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HIV AND CANCER: ARE THEY RELATED?

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ABSTRACT

Introduction: People living with HIV (PLHIV) are at higher risk of developing various types of cancer and viral infections compared to the general population. AIDS-defining cancers (ADC) include Kaposi's sarcoma, cervical cancer, and lymphoma. In addition to these three cancers, other types of cancer are considered non-AIDS-defining cancers (NADC). **Objective:** estimate the periode of time cancers after HIV diagnosis for small multicenter dataset. **Methods:** a descriptive observational method involved 23 respondents with HIV and cancer. **Results:** ADC included cervical cancer and lymphoma. NADC in this study includes, breast cancer, liver cancer, leukemia, brain cancer, nasopharyngeal cancer, colon cancer, and rectal cancer. The average time to cancer diagnosis after HIV was 2.73 years. The earliest time to cancer symptoms in HIV was 0.6 years, and the longest time was 14.6 years. The interval between HIV diagnosis and cancer onset is influenced by decreased CD4 counts, age, opportunistic infections, genetic history of cancer, and cancer type. **Conclusions:** The progressive decline in CD4 counts can lead to a decline in the immune system, even at the cellular level, or immunocompromised. Severe immune system impairment increases the risk cancers associated with immunodeficiency. It is important to have self-awareness about early cervical cancer screening for HIV-positive women and regulations that integrate cancer screening services into HIV service units.

Keywords

HIV, cancer, ADC, NADC

INTRODUCTION

HIV-AIDS complications in people living with HIV (PLHIV), such as recurrent opportunistic infections, are decreasing, but the incidence of non-AIDS-defining cancers (NADC) more increasing. HIV-related morbidity is higher in cancer cases (Suarez et al., 2023; Lim & Levine, 2005). Cancers in HIV are characterized by more aggressive cell growth with higher lesion rates, more advanced stages, and shorter survival compared to cancers in the general population (Souza, Sym, & Chehter, 2023).

The most common cancer cases are lung cancer, Hodgkin's lymphoma, anal cancer and liver cancer for NADC (Suarez et al., 2023; Simard et al., 2011). NADC are

neoplasms that appear after HIV diagnosis. NADC is a different cancer from AIDS-defining cancers (ADC) such as Kaposi's sarcoma and non-Hodgkin's lymphoma. NADC include Hodgkin's, anal, lung, liver, non-melanoma skin cancers (including basal cell and squamous cell carcinomas), and prostate cancer (Chiao et al., 2021). Even solid cancers can occur in patients with well-controlled HIV infection (Bonnet et al, 2004).

PLHIV taking medicine antiretroviral therapy (ART) have an increased risk of NADC. However, the mechanisms underlying the development and progression of specific NADC remain unclear. HIV transactivation response RNA elements in HIV-infected T cell exosomes are responsible for triggering cancer cell proliferation and inducing the expression of proto-oncogenes and inducible genes from HIV-infected T cells that promote NADC growth and progression (Chen et al., 2018). Low CD4 counts are also important prognostic factors, followed by hepatitis virus infection, and HIV transmission through heterosexual contact or injection drug use by injecting drug users (IDUs). These factors vary across countries and regions, and over time (Engels et al., 2024).

Despite increasing global data on HIV-associated malignancies, little is known about cancer onset patterns and distribution among PLHIV in Indonesia, especially regarding the periode of time from HIV diagnosis to cancer occurrence. The study's novelty includes describing both ADC and NADC in a small multicenter dataset, reporting time-to-cancer among PLHIV, analyzing CD4, comorbidities, ART adherence.

NURSING THEORY

Various conceptual models of treatment which has been developed by the experts, one of them is Self Care Deficit by Dorothea Orem. Principal focus from this conceptual model is ability of someone to take care of his self, self-supportingly causing is reached ability to maintain its (the health and prosperity). This theory also is a base for nurse in self-supporting of client according to level of its (do not place client in dependent position). (Orem, DE., 1980).

PLHIV are patient vulnerability, early screening, symptom recognition, adherence behavior. Nursing theory was fits topic for PLHIV is Self-Care Theory by Doroti Orem. Guided by Orem's Self-Care Theory, cancer risk among PLHIV can be understood in relation to self-care behaviors such as ART adherence, screening participation, and management of comorbidities.

METHOD

The study is descriptive observational. This study describes the relationship between HIV disease and the incidence of cancer in PLHIV. The study was approved by Wahidin Sudirohusodo Mojokerto Hospital and Dharmais Cancer hospital research ethics committee.

The instrument was distributed in 9 hospitals and the researchers were assisted by a team. Instrument filled and data verified by nurse or research assistant. Respondents from 9 hospitals selected with purposive sampling. Sample criteria include are patients who have been diagnosed with HIV and have undergone further treatment at the HIV clinic and also have cancer or have been diagnosed with cancer while undergoing HIV treatment.

