



Original article

Causes of hospitalization and predictors of in-hospital mortality among people living with HIV in Sicily-Italy between 2010 and 2021



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ABSTRACT

Background: Despite the rising number of people living with human immunodeficiency virus (HIV), there is a lack of knowledge about the factors that lead to PLWHs being hospitalized in worldwide literature. Our study aimed to investigate PLWH admissions in Sicily (Italy) between January 2010 and September 2021 and to analyze the characteristics and risk factors for in-hospital mortality and differences between Italians and foreigners.

Methods: Data from the hospital discharge forms of all people living with HIV (PLWH) hospitalized in Sicilian hospitals were retrospectively collected. Age, sex, nationality, length of stay, acquired immunodeficiency syndrome (AIDS), and non-AIDS-related diseases were evaluated using univariate analysis according to in-hospital mortality rates. The factors associated with mortality were included in the logistic regression model.

Results: In total, 5281 admissions from 2726 PLWHs occurred, most of which were related to non-AIDS diseases. Approximately 20 % regarded foreign patients, mainly from Africa. Logistic regression analysis revealed an association between in-hospital mortality and some AIDS- and non-AIDS-related diseases (wasting syndrome, lymphomas, Kaposi sarcomas, progressive multifocal leukoencephalopathy, cryptococcosis, abscesses, sepsis, cardiovascular disease, nephropathy, and respiratory diseases). African patient admissions were significantly associated with tuberculosis, toxoplasmosis, Burkitt lymphoma, and hepatitis B diagnoses.

Conclusions: Our study showed that most hospitalizations were related to non-AIDS-defining diseases, with differences between Italian and foreign patients, mainly from Africa.

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Introduction

Although the number of new human immunodeficiency virus (HIV) diagnoses has decreased over time from a peak of 3 million in 1997 to an estimated 1.5 million in 2020, the population of people

living with HIV (PLWH) continues to rise, and it is estimated to have reached 38 million in 2020, an increase of 11.3 % compared to 2010 [1]. A notable decrease in hospital admissions and opportunistic infections has occurred since the introduction of potent anti-retroviral therapy [2]. However, HIV-infected individuals survive and experience longer life expectancies as well as age-associated comorbidities [3]; therefore, the number of hospitalizations has emerged as an important outcome measure and contributor to healthcare expenditures in this population.

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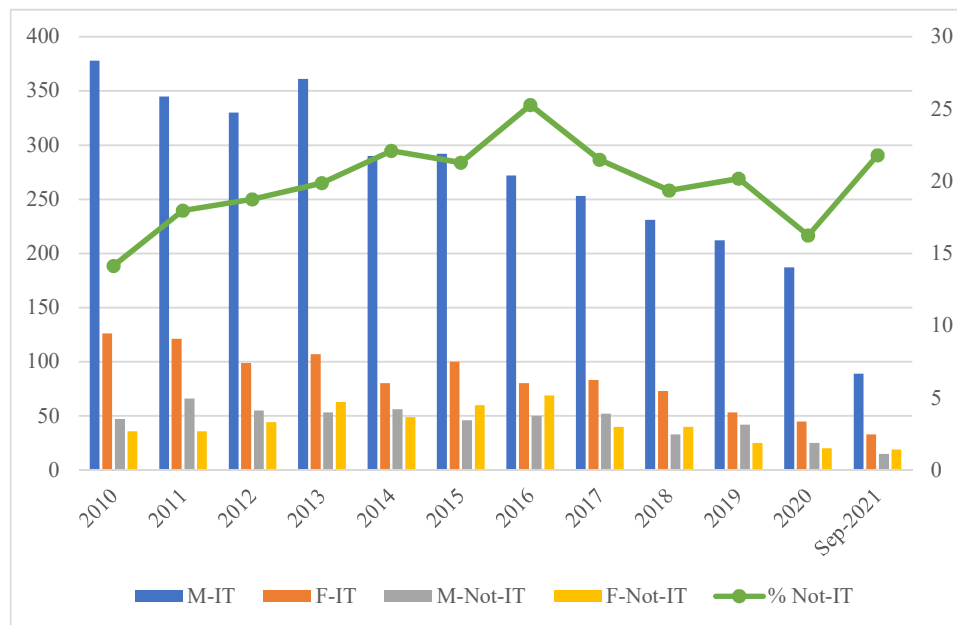


Fig. 1. Hospitalizations of Italian and non-Italian patients by sex and Italian or non-Italian status from 2010 to 2021.

