohol and/or drugs; street dweller; psychiatric disorder patient);
e) evaluation of therapeutic itinerary adequacy[14] (inadequacy in access; inadequacy in health care; inadequacy in health system organization; inadequacy in relation to antiretroviral treatment; no inadequacies);
f) death avoidability (yes; no; inconclusive);
g) case notification criterion (Caracas/Rio de Janeiro; adapted CDC; CDC by CD4 T cell count; 'death'); and
h) recommendations for health services.

The most frequent inadequacies identified in the therapeutic itineraries, as well as the number of concomitant inadequacies found in each case were also computed. Inadequacies identified relating to AIDS deaths eligible for AIDSMC investigation in 2015 are shown descriptively, by means of absolute and relative frequencies, when appropriate, averages and standard deviations or medians and interquartile ranges. SPSS version 25.0 was used for this purpose.

The researchers were advised as to their duty to preserve the confidentiality and privacy of the cases they analyzed and signed a Confidentiality Commitment form as a requirement for taking part in the study.

The study project was approved by the Porto Alegre *Hospital de Clínicas* Research Ethics Committee (CEP/HCPA): Registration No. 12298713.7.0000.5327, dated April 10th 2013.

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Results

In 2015 there were 336 deaths from AIDS-related causes among people resident in Porto Alegre. Of these deaths, 113 (33.6%) were considered eligible for investigation by the AIDSMC, which was able to analyze 52 cases, accounting for 46,0% of eligible deaths. Figure 1 shows the flowchart for selecting the analyzed cases in relation to total eligible deaths.

When analyzing individuals eligible for investigation by the AIDSMC (n=113), the most frequent criterion found was diagnosis followed by a period of less than 2 years between HIV infection being identified and death (59/113 cases). The next most frequent criterion was HIV/tuberculosis coinfection in people under 50 years old (27/113 cases), as shown in Table 1. Among the deaths investigated by the AIDSMC (n=52), the first and second most frequent criteria were the same as
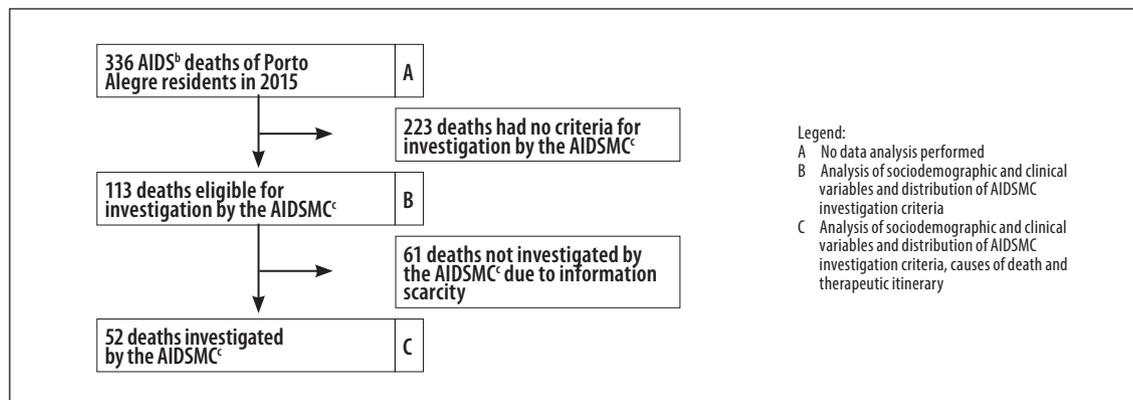
a) HIV: human immunodeficiency virus.
b) AIDS: acquired immunodeficiency syndrome.
c) AIDSMC: Municipal AIDS Mortality Committee.

Figure 1 – Flowchart for selecting HIV[a]/AIDS[b] deaths of people resident in Porto Alegre, Rio Grande do Sul, 2015

those listed above in this paragraph, with 28/52 cases and 11/52 cases, respectively.

With regard to the sociodemographic variables, among the deaths having criteria for AIDSMC investigation, attention is drawn to the majority (56.6%) being male (64/113 cases), mean age 41 years (standard deviation: 11 years), greater frequency of white race/skin color (61/113) and predominance of low schooling (61/113 had incomplete middle school education) (Table 1). As for the deaths investigated by the AIDSMC, the majority were also male (30/52 cases), mean age 40.5 years (standard deviation: 12.2 years), predominance of white race/skin color (27/52 cases) and low schooling (29/52 cases had incomplete middle school education).

