

# High Burden of Non-AIDS Defining Malignancies Among Adults with HIV in Thailand, 1996-2023



T Avihingsanon<sup>1</sup>, R. Indarodom<sup>1</sup>, P. Damtham<sup>1</sup>, F. Chiewbangyang<sup>1</sup>, WM. Han<sup>2</sup>, J. Sophonphan<sup>2</sup>, HS. Lwin<sup>2</sup>, A. Avihingsanon<sup>2</sup>, N. Parinyanitikul<sup>3</sup>

<sup>1</sup> Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand ; <sup>2</sup> HIV-NAT, Thai Red Cross AIDS Research Center, Bangkok, Bangkok, Thailand

<sup>3</sup> Division of Medical Oncology, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand

**Conclusions** : In this cohort of people with HIV, cancer risks—particularly those associated with oncogenic viruses—were elevated for both AIDS-defining cancers (e.g., cervical cancer) and non-AIDS-defining cancers (e.g., hepatocellular carcinoma). These findings highlight the urgent need for targeted cancer prevention and screening strategies, especially for older individuals, and those with advanced HIV disease. Addressing co-infections, such as hepatitis B and C, alongside routine cancer screenings, could significantly improve health outcomes in this vulnerable population.

## Introduction

- With the advent of highly effective combination antiretroviral therapy (ART) and the resulting increase in life expectancy, the primary causes of death among people with HIV (PWH) have shifted from AIDS-related cancers (ADM) to non-AIDS-defining malignancies (NADMs).
- However, there is limited information on the spectrum of NADMs among PWH in resource-limited settings.
- Such data is crucial for informing effective screening and treatment strategies in these regions.

## Methods

- We conducted a retrospective analysis using data from a long-term prospective cohort of adults with HIV (aged ≥18 years) who had no prior cancer diagnosis before initiating ART, enrolled at HIV-NAT, Thai Red Cross AIDS Research Centre, Thailand, from June 1, 1996, to December 31, 2023.
- Non-Hodgkin lymphoma, cervical cancer and Kaposi sarcoma were defined as ADM
- We calculated the crude incidence rate and age-standardized incidence rate (ASR) of cancer.
- Cox regression was employed to identify risk factors associated with cancer, reporting hazard ratios (HR) and adjusted hazard ratios (aHR). Variables with a p-value <0.1 in univariate analysis were included in multivariate models.

## Results

**Table 1. Baseline Demographics at time of ART initiation**

	Total N= 3,178	No N=3,085	Cancer N=93	P-value
Age (years), median (IQR)	31.5 (26.6-37.8)	31.4 (26.5-37.5)	36.6 (32.2-43.9)	<0.001
Female, n (%)	939 (29.6)	900 (29.2)	39 (41.9)	0.008
BMI (kg/m <sup>2</sup> ), median (IQR)	21.5 (19.5-23.8)	21.5 (19.5-23.8)	21.5 (19.6-23.7)	0.76
CD4 cell count (cell/mm <sup>3</sup> ), median (IQR)	272 (166-400)	274 (168-401)	207 (126-327)	0.006
Log <sub>10</sub> HIV-RNA (copies/ml), median (IQR)	4.7 (4.1-5.1)	4.7 (4.1-5.1)	4.7 (4.4-5.1)	0.73
<b>CDC Classification, n (%)</b>				<0.001
- A	2058 (64.2)	2001 (64.9)	38 (40.9)	
- B	740 (23.1)	705 (22.8)	30 (30.2)	
- C	406 (12.7)	379 (12.3)	25 (26.9)	
ART first-line, n (%)				0.04
- NNRTI	433 (13.6)	429 (13.8)	6 (6.9)	
- PIs	2025 (63.7)	1989 (63.8)	53 (60.9)	
- INSTI	720 (22.7)	699 (22.4)	28 (32.2)	
<b>Underlying</b>				
Diabetes mellitus, n (%)	230 (7.2)	219 (7.10)	11 (11.8)	0.08
Hypertension, n (%)	419 (13.2)	395 (12.8)	24 (25.8)	<0.001
HCV, n (%)	390 (12.3)	374 (12.1)	16 (17.2)	0.14
HBV, n (%)	559 (17.6)	536 (17.4)	23 (24.7)	0.07
Smoking status, n (%)				0.62
- No	2,262 (71.2)	2,200 (71.3)	62 (67.7)	
- Ever	497 (15.6)	480 (15.6)	17 (18.3)	
- Currently	419 (13.2)	405 (13.1)	14 (15)	
Alcohol consumption, n (%)	865 (27.2)	844 (27.4)	21 (22.6)	0.31