The study was conducted at the Hospital in August 2025 - November 2025 use retrospective chart review. The total sample was 23 respondents. Limitation this study is sample size extremely small, inconsistent medical record quality, and heterogeneous hospital sources.

The variables are 1) age (in years), 2) CD4 count, 3) gender, 4) adherence to ART, 5) opportunistic infections, 6) genetic history of cancer in the family, 7) type of cancer, 8) The periode of time for cancer occurring after HIV (in years). The instrument uses an observation sheet. Data analysis uses frequency distribution.

Table 1. observation sheet

Respondents	assessment results

Respondent code:	(Last 3 digits of medical record number)
Age :	(year)
Date of HIV Diagnosis	(If there is no data regarding HIV testing, you can enter the initial date of hospital admission)
CD4 count (cells /µL)	(date-month-year)
Adherence for ART	use or routine of taking ART drugs adherence or not adherence
opportunistic infections	There isn't any. If present, specify type ....
Date of cancer diagnosis	(date-month-year)
Type of cancer	
Family history of cancer	There isn't any. If present, specify type ....

RESULTS

Table 2. Respondent characteristics by age

Vari a-ble	Mea n	Medi an	SD	Min - ma x	95% CI
age	38,1 3 year s	38 years	8,3 1	20 yea rs – 54 yea rs	34,73 - 41,53 years

Based on table 2, the youngest respondent was 20 years old, and one respondent was classified as pre-elderly 54 years old.

Table 3.Respondent characteristic by CD4

Vari a-ble	Mea n	Medi an	SD	Mi n – ma x	95% CI
CD4	304, 83 sel /µL	294 sel /µL	119, 40	56 - 58 2	256,0 3 – 353,6 2 sel /µL

Based on table 3, shows that all respondents had CD4 counts below normal.

Table 4. Respondent characteristics based on gender, ART adherence, opportunistic infections, genetic history of cancer and type of cancer

Data	N	%
Gender		
Female	14	60,87
Male	9	39,13
Adherence for ART		
adherence	12	52,17
not adherence	11	47,83
Opportunistic infections	13	56,52
no infection	4	17,40
Oral candidiasis	2	8,70
Hepatitis B	2	8,70
TBC	1	4,34
Diarrhea	1	4,34
Toxoplasma		
Family history of cancer	20	86,96
There isn't any.	3	13,04
There is		
Type of cancer :		
ADC		
Cervical cancer	7	30,43
Lymphoma	1	4,35
NADC		
Breast cancer	4	17,39
Hepatocellular	3	13,04
carcinoma	3	13,04
AML/ALL	2	8,70
(leukemia)	1	4,35
Nasopharyngeal	1	4,35
cancer	1	4,35
Brain cancer		
Colon cancer		
Rectal cancer		

Based on gender, the risk of cancer is greater in HIV-positive women than in HIV-positive men (table 4). The 52% ART adherence rate indicates a high level of non-adherence among PLHIV. Data opportunistic infections in table 4 shows that

the majority of respondents (56%) did not have any comorbidities or opportunistic infections. The most common opportunistic infections were oral candidiasis (17.4%), hepatitis B, and tuberculosis (8.7% each).

Table 4 shows a genetic history of cancer among 13 respondents, and most (87%) had no family history of cancer. ADC included cervical cancer and lymphoma. Cervical cancer was the dominant cancer type in 30% of cases. The percentages NADC below ADC. NADC such as breast cancer, liver cancer, leukemia, and lymphoma. Other types of cancers include brain cancer, nasopharyngeal cancer, colon cancer, and rectal cancer.

Table 5. Respondent characteristics based on periode of time (years) from HIV diagnosis to cancer diagnosis

Variable	Mean	Median	SD	Min - max	95% CI
periode of time from HIV to cancer	2,73 years	1,51 years	3,06 years	0,59-14,58 years	1,41-4.06 years

Based on Table 5 above, it was found that the average cancer diagnosis occurring after HIV diagnosis was 2.73 years with a standard deviation of 3.06 years, indicating a large range of variation each respondent. The confidence interval of 1.41-4.06 years means a high time difference between respondents. More than half of respondents experienced cancer symptoms within 1–3 years after HIV diagnosis. However, three respondents experienced a very longtime interval, or more than 10 years, showing signs of neoplasm after HIV diagnosis.

DISCUSSION

Elderly individuals should initiate treatment early in the progression of HIV disease because the potential for immune recovery and the rate of recovery decline with age. Targeted HIV testing and care linkage remain crucial for this patient population, which tends to initiate treatment at lower CD4+ cell counts (Means et al., 2016).

Normal CD4 counts range between 1000-1500 cells/µL (Taylor, et al, 1989; Cooper, E. & Lacey, 1988). Decrease the average CD4 count is correlated with opportunistic infections and various other diseases such as cancer (Chiao, et al, 2021; Simard, 2011).

HIV-positive women are at greater risk of cervical cancer because they are easily infected with the Human Papilloma Virus (HPV) (Agaba, et al, 2024). Nursing implications are self-awareness is important for early cervical cancer screening in HIV-positive women. It is necessary to integrate cancer screening services into HIV service units.