In relation to the clinical variables, the most frequent form of HIV transmission was heterosexual, both among individuals having criteria for AIDSMC investigation (60/113 cases) and also among those investigated by the AIDSMC (29/52 cases). The median values for the period elapsed between HIV diagnosis and death and for the period between AIDS case notification and death were

89 days (interquartile range 9; 531 days) and 38 days (interquartile range 0; 400 days), respectively, for eligible deaths; and 38 (interquartile range 4; 497 days) and 17 days (interquartile range 0; 354 days), respectively, for those cases investigated by the AIDSMC.

The leading causes of death were analyzed among the 52 cases investigated by the AIDSMC (Table 2). Tuberculosis was the most frequent cause (17/52 cases), whereby its pulmonary form was most common, followed by pneumonia (14/52 cases) and septicemia (6/52 cases). With regard to situations related to death, in 21 cases there were records of abusive use of alcohol and/or drugs.

Analysis of the occurrence of potential therapeutic itinerary inadequacies found 150 events. In 50 out of the 52 cases investigated there was at least one situation that could be characterized as an inadequacy, regardless of its nature. We identified 72 (48%) situations characterized as 'inadequacy in care provided by health services' (Table 3). The 'late diagnosis of HIV infection' category was found 23 times. Situations typified as 'inadequacy in access to health services' were found 46 times (30.7%) and 30 of these were identified as

Table 1 – Distribution of sociodemográphic and clinical characteristics of AIDS deaths investigated by the Municipal AIDS Mortality Committee (n=52) and of AIDS deaths eligible for investigation (n=113), Porto Alegre, Rio Grande do Sul, 2015

Variables	Deaths eligible for investigation by AIDSMC (n=113)	Deaths investigated by AIDSMC (n = 52)
	n	n
Death investigation criteria		
'Death'	13	7
Under 30 years old	12	6
TB[a]/HIV[b] coinfection under 50 years old	27	11
HIV diagnosis less than 2 years before death	59	28
Pregnant/puerperal women	2	–
Sociodemographic variables		
Male	64	30
Race/skin color		
White	61	27
Black	29	14
Brown	16	9
Indigenous	1	–
Unknown	6	2
Schooling		
None	3	1
Incomplete primary school	4	–
Complete primary school	9	4
Incomplete middle school	45	24
Complete elementary education	13	7
Incomplete high school education	8	2
Complete high school or higher education	12	6
Unknown	10	8
Clinical variables		
HIV[b] transmission route		
Homosexual	6	3
Bisexual	1	1
Heterosexual	60	29
Drug use	6	1
Vertical transmission	–	–
Unknown	40	18

a) TB: tuberculosis.
b) HIV: human immunodeficiency virus.

'inadequacy in HIV diagnosis'. When checking for concomitant inadequacies in each case investigated, 46 cases had at least one inadequacy related to care provided by health services along the therapeutic itinerary, while 29 cases had at least one inadequacy related to access to health services (Table 4).

Discussion

The findings of this study enabled identification among the deaths investigated by the Porto Alegre AIDSMC of a predominance of individuals with recent diagnosis of HIV infection (up to 2 years before death),

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Table 2 – Absolute frequency of causes of deaths and causes correlated to death among individuals investigated the Municipal AIDS Mortality Committee (n=52), Porto Alegre, Rio Grande do Sul, 2015

Variables	Absolute frequency n
Cause of death	
Pulmonary tuberculosis	7
Miliary tuberculosis	4
Unspecified tuberculosis	6
Total Tuberculosis[a]	17
Unspecified pneumonia	9
Pneumocystosis	5
Total Pneumonia[b]	14
Septicemia	6
Cryptococcosis	5
Cerebral toxoplasmosis	4
Progressive multifocal leukoencephalopathy	2
Histoplasmosis	1
Unspecified non-Hodgkin lymphoma	1
Stroke	1
Heart arrest	1
Situations correlated to death	
Abusive use of alcohol and/or drugs	21
Street dwellers	4
Psychiatric disorder patient	5

a) Sum of pulmonary, military and unspecified tuberculosis.
b) Sum of unspecific pneumonia and pneumocystosis.

males, adults, white race/skin color and low schooling; as well as the leading cause of death being tuberculosis. Moreover, at least one inadequacy occurred along the therapeutic itinerary of the majority of PLWHAs investigated, whereby inadequacies in care provided by health services were the most frequent.