Since the emergence of the HIV epidemic in Italy in 1982, 84,215 acquired immunodeficiency syndrome (AIDS) cases have been reported, with a downward trend in the incidence of new infections that in 2019 was 4.4 and in 2020 was 2.2 per 100,000 population (the latter being affected likely by the COVID-19 pandemic) [4]. The surveillance system for new diagnoses of HIV infection was only established with a Decree from the Italian Ministry of Health on March 31, 2008, and there are no data regarding HIV positivity in deceased persons; therefore, we can only estimate the number of PLWHs in Italy. Currently, 130,000 (110,000–150,000) adults in Italy are estimated to have HIV/AIDS [5]. Italian data on the number of hospitalizations of PLWHs are limited to knowledge of the number of hospitalizations under the Major Diagnostic Categories (MDC) 25, which decreased from 9796 (0.1 % of 7,374,765 of all ordinary hospitalizations) with 130,000 days of hospitalization and an average length of stay (LOS) of 6.7 days in 2010–4611 (0.1 % of 6,020,466 ordinary hospitalizations) with 80,012 days of hospitalization and an average LOS of 17.4 days in 2019 [6,7].

Sicily is the largest region in Italy and the 5th in terms of population, with 4,801,468 inhabitants (8.1 % of the 58,983,122 Italian population). Hospitalizations in Sicily represent approximately 7 % of national hospitalizations. Due to the success of antiretroviral therapy, human immunodeficiency virus (HIV) infection has been transformed into a lifelong condition, but the morbidity associated with HIV infection is poorly characterized. In 2015, a systematic review and meta-analysis of the causes of hospital admission among PLWHs worldwide found that no Italian data were included [8].

Our study aimed to evaluate over the examined period the burden of PLWH hospitalizations, diagnostic categories, and length of stay; to assess risk factors for mortality; and to evaluate differences between Italian and non-Italian patients.

Methods

Data on the hospital discharge forms of all PLWHs hospitalized for any reason in all public and private Sicilian hospitals from January 2010 to September 2021 were retrospectively collected and analyzed.

The dataset included primary diagnoses (defined as primary disorders for hospitalization) and up to five additional diagnoses.

The following variables were assessed for each patient: age, sex, nationality, LOS, death, AIDS-related diseases, and non-AIDS-related diseases.

As this computerized system is anonymous, according to the Italian Data Protection Authority, neither ethical committee approval nor informed consent was required for this study. Regional health authorities routinely use anonymous data for epidemiological and administrative purposes. All patients were considered to have AIDS if they had one or more AIDS-defining conditions [9]. However, attention was paid to all diagnoses during hospitalization. Comorbidities included non-infectious illnesses such as diabetes, respiratory diseases, cardiovascular diseases, kidney diseases, cancer, and infectious conditions such as chronic hepatitis.

Non-AIDS-defining pathologies such as pneumonia; hepatitis B, C, and A; sepsis; syphilis; enteritis; leishmaniasis; staphylococcal, Pseudomonas, Salmonella, and Klebsiella infections; abscesses; cystitis; pyelonephritis; enteritis; zoster; influenza; endocarditis; and malaria were explored. Childbirth admissions were also included in the database.

Statistical analysis

Continuous variables were summarized as mean \pm standard deviation or median and interquartile range, and categorical variables as absolute and relative frequencies. Differences in means were evaluated using an unpaired Student's t-test or the Mann-Whitney U test, and the χ^2 test was applied to categorical variables. Statistical significance was set at $p < 0.05$, significant. Crude odds ratios (OR) and their 95 % CI for the association between mortality and potential risk factors were calculated using univariate analysis. Adjusted OR were calculated using stepwise logistic regression analysis to identify the factors independently associated with mortality. The logistic regression analysis included only factors associated with mortality in the univariate analysis.

Results

Between January 2010 and September 2021, 5281 hospital admissions occurred in 2726 PLWHs. The distributions of sex and nationality over the years are shown in Fig. 1.

Table 1
General features and univariate analysis according to in-hospital mortality of 5281 admissions of PLWHs in Sicily from 2011 to 2021.

