Epidemiological Profile and Clinical Outcomes of HIV-Associated Malignancies in Georgia: A Five-Year Retrospective Study

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Abstract

Background: HIV-associated malignancies remain a significant clinical and public health burden globally. Although antiretroviral therapy (ART) has reduced the incidence of AIDS-defining cancers (ADCs) , non-AIDS-defining cancers (NADCs) now constitute a growing proportion of cancers among people living with HIV (PLWH).
Methods: To characterize the epidemiology, cancer spectrum, immunologic profiles, and mortality outcomes of malignancies among PLWH in Georgia over a five-year period Methods: A retrospective analysis of 1,945 newly registered PLWH between 2020 and 2025 was conducted at the T. Tsertsvadze Infectious Diseases, AIDS and Clinical Immunology Research Center, Tbilisi, Georgia (18). Demographic variables, cancer types, CD4 cell counts, ART status, and mortality were evaluated.
Results:A total of 44 malignancy cases (2.26%) were identified. ADCs accounted for 18 cases (41%), while NADCs comprised 26 cases (59%). The median CD4 cell count was significantly lower among patients with ADCs (158 cells/mm³) compared with those with NADCs (354 cells/mm³)(15,6). The overall mortality rate was 31.8%, with the highest mortality observed in patients with ADCs (37.5%) and in those with CD4 counts <200 cells/mm³ (50%) (10,3). .
Conclusions: The shift toward NADCs, substantial mortality, and strong association between CD4 count and malignancy underscore the urgent need for earlier HIV diagnosis , integrated HIV–oncology care, and implementation of structured cancer screening strategies for PLWH in Georgia (14,16,20). **(TCM-GMJ May 2026; 11 (1): P27-P31)**

Keywords: HIV, AIDS-defining cancers, Non-AIDS-defining cancers, CD4, Georgia.

Introduction

Malignancies remain a leading cause of morbidity and mortality among people living with HIV (PLWH) (7). Before the widespread use of combination antiretroviral therapy (ART), AIDS-defining cancers (ADCs) including Kaposi sarcoma, non-Hodgkin lymphoma, and invasive cervical cancer were predominant (5). In the ART era, however, the epidemiological paradigm has shifted: with non-AIDS-defining cancers (NADCs) now comprising the majority of cancer diagnoses among PLWH. This transition is driven by increased life expectancy, chronic immune activation, oncogenic viral co-infections (e.g., human papillomavirus, Epstein–Barr virus, hepatitis B and C viruses), and behavioral risk factors such as tobacco use and alcohol consumption (2,14,15).

Globally, PLWH have a 2–4-fold higher overall risk of developing cancer compared to the general population[8]. The distribution of cancer types varies by region reflecting differences by HIV prevalence, ART coverage, screening programs, and access to oncologic care. In Eastern Europe, including Georgia, national-level data on malignancy patterns among PLWH remain limited, creating critical gaps in evidence to inform prevention strategies, screening policies and integrated clinical management of PLWH (18).

This study presents a five-year retrospective analysis of malignancy incidence among PLWH in Georgia, extending regional data and incorporating detailed immunologic and survival indicators(11,13). To our knowledge, our study represents the most comprehensive evaluation of HIV-associated cancer burden in our country to date.

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Methods

This study was reviewed and approved by the Institutional Review Board T. Tsertsvadze Infectious Diseases, AIDS and Clinical Immunology Research Center. The requirement for informed consent was waived because of the retrospective nature of the study[17]. A retrospective chart review was conducted among 1,945 individuals diagnosed with HIV at our center between June 2020 and June 2025 (18). Patients with recurrent malignancies, secondary cancers, or insufficient diagnostic documentation were excluded from the analysis.

Demographic, clinical, and laboratory variables were extracted from electronic medical records, including date of HIV diagnosis, date of malignancy confirmation, sex, ART history, viral load status, CD4 cell count at the time of cancer diagnosis, pathological classification of malignancies, oncologic treatment information, and mortality outcomes (10,14). The date of HIV diagnosis was defined as the date of laboratory confirmation of HIV infection, while the diagnosis of malignancy was defined as the date of pathological verification. Follow-up extended until death from any cause or the last documented medical visit within the study period.

ADCs were classified according to the Centers for Disease Control and Prevention criteria and included non-Hodgkin lymphoma, Kaposi sarcoma, and invasive cervical cancer (3). All other malignancies, including gastrointestinal, breast, lung, thyroid, urogenital, brain tumors, melanoma, and Hodgkin lymphoma, were categorized as NADCs (14).