The characterization of the deaths investigated by the Porto Alegre AIDSMC demonstrated a sociodemographic profile and avoidable causes of mortality consistent with those found in previous studies. The sociodemographic profile found by a study conducted with a national cohort of people monitored between 2009 and 2012 who received antiretroviral therapy, revealed a predominance of males, mean age of 37 years and heterosexual HIV transmission.[15] A case-control study conducted with deaths and PLWHAs, based on dated for the year 2003 retrieved from the SIM and SINAN-AIDS information systems found higher frequencies for people aged 30-39, incomplete high school education and time between AIDS diagnosis and death of less than one year.[16] Another study of AIDS deaths in 2014, based on the databases of information systems in Uruguay, found that the most frequent characteristics were being male, having low schooling and infection via the sexual transmission route, as well as mean age being 43.7 years at the time of death.[17]

In the metropolitan region of Porto Alegre, a study of the sociodemographic profile of people with AIDS between 1980 and 2015, based on data retrieved from Ministry of Health information systems,[18] found predominance of males, 30-39 age group and heterosexual exposure category.

With regard to clinical profile, both cases eligible for analysis by the AIDSMC and also those investigated revealed a short time between HIV infection diagnosis and death, highlighting lost opportunities to prevent HIV infection, progression to AIDS and occurrence of death.[19-21] Furthermore, tuberculosis, as the leading cause of death among the cases studied, points to a morbidity profile compatible with the era prior to the

Table 3 – Absolute frequency of inadequacies identified in the therapeutic itinerary of individuals investigated by the Municipal AIDS Mortality Committee (n=150), Porto Alegre, Rio Grande do Sul, 2015

Inadequacies	n	Categories	n
Inadequacy in care provided by health service	72	Late HIV[a] infection diagnosis	23
		Non-adherence to antiretroviral treatment	15
		Lost diagnosis opportunity	10
		Inadequate clinical management during hospitalization	10
		Failure to perform diagnosis tests	6
		Inadequate clinical management at emergency service	4
		Failure to comply with clinical protocol for HIV[a] management in health services	4
Inadequacy in access to health services	46	Inadequacy in HIV[a] diagnosis	30
		Inadequacy in reception/consultation at outpatient clinic/specialized service	6
		Inadequacy in reception/consultation at PHC[b]/FHS[c]	4
		Adequate therapy	3
		Hospitalization	1
		Hospitalization in ITU[d]	–
		Specialized examinations	–
		Urgency/emergency service	–
		Other	2
Inadequacy in relation to antiretroviral treatment	18	Poor adherence to treatment	17
		Patient did not want to receive treatment	–
		Therapy failure due to multidrug-resistant HIV[a]	–
		Other	1
Inadequacy in health service organization	14	Case referral and counter-referral	7
		Hospital bed control center	4
		Transport between hospitals/services	–
		Consultation control center	–
		Other	3
Total	150		

a) HIV: human immunodeficiency virus.
b) PHC: primary healthcare center.
c) FHS: Family Health Strategy.
d) ITU: intensive therapy unit.

Table 4 – Absolute frequency of concomitant inadequacies identified in the therapeutic itinerary of individuals investigated by the Comitê AIDS Mortality Committee (n=52), Porto Alegre, Rio Grande do Sul, 2015

Concomitant inadequacies per individual	No inadequacies n	1 inadequacy n	2 inadequacies n	3 inadequacies n	4 inadequacies n	5 inadequacies n
Inadequacy in access to health services	23	22	5	2	–	–
Inadequacy in care provided by health services	6	20	20	6	–	–
Inadequacy in health service network organization	39	12	1	–	–	–
Inadequacy in relation to antiretroviral treatment	34	18	–	–	–	–
All inadequacies	2	4	13	18	11	4

adoption of highly active antiretroviral therapy and the 'test and treat' approach.[22] Tuberculosis occurs in a higher proportion among PHVAs. HIV/tuberculosis coinfection impairs adherence to treatment and is related to people's social vulnerability.[23] A retrospective cohort study analyzed 2,419 cases of this form of coinfection in Porto Alegre between 2009 and 2013 and found hospitalization and mortality frequencies of 63.1% and 27.4%, respectively.[4]