Variables	All hospitalizations (N = 5281)	Vital status at discharge		p
		Alive (N = 4966)	Dead (N = 315)	
Sex				0.27
Male	3780 (71.6 %)	3546 (71.4 %)	234 (74.3 %)	
Female	1501 (28.4 %)	1420 (28.6 %)	81 (25.7 %)	
Age (years) (mean ± SD)	46.3 ± 13.0	46.3 ± 13.0	50.3 ± 12.4	< 0.01
Country of origin				
Italians	4240 (80.3 %)	3997 (80.5 %)	243 (77.1 %)	0.15
Africans	752 (14.2 %)	700 (14.1 %)	52 (16.5 %)	0.23
European (non-Italian)	228 (4.3 %)	211 (4.25 %)	17 (5.4 %)	0.33
North Americans	15 (0.3 %)	14 (0.3 %)	1 (0.3 %)	0.91
Centro-meridional Americans	35 (0.7 %)	33 (0.6 %)	2 (0.6 %)	0.95
Asians and Australians	11 (0.2 %)	11 (0.2 %)	0 (0.0 %)	0.40
LOS (days) (median and IQR)	9 (5–18)	9 (4–17)	16 (6–31)	< 0.01
LOS AIDS (days) (median and IQR)	18 (8–33)	17 (8–32)	24 (13–39)	< 0.01

According to the Major Diagnostic Categories (MDC), the "MDC 25-Human Immunodeficiency Virus Infections" was coded in 3176 cases (60.0%). The following 4 MDCs in decreasing order were "MDC 7 -Diseases and disorders of the hepatobiliary system and pancreas" (6.0%), "MDC 4-Diseases and disorders of the respiratory system" (5.3 %); "MDC18-Infectious and parasitic diseases" (3.4%); and "MDC 6-Diseases digestive system (3.3 %)".

The average cost of hospitalization per day increased from 5100 to 7300 over the years. However, the number of cases was reduced, and the total cost of hospitalizations decreased from 3,000,000 in 2010–1,600,000 in 2020.

Among hospitalizations, 80.3 % regarded Italian patients, whereas the remaining were related to foreign patients, mainly from Africa (72.2 %). Patients were hospitalized up to 23 times, with an overall LOS of up to 398 days. The number of patients with repeated hospitalizations was 863 out of 2091 (41.3 %) in Italians and 201 out of 635 (31.6 %) in foreigners, with a statistically significant difference ($p < 0.01$). According to overall hospitalizations, 71.6 % were males, with a sex ratio of 3.2 in Italians, 1.1 in foreign patients, and 0.8 in Africans. The age distribution of Italian and non-Italian patients by sex and Italian or non-Italian status is shown in [Fig. 1 of the Supplemental materials](#).

The percentage of foreign patients increased from 14 % in 2010 to 21 % in 2021, with a peak of 25.3 % in 2016. A total of 1041 admissions of foreign patients were recorded among them: 72.0 % were Africans, 26.0 % were Eastern Europeans, 11.0 % were Asians, and 5.0 % were Americans. Most Africans came from Ghana, Nigeria, and Ivory Coast ([Fig. 2, Supplemental materials](#)). Hospitalizations related to AIDS-associated diseases were 19.0 %. The most common were tuberculosis, *Pneumocystis pneumonia*, and wasting syndrome ([Fig. 3; Supplemental materials](#)). Most hospital admissions were related to non-AIDS conditions, of both infectious and non-infectious etiologies, and the most common were respiratory diseases, liver cirrhosis, and cardiovascular and kidney diseases.

The overall median LOS was 9 days (IQR 5–18); hospital admissions of patients with AIDS-related disease showed a longer duration (18 days IQR 8–33) than that of patients with a non-AIDS disease diagnosis ($p < 0.001$). The overall in-hospital mortality rate was 6.0 %, with a doubling in the last 10 years ([Fig. 4, Supplemental materials](#)), without statistical difference between Italian and not Italian patients. The univariate analysis of the associations between in-hospital mortality and age, male sex, LOS, and different diseases is shown in [Tables 1–3](#). [Table 4](#) shows the results of logistic regression analysis.

[Table 5](#) shows the characteristics of African patient admissions. Comparison of the features of Africans and non-Africans showed a significant association between being an African native and the diagnosis of tuberculosis, toxoplasmosis, Burkitt lymphoma, and

hepatitis B. Liver cirrhosis and cancer showed a low association in comparison with non-African patients. Africans had a higher risk of hospitalization for AIDS-related diseases and childbirth ([Table 6](#)). The percentage of deaths from African admissions was 6.9 %, without a statistically significant difference compared to non-Africans.