Statistical analysis was descriptive and performed in accordance with the standards for retrospective epidemiological studies. Frequencies, percentages, medians, and interquartile ranges were calculated to summarize demographic and clinical characteristics. Comparisons between ADC and NADC groups were performed using nonparametric tests for continuous variables and exact probability tests for categorical variables (6,15). Overall mortality was assessed as the proportion of patients who died during the observation period. Due to the limited sample size, multivariate regression analyses were not preformed; however, CD4 level groups (<200 cells/mm³ vs ≥200 cells/mm³) were assessed to evaluate the impact of immunologic status on mortality (1,4). Statistical significance was defined as $p < 0.05$.

Results and discussion

A total of 44 PLWH were diagnosed with malignant diseases during the study period. Of those, 18 patients (40.9%) had ADCs, whereas 26 patients (59.1%) were diagnosed with NADCs. Male patients predominated in both groups, reflecting the overall sex distribution of the cohort. NADCs were more frequently observed in older individuals, whereas ADCs tended to occur in comparatively younger patients. The median age at cancer diagnosis for the overall cohort was 46.5 years (IQR: 38.8-57.0). Patients with NADCs had higher median CD4+ T-cell counts at cancer diagnosis (354 cells/mm³) compared with those with ADCs (158 cells/mm³). HIV viral suppression (HIV RNA <50 copies/mL) was documented in 26 patients (59.1%), while remaining patients had detectable viremia at the time of malignancy diagnosis.

Regarding lifestyle factors, 56.8% of the cohort reported a history of tobacco use, and 27.3% reported alcohol consumption. HIV acquisition risk factors included heterosexual transmission in 35 patients (79.5%) and homosexual transmission in 9 patients (20.5%). ART exposure prior to cancer diagnosis differed markedly between groups: 35 patients (79.5%) were receiving antiretroviral therapy at the time of the malignancy diagnosis, whereas 9 (20.5%) were ART-naïve. All ART-naïve patients-initiated therapy following the diagnosis of malignancy (Table 1).

Among ADCs, non-Hodgkin lymphoma was the most common diagnosis (n=8), followed by Kaposi sarcoma (n=7) and invasive cervical cancer (n=3). Among NADCs, gastrointestinal malignancies constituted the largest category (n = 8), followed by Hodgkin lymphoma (n=5), breast cancer (n=4), lung cancer (n=3), urogenital cancers (n=2), brain tumors (n=2), thyroid carcinoma (n=1), and melanoma (n=1). The distribution of cancer types is detailed in Table 2.

The overall mortality rate among patient with malignancies was 31.8%, which was significantly higher than the mortality observed in the overall cohort of PLWH (7.4%; $p < 0.0001$). Mortality was higher among patients with ADCs (37.5%) than among those with NADCs (28.6%) (OR = 1.5; 95% CI: 0.41-5.53). Patients with advanced immunosuppression (CD4 <200 cells/mm³) has a significantly higher mortality rate (50%) compared with those with CD4 ≥200 cells/mm³ (33%) (OR = 1.8; 95% CI: 0.5-6.4). No deaths were attributed to causes other than malignant disease progression or AIDS-related complications during the available follow-up period (Table 3).

This study demonstrated significant epidemiologic transitions in the pattern of HIV-associated malignancy in Georgia consistent with global trends in the ART era (6,15,20), NADCs account for the majority of malignancies (59%). Gastrointestinal cancers emerged as the most common NADC, followed by Hodgkin lymphoma and breast cancer—findings that are consistent with reports from European HIV–oncology registries.

The markedly lower median CD4 cell count observed among ADCs reinforces the well-established association between profound immunodeficiency and the development of opportunistic neoplasms (4,5,14). However, the occurrence of NADCs at relatively preserved CD4 cell levels suggests that oncogenic risk persists even in the setting of viral suppression. This finding supports prior evidence implicating chronic immune activation, residual immune dysregulation, and oncogenic viral co-infections as key pathogenic mechanisms (12,15). The mortality burden observed in this cohort was substantial. A 50% mortality rate in individuals with CD4 <200 cells/mm³ underscores the importance of early HIV diagnosis and immediate ART initiation. ADC cases also exhibited higher mortality (37.5%) compared with NADCs (28.6%), mirroring international data where immunosuppression severity directly influences survival outcomes. Public health implications of these findings highlight the urgent need for a more tai-

lored and integrated national approach to cancer prevention among PLWH. Establishing dedicated cancer screening guidelines for PLWH would allow earlier detection of both AIDS-defining and non–AIDS-defining malignancies, particularly given the shifting cancer landscape in the ART era. Strengthening collaboration between oncology and HIV care pathways is essential to ensure timely referral, coordinated management, and continuity of treatment. Expanding HPV vaccination programs among adolescents and high-risk adults could significantly reduce the future burden of cervical and other HPV-related cancers in this population. Equally important is enhancing clinician awareness and training to improve early recognition of cancer-related symptoms, especially in patients with advanced immunosuppression, where delays in diagnosis can be fatal (12). Collectively, these measures underscore the broader public health priority of integrating cancer prevention strategies into routine HIV care at the national level (1).