Anti retroviral therapy (ART) can suppress viral load and reduce the risk of cervical cancer for women living with HIV (Lewis et al., 2022). Early identification and treatment of HIV are crucial for HIV patients (Ashindoitiang et al., 2024). ART restore immune function, reduce opportunistic infections, lower viral load, reduce morbidity and mortality associated with AIDS-related complications, and increase life expectancy. Non-adherence for ART will decrease CD4 counts, accelerate the progression of HIV to AIDS, increase the risk of opportunistic infections and increase the risk of cancer.

Other opportunistic infections that also occurred at smaller rates were diarrhea and toxoplasma. HIV-AIDS decreased severe immune cells causing opportunistic infections and increasing the risk of cancer (Quinn et al., 2015).

This is consistent with research findings that genetic factors remain the primary trigger for cancer (Parrish, 2025). Respondents without a genetic history of cancer, several factors may contribute to the cancer, including delayed cancer diagnosis, advanced stage cancer at the time of diagnosis, more aggressive cancer, and a higher incidence of comorbidities in PLHIV, such as hepatitis (Souza, Sym, & Chehter, 2023).

ADC such as Kaposi's sarcoma, cervical cancer, and non-Hodgkin's lymphoma (Beumer, 2014; Lim & Levine, 2005). In this study, ADC was the most common in cervical cancer cases. HIV substantially exacerbates the carcinogenicity of Human Papillomavirus (HPV) and increases the risk of cervical cancer. Research findings revealed a 24.9% incidence of cervical cancer in women living with HIV, with the highest age being between 35-54 years. The risk of cervical cancer in women living with HIV aged <34 years and >54 years was 12%. Whereas, aged between 34-54 years have an 86% risk cervical cancer (Ibrahim Khalil, 2022).

NADC include anal cancer, lung cancer, liver cancer, non-melanoma skin cancer (including basal cell and squamous cell carcinoma), and prostate cancer. PLHIV have a 79% higher risk of death from NADC compared to the general population, especially for viral cancers and among women and at younger ages (Suarez et al., 2023).

The risk of NADC is increased by HIV-related immune suppression. Other factors include HPV infection, hepatitis B and C, and lifestyle factors such as tobacco and alcohol use (Lim & Levine, 2005). Rectal and breast cancers are also found in HIV-AIDS (Ashindoitiang, et al, 2024). This research has shown that leukemia and Kaposi's sarcoma are also associated with advanced immunodeficiency (Bonnet et al. 2004).

NADC will continue to be a major clinical issue as the global population ages. This is further compounded by the presentation of multiple NADC (breast and anal cancers) in PLHIV, placing a further burden on patients' health. PLHIV with a good performance status should be offered guidelinebased cancer treatments (Ashindoitiang, et al, 2024).

Cancer in HIV is characterized by more aggressive cells with higher levels of lesions, more severe stage, and lower life expectancy, compared with cancers in the general population. NADC are not limited to Kaposi's sarcoma, cervical cancer, and lymphomas but also carcinoma of the skin, testicular cancer, squamous cell cancers of the mouth, head, and neck, including nasopharyngeal cancer, and lung cancer (Chiao et al., 2021). The biggest obstacle to managing the health of HIV patients with a cancer diagnosis is the potential interaction of ART drugs with antineoplastic drugs or chemotherapy (Chiao et al., 2021; Dunne et al., 2022). As HIV/AIDS is increasingly treated as a chronic disease, greater attention needs to be focused on cancer screening and prevention (Simard et al., 2011).

PLHIV are patient vulnerability, early screening, symptom recognition, adherence behavior. Nursing theory was fits topic for PLHIV is Self-Care Theory by Doroti Orem. Guided by Orem's Self-Care Theory, cancer risk among PLHIV can be understood in relation to self-care behaviors such as ART adherence, screening participation, and management of comorbidities. Nursing implications include: importance of cancer screening integration in HIV clinics, education for ART adherence, early identification of symptoms by nurses, psychosocial support for PLHIV at risk.

CONCLUSIONS

The results of the study show that the types of cancer that are ADC included cervical cancer and lymphoma. Whereas, NADC consist of breast cancer, liver cancer, leukemia, brain cancer, nasopharyngeal cancer, colon cancer, and rectal cancer. The average time to cancer occurring after HIV was 2.73 years, with a standard deviation of 3.06 years, indicating large range of variation in each respondent. The confidence interval of 1.41-4.06 years means a high time difference between respondents. The earliest time to cancer symptoms in HIV was 0.6 years, and the longest time was 14.6 years. The interval between HIV diagnosis and cancer onset is influenced by severe immunodeficiency, as indicated by decreased CD4 counts, age, opportunistic infections, genetic history of cancer, and cancer type. It is important to have self-awareness about early cervical cancer

screening for HIV-positive women and regulations that integrate cancer screening services into HIV service units.

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