Discussion

The demographic characteristics and related diseases of 5281 hospitalized PLWHs are shown in our study. The hospitalizations of foreign patients were regarded mainly as Africans, usually immigrants, with an average age significantly lower than that of Italians, especially in females; furthermore, the ratio of female patients was higher. This is likely due to the difference in risk factors in Africans, such as the congenital acquisition of HIV infection caused by a lack of cure in the native country, sexual abuse during desperate journeys, especially in Libya, and sex work in Africa. A higher percentage of incidence of HIV infection in female patients in Eastern, Southern, Western, and Central Africa than in the other countries was also shown in UNAIDS data, conforming with our data about the difference in the sex ratio [10]. Furthermore, different percentages of risk factors were reported. In Africa, heterosexual transmission was the main one, and sex work is one of the main risk factors, while in developed countries, transmission through homosexual intercourse is the most represented [10].

The number of African hospitalizations has increased over the years in association with increased migration. Most migrant landings occurred in Sicily, with a peak in 2016, which reflects the rise in hospitalizations of foreign patients observed in our study [11]. Most migrants came from sub-Saharan Africa (Ghana, Nigeria, and the Ivory Coast) and had long journeys, the crossing of which was only the last stage. The main route crossed by migrants from West Africa passes through Niger and Libya and then arrives in Italy through the Sicily Channel ([Fig. 5, Supplemental materials](#)) [12]. However, the total number of hospitalizations has reduced over the years, reflecting the Italian trend, while the percentage of deaths has doubled [4]. This can be explained by the tendency to admit only more severely ill patients in recent years. The COVID-19 pandemic further reduced the number of hospitalizations for non-COVID-19 pathologies by 2021. HIV infection is diagnosed at an advanced stage in migrant populations owing to various psychological and bureaucratic barriers that delay HIV testing and antiretroviral therapy administration [13]. The admissions of Italian patients were more frequently related to non-AIDS-defining diseases, and the number of rehospitalizations was significantly greater than that of foreign patients. Hospitalized Italian PLWHs are usually older patients with more comorbidities in confronting to the African population. Our statistical analysis showed a significant association between African

Table 2
AIDS-related diseases according to in-hospital mortality in univariate analysis.

AIDS-related diseases	All hospitalizations (N = 5281)	Vital status at discharge		p
		Alive (N = 4966)	Dead (N = 315)	
All	1006 (19.0 %)	906 (18.2 %)	100 (32.0 %)	< 0.01
Tuberculosis	208 (3.9 %)	192 (3.9 %)	16 (5.1 %)	0.28
Pneumocystis pneumonia	205 (3.8 %)	190 (3.8 %)	15 (4.8 %)	0.40
Wasting Syndrome	172 (3.2 %)	135 (2.7 %)	37 (11.7 %)	< 0.01
Lymphomas ^a	165 (3.1 %)	148 (3.0 %)	17 (5.4 %)	0.02
Cytomegalovirus infection	151 (2.8 %)	138 (2.8 %)	13 (4.1 %)	0.16
Candida Esophagitis	125 (2.4 %)	118 (2.4 %)	7 (2.2 %)	0.86
Kaposi's sarcomas	103 (1.9 %)	89 (1.8 %)	14 (4.4 %)	< 0.01
PML	93 (1.8 %)	80 (1.6 %)	13 (4.1 %)	< 0.01
Toxoplasmosis	90 (1.7 %)	81 (1.6 %)	9 (2.8 %)	0.10
Atypical mycobacterial infection	41 (0.8 %)	39 (0.8 %)	2 (0.6 %)	0.77
Cryptococcosis	37 (0.7 %)	31 (0.6 %)	6 (1.9 %)	0.01
Burkitt lymphomas	25 (0.5 %)	22 (0.4 %)	3 (0.9 %)	0.20
Cervical cancer	17 (0.3 %)	16 (0.4 %)	1 (0.3 %)	0.99
Herpes simplex infection	17 (0.3 %)	16 (0.4 %)	1 (0.3 %)	0.99
Cryptosporidiosis	12 (0.2 %)	11 (0.2 %)	1 (0.3 %)	0.73

^a All lymphomas, including non-AIDS-defined lymphomas, were included.

native country patients hospitalized for AIDS-related diseases and a high risk of tuberculosis, toxoplasmosis, atypical mycobacterial infection, Burkitt lymphoma, HBV, malaria, septic shock, and nephropathy. Liver cirrhosis and cancer were inversely associated with African patients, probably due to their younger age.