This retrospective analysis provides an important epidemiologic snapshot of malignancy patterns among PLWH in a contemporary treatment era(14,15). Although the overall proportion of NADCs exceeded that of ADCs, the clinical profile of patients within each category demonstrated marked differences in immunologic status, ART exposure, and virologic control (5,6,15). Patients with ADCs consistently exhibited more profound immunosuppression, lower median CD4+ T-cell counts, and substantially higher rates of detectable viremia, underscoring the continued role of impaired cellular immunity in the development of traditional HIV-associated cancers such as Kaposi sarcoma and non-Hodgkin lymphoma (3,4,14).

In contrast, NADCs in this cohort reflected the growing shift toward malignancies increasingly observed in the general aging population, including gastrointestinal, breast, lung, and thyroid cancers(1,2). The predominance of NADCs among older PLWH reinforces the dual influence of HIV-related chronic inflammation and age-related oncogenic processes (1,9,15). Importantly, the majority of patients in the NADC group had achieved viral suppression and sustained ART exposure before their cancer diagnosis, suggesting that long-term survival with HIV—rather than uncontrolled infection—may be the primary factor shaping cancer epidemiology in this subgroup (11,12).

Mortality patterns further illustrated the prognostic influence of immune status. Although overall mortality was 31.8%, deaths were more frequent among patients with ADCs, and those with CD4 counts below 200 cells/mm³ faced a disproportionately high risk of adverse outcomes (4,10). These findings emphasize the importance of early HIV diagnosis, timely ART initiation, and continuous immunologic monitoring to prevent progression to severe immunosuppression—conditions that predispose individuals to both opportunistic malignancies and poorer cancer-related survival (4,14,17).

Conclusion

Taken together, this study highlights the evolving landscape of malignancy in PLWH and underscores the necessity of integrated oncologic and HIV care. Strengthening routine cancer screening, prioritizing early recognition of malignancy-related symptoms, and maintaining sustained viral suppression are critical steps toward improving outcomes. Future research with larger multicenter cohorts is warranted to further explore the impact of immune restoration, ART duration, and comorbidity burden on cancer risk and survival among PLWH. Despite the inherent limitations of this retrospective, single-center studies, our findings provide valuable insights into the shifting patterns of malignancy in the HIV population and underline the ongoing importance of comprehensive, multidisciplinary management.

TABLE 1. Clinical characteristics of patients diagnosed with malignant diseases (N=44)

Variable	ADC (n=18)	NADC (n=26)
Sex, n (%)		
Male	12 (66.7%)	18 (69.2%)
Female	6 (33.3%)	8 (30.8%)
Median age at cancer diagnosis, years	43	49
Smoking history, n (%)		
Yes	10 (55.6%)	15 (57.7%)
No	8 (44.4%)	11 (42.3%)
Alcohol consumption, n (%)		
Yes	5 (27.8%)	7 (26.9%)
No	13 (72.2%)	19 (73.1%)
HIV transmission route, n (%)		
Heterosexual	14 (77.8%)	21 (80.8%)
Homosexual (MSM)	4 (22.2%)	5 (19.2%)
ART before malignancy, n (%)		
Yes	12 (66.7%)	23 (88.5%)
No	6 (33.3%)	3 (11.5%)
CD4+ count (median, cells/mm³)	158	354
HIV RNA, n (%)		
<50 copies/mL	7 (38.9%)	19 (73.1%)
≥50 copies/mL	11 (61.1%)	7 (26.9%)
Mortality, n (%)	6 (37.5%)	7 (28.6%)

TABLE 2. Distribution of malignancy types among PLWH

Malignancy Category	Subtype Number of Cases (n)
AIDS-defining cancers (ADCs)	
Non-Hodgkin lymphoma	8
Kaposi sarcoma	7
Invasive cervical cancer	3
Non–AIDS-defining cancers (NADCs)	
Gastrointestinal cancers	8
Hodgkin lymphoma	5
Breast cancer	4
Lung cancer	3
Urogenital cancers	2
Brain tumors	2
Thyroid carcinoma	1
Melanoma	1

TABLE 3. Mortality rates among PLWH with malignant diseases

Mortality Category	Number of Deaths (n)	Mortality Rate (%)
Overall mortality	14	31.8%
ADC mortality	6	37.5%
NADC mortality	7	28.6%
Mortality with CD4 <200 cells/mm³	6	50.0%
Mortality with CD4 ≥200 cells/mm³	8	33.0%

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