Tuberculosis is a death risk factor for people with HIV/AIDS.[20,24] In this study, tuberculosis was followed by pneumonia and septicemia. In Ghana, a retrospective study with PLWHAs hospitalized between 2012 and 2013 found tuberculosis, anemia, toxoplasmosis and pneumonia as causes of death, in this decreasing order of frequency.[24] In the city of Rio de Janeiro, pneumonia was the most commonly diagnosed health condition among a cohort of people coinfected with HIV and tuberculosis monitored between 2000 and 2010.[20] Even though there are variations among leading causes of death, tuberculosis is the most frequent condition among individuals with HIV, despite being a manageable clinical event and deaths attributed to it being avoidable through health actions that strengthen timely diagnosis and adequate treatment.[4,23]

The high frequency of individuals with a history of abusive use of alcohol and/or drugs in the population studied recalls a characteristics of the HIV epidemic in Porto Alegre where, during the 1990s, more than a third of AIDS cases were related to injecting drug use.[25] With regard to this aspect of HIV transmission, use of drugs prior to death was found in 47.1% of the subjects of the study conducted in Uruguay mentioned above.[17]

Given that the evidence points to specific profiles of individuals who become ill and die because of HIV/AIDS, prevention and control actions can prioritize these populations. People with HIV/tuberculosis coinfection, history of alcohol and/or drug abuse and people with recent HIV diagnosis need differentiated care from health services, given that they are at greater risk of dying.[4,16,20,24] Nevertheless, in Porto Alegre, weakening of the Municipal Sexually Transmitted Infections and HIV/AIDS Program, low Primary Healthcare coverage, articulation difficulties between HIV and tuberculosis care services and hospital care profile can be seen.[18,26,27]

Analysis of the therapeutic itineraries highlighted health service and health worker difficulties in identifying and retaining individuals in HIV/AIDS treatment. A multiplicity of factors considered to have contributed to death were found, similarly to other analyses carried by mortality prevention committees[28] like the AIDSMC. A study carried out in municipalities in the interior region of São Paulo state in 2014 with people with HIV/tuberculosos coinfection, indicated that in places where management of these patients was of a satisfactory quality, Primary Healthcare was better structured and the healthcare network was better organized.[29] The fragile context of the network of health services for people living with HIV/AIDS in Porto Alegre reinforces the need for improvements to HIV care, access to prevention and treatment, as well as improvements to the health service network in general.

This study has limitations, such as the impossibility of studying the adequacy of the therapeutic itineraries of 113 deaths eligible for investigation by the AIDSMC in 2015, given that part of the information needed was not available. However, it is appropriate to consider the similarity between the profile of cases eligible for investigation and those effectively analyzed by the AIDSMC. Another limitation to be highlighted was the use of secondary data retrieved from health information systems and from the AIDSMC database: despite the efforts of the research team and despite training in data collection, the information was subject to this weakness. The characterization of inadequacies in opportunities for access to diagnosis and retention in treatment demonstrates subjectivity. However, the collegiate nature afforded by case discussion among the group of researchers contributed to minimizing the effect of these inadequacies on the analysis performed.

The findings of this study enabled identification of the sociodemographic and clinical profile of deaths from HIV/AIDS of individuals resident in Porto Alegre, who were predominantly male, of white race/skin color, with low schooling and 40 years old on average, having recent HIV infection diagnosis and having tuberculosis as the leading cause of death. This characterization allows us to postulate, at least in relation to part of the cases, that inadequacies continue to exist in access and retention of people in treatment. Future studies should use information generated at the local level for defining health actions that assist with addressing HIV.

Authors' contributions

All the authors took part in the concept and design of the study. Mocellin LP and Kuchenbecker RS took part in planning the study. Mocellin LP, Winkler GB, Beck C, Stella IM, Vieira PC and Behar PRP took part in data analysis. Mocellin LP, Winkler GB and Kuchenbecker RS interpreted the data. Mocellin LP drafted the scientific article. Winkler GB, Beck C, Stella IM, Vieira PC, Behar PRP and Kuchenbecker RS contributed to critically reviewing the intellectual content of the manuscript. Kuchenbecker RS oversaw the work. All the authors have approved the final version and are responsible for all aspects thereof, including the guarantee of its accuracy and integrity.

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