According to Ford et al. [8], in a meta-analysis that included studies reporting the cause of hospital admission of PLWHs in 2007, malnutrition, wasting syndrome, parasitic infections (primarily malaria), and hematological disorders were more common in the African region, where the highest mortality was reported. In our study, the mortality rate for African patients was 6.9 % of African admissions, marginally higher than that of other nationality patients, but non-statistical significance in univariate analysis was observed. In our study, wasting syndrome and lymphomas were the principal diseases reported in patients who died of AIDS-related disorders and respiratory and cardiovascular diseases in non-AIDS patients. In Africans, wasting syndrome (15.1 % of deaths among

Africans) and tuberculosis (11.5 %) were the principal AIDS-related diseases, and respiratory illnesses (30.8 %) and sepsis (11.5 %) were non-AIDS-related diseases.

According to our analysis, wasting syndrome and respiratory diseases increased the risk of in-hospital death by more than five times. The high risk of mortality associated with wasting syndrome is probably because this diagnosis can undermine undiagnosed pathologies, which, therefore, are uncured, leading to the death of a patient, such as a histoplasmosis or other less common infections in our geographical area that are difficult to diagnose. Wasting syndrome is a predictor of in-hospital mortality, but the data can be overexpressed because of misdiagnosed conditions.

The multivariable analysis highlighted other mortality-related diseases, such as Kaposi's sarcoma, progressive multifocal leukoencephalopathy (PML), cryptococcosis, abscesses, sepsis, cardiovascular disease, and nephropathy.

Table 3
Univariate analysis of non-AIDS-related diseases according to in-hospital mortality.

Non-AIDS-related diseases	All hospitalizations (N = 5281)	Vital status at discharge		p
		Alive (N = 4966)	Dead (N = 315)	
Pneumonia	706 (13.4 %)	636 (12.8 %)	70 (22.2 %)	< 0.01
Hepatitis C	661 (12.5 %)	636 (12.8 %)	25 (8.0 %)	0.01
Cirrhosis	469 (8.9 %)	433 (8.7 %)	36 (11.4 %)	0.10
Respiratory disease (except pneumonia)	454 (8.6 %)	364 (7.3 %)	90 (28.5 %)	< 0.01
Cardiovascular disease	442 (8.36 %)	392 (7.9 %)	50 (15.9 %)	< 0.01
Nephropathy (except pyelonephritis)	388 (7.3 %)	345 (6.9 %)	43 (13.6 %)	< 0.01
Cancers (all)	316 (6.0 %)	298 (6.0 %)	18 (5.7 %)	0.83
Diabetes	277 (5.2 %)	258 (5.2 %)	19 (6.0 %)	0.52
Cystitis	145 (2.7 %)	145 (2.9 %)	0 (0.0 %)	< 0.01
Sepsis	139 (2.6 %)	108 (2.2 %)	31 (9.8 %)	< 0.01
Childbirth	117 (2.2 %)	117 (2.3 %)	0 (0.0 %)	< 0.01
Hepatitis B	114 (2.1 %)	112 (2.2 %)	2 (0.6 %)	0.05
Syphilis	112 (2.1 %)	109 (2.2 %)	3 (0.9 %)	0.14
Enteritis	112 (2.1 %)	111 (2.2 %)	1 (0.3 %)	0.02
Leishmaniasis	101 (1.9 %)	97 (1.9 %)	4 (1.3 %)	0.39
Staphylococcal infection	86 (1.6 %)	77 (1.5 %)	9 (2.8 %)	0.08
Zoster disease	59 (1.1 %)	59 (1.2 %)	0 (0.0 %)	0.05
Abscesses	52 (1.0 %)	45 (0.9 %)	7 (2.2 %)	0.02
Pseudomonas infection	46 (0.9 %)	45 (0.9 %)	1 (0.3 %)	0.28
Hodgkin lymphomas	39 (0.7 %)	35 (0.7 %)	4 (1.3 %)	0.26
Influenza	30 (0.6 %)	28 (0.6 %)	2 (0.6 %)	0.87
Endocarditis	22 (0.4 %)	21 (0.4 %)	1 (0.3 %)	0.78
Rectal and anal cancer	22 (0.4 %)	21 (0.4 %)	1 (0.3 %)	0.78
Hepatitis A	18 (0.3 %)	18 (0.4 %)	0 (0.0 %)	0.28
Pyelonephritis	12 (0.2 %)	12 (0.2 %)	0 (0.0 %)	0.38
Salmonella infection	9 (0.2 %)	8 (0.2 %)	1 (0.3 %)	0.51
Malaria	6 (0.1 %)	6 (0.1 %)	0 (0.0 %)	0.54

Table 4
Multivariable analysis of mortality upon admission in PLWHs.

Variables	Beta	S.E.	COR (95% C.I.)	AOR (95% C.I.)	p
Wasting syndrome	1.77	0.208	4.76 (3.25–6.99)	5.87 (3.91–8.83)	< 0.001
Lymphomas (all)	1.07	0.277	1.86 (1.11–3.11)	2.92 (1.70–5.03)	< 0.001
Kaposi's sarcomas	1.00	0.318	2.55 (1.43–4.53)	2.74 (1.47–5.10)	0.001
PML	1.26	0.325	2.63 (1.45–4.78)	3.52 (1.86–6.67)	< 0.001
Cryptococcosis	1.01	0.478	3.10 (1.28–7.46)	2.76 (1.08–7.04)	0.034
Hepatitis C	-0.32	0.221	0.587 (0.39–0.89)	0.720 (0.47–1.11)	0.128
Abscesses	1.18	0.445	2.48 (1.11–5.56)	3.26 (1.36–7.80)	0.008
Sepsis	1.67	0.230	4.91 (3.24–7.45)	5.33 (3.40–8.37)	< 0.001
Pneumonia	0.49	0.153	1.94 (1.47–2.57)	1.64 (1.22–2.22)	0.001
Cardiovascular disease	0.91	0.175	2.20 (1.60–3.03)	2.51 (1.78–3.53)	< 0.001
Nephropathy (except pyelonephritis)	0.76	0.187	2.12 (1.51–2.98)	2.14 (1.48–3.09)	< 0.001
Respiratory diseases (not including pneumonia)	1.67	0.146	5.06 (3.87–6.60)	5.36 (4.03–7.12)	< 0.001
Intercept	-3.60				

Increasing average life expectancy due to the introduction of efficacious antiretroviral therapy has resulted in comorbidities that were previously not observed, probably associated with chronic inflammation due to HIV infection and the side effects of antiretroviral drugs [14]. Several longitudinal studies considered in a literature review have reported a reduction in AIDS-related causes of hospital admission and an increase in non-AIDS causes over the past 15 years as access to ART has improved, and analysis of the above causes could soon assume an important role [8]. Our study showed that most hospital admissions occurred for non-AIDS-related diseases, both infectious and non-infectious. AIDS-related diseases were present in 19.0 % of admissions, with the majority being tuberculosis, *Pneumocystis pneumonia*, and wasting syndrome. Similar data have been reported in the international literature, which reported tuberculosis, *Pneumocystis pneumonia*, and cerebral toxoplasmosis as among the leading causes of hospitalization for AIDS-related diseases, bacterial infections (pneumonia, bacteriemia, and diarrhea), respiratory disease, psychiatric disorders, cardiovascular disease, renal disorders, and liver disease [8]. In our study, cerebral toxoplasmosis was ranked ninth according to the incidence, and psychiatric disorders were not investigated.

The high prevalence of HCV infection and cirrhosis in our study suggests that screening for hepatitis C should be a priority for PLWHs admitted to hospitals, as shown in another Italian article [15].

According to data from the Italian "Istituto Superiore di Sanità" (ISS), *pneumocystis pneumonia*, *Candida esophagitis*, and wasting syndrome were Italy's most frequent initial AIDS-defining conditions between 2009 and 2020. Pulmonary tuberculosis and mycobacterial infections jointly represented 10.3% of AIDS-related diseases in Italy during the same period [4]. Italian ISS data do not specify the type of mycobacterial infection outside the category of pulmonary tuberculosis.

In our study, tuberculosis was the most frequent AIDS-related disease, with 208 hospitalizations (14 % of AIDS illnesses). Our research sheds light on the infectious and non-infectious factors that necessitate hospitalization in PLWHs. This information is absent in ISS reports, which only report the initial AIDS-defining conditions that allowed the case to be notified.

Table 5
General features and univariate analysis according to in-hospital mortality of African PLWHs according to hospital mortality.

Variables	All hospitalizations (N = 752)	Vital status at discharge		p
		Alive (N = 700)	Dead (N = 52)	
Sex				0.02
Male	344 (45.7 %)	312 (45.6%)	32 (61.5 %)	
Female	408 (54.2 %)	388 (55.4 %)	20 (38.5 %)	
Age (years) (mean ± SD)	36.9 ± 11.3	36.5 ± 11.2	41.6 ± 11.5	< 0.01
LOS (days) (median and IQR)	11 (IQR 5–24)	10 (IQR 5–23)	21 (IQR 8–38)	0.02
AIDS related disease	233 (31.0 %)	207 (29.6 %)	26 (50.0 %)	< 0.01

Table 6
Comparison of associated diseases and childbirth rates between African and non-African PLWHs using the chi-square test.

Variables	Admission African patients (N = 752)	Admission Non-African patients (N = 4529)	p
Mortality	52 (6.9 %)	263 (5.8 %)	0.23
AIDS-related diseases	233 (31.0 %)	873 (19.3 %)	< 0.01
Respiratory diseases	132 (17.5 %)	915 (20.2 %)	0.09
Tuberculosis	104 (13.8 %)	104 (2.3 %)	0.02
Nephropathy	74 (9.8 %)	314 (6.9 %)	< 0.01
Cardiovascular diseases	63 (8.4 %)	379 (8.4 %)	0.99
Hepatitis B	54 (7.2 %)	60 (1.3 %)	< 0.01
Childbirth ^a	53 (13.0 %)	63 (6.1 %)	< 0.01
Toxoplasmosis	34 (4.5 %)	56 (7.4 %)	< 0.01
Sepsis	29 (3.8 %)	110 (2.4 %)	0.02
Wasting syndrome	26 (3.4 %)	146 (3.2 %)	0.74
Atypical mycobacterial infection	11 (1.5 %)	30 (0.7 %)	< 0.01
Burkitt lymphoma	9 (1.2 %)	16 (0.3 %)	< 0.01
Hepatic cirrhosis	6 (0.8 %)	463 (10.2 %)	< 0.01
Malaria	5 (0.7 %)	1 (< 0.1 %)	< 0.01
Cancer	9 (1.2 %)	307 (6.8 %)	< 0.01

^a % Based on hospitalizations of female patients.

Childbirth was most frequently associated with hospitalization in African women. This is likely because sometimes migrant women arrive pregnant in Italy, and, in some contexts, pregnant African women undergo fewer clinical checks during pregnancy.

Conclusion

Considering the lack of information about the causes of hospital admission in PLWHs in Italy and the international literature, our study adds important information on the topic.

Tuberculosis, *Pneumocystis pneumonia*, and wasting syndrome were the most frequent AIDS conditions associated with hospitalization, while respiratory disease, cirrhosis, cardiovascular diseases, and nephropathy were among the non-AIDS diseases.

Native Africans have a different prevalence of defining AIDS and non-AIDS pathologies and outcomes than Italians.

Over 70 % of hospitalizations of PLWHs are associated with non-AIDS diseases, and this percentage is destined to increase in consideration of lengthening of life because of the success of anti-retroviral therapy and in the setting of HIV infection, persistent chronic inflammation that typically characterizes immunological aging is a contributor to several comorbidities.

Limitations of the study

Laboratory examinations, CD4 + T cell counts, risk factors for HIV infection acquisition, such as sexual behavior, information about antiretroviral therapy, and prophylaxis were not available because the study was based on hospital discharge forms.

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CRediT authorship contribution statement

Luca Pipitò: Writing- Original draft preparation, Data curation, Statistical analysis. **Marcello Trizzino:** Supervision. **Claudia Gioè:** Supervision. **Manlio Tolomeo:** Supervision. **Paola Di Carlo:** Supervision. **Claudia Colomba:** Supervision. **Lidia Gibaldi:** Data curation. **Chiara Iaria:** Supervision. **Piero Almasio:** Methodology, Statistical analysis, Supervision. **Antonio Cascio:** Conceptualization, Methodology, Supervision, Writing- Reviewing and Editing.

Declaration of Competing Interest

We have no conflict of interest to declare.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at [doi:10.1016/j.jiph.2023.08.023](https://doi.org/10.1016/j.jiph.2023.08.023).

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