- A total of 3,178 PWH (70.4% male, median age was 31.5 years) were included
- Median CD4 cell counts (IQR) was 272 (166-400) cells/mm<sup>3</sup>
- HBSAg positive in 17.6%, anti-HCV positive in 12.3%** (Table1.)

**Table3a. Risk factor associated with all cancer in PWH**

Factors	Univariate		Multivariate	
	HR (95%CI)	P-value	aHR (95%CI)	P-value
Age ≥ 35 years	2.77 (1.85-4.22)	<0.001	2.66 (1.75-4.03)	<0.001
Gender: male	1.09 (0.72-1.66)	0.67		
BMI ≥ 25 kg/m <sup>2</sup>	1.43 (0.74-2.78)	0.29		
CD4 cell count<350	1.63 (0.92-2.89)	0.09	1.39 (0.78-2.49)	0.257
CDC Classification: C	2.25 (1.42-3.56)	0.001	2.10 (1.30-3.39)	0.002
Diabetes mellitus	0.94 (0.50-1.76)	0.84		
Hypertension	1.10 (0.69-1.77)	0.69		
HCV	1.59 (0.92-2.72)	0.09	1.46 (0.85-3.39)	0.002
HBV	1.43 (0.89-2.30)	0.13		
Smoking	0.93 (0.61-1.45)	0.78		
Alcohol consumption	0.82 (0.50-1.34)	0.43		

- age >35 years (aHR 2.66; 95% CI 1.75-4.03, p < 0.001), CDC C classification (aHR 2.1; 95% CI 1.30-3.39, p=0.002) and HCV co-infection (aHR, 1.46, 95% CI 0.85-3.39; p=0.002) were significantly associated with increased cancer risk (Table3a.)

**Table 2. Incidence of cancer among HIV patients (Incidence/100,000PY)**

	Overall	Male	Female	P-value
<b>Any cancer</b>	260 (212-318.9)	245.8 (188-321)	383.2 (207-387.6)	0.50
<b>AIDS defining</b>	47.6 (29.6-76.5)	22.8 (9.5-54.7)	87.1 (49.5-153.4)	0.009
Cervical cancer	-	-	87.1 (49.5-153.4)	NA
Non-Hodgkin lymphoma	5.6 (1.4-22.4)	9.1 (2.3-36.4)	0	0.38
Kaposi's sarcoma	8.5 (2.7-26)	13.7 (4.4-42.3)	0	0.23
<b>Non-AIDS defining</b>	212.7 (170-266.3)	223.1 (168-296)	196.1 (134.5-286)	0.60
Hepatocellular carcinoma	47.6 (29.5-76.5)	72.8 (44.6-119)	7.3 (1-51.6)	0.003
Cholangiocarcinoma	11.2 (4.2-29.8)	13.7 (4.4-42.3)	7.3 (1-51.6)	0.64
Lung cancer	33.6 (19.1-59.1)	36.4 (18.2-72.8)	29 (11-77.4)	0.74
Breast cancer	-	-	87.1 (49.5-153.4)	NA
Lymphoma	30.7 (17-55.6)	41 (21-78.7)	14.5 (3.6-58.1)	0.18
Colon cancer	11.2 (4.2-29.8)	9.1 (2.3-36.4)	14.5 (3.6-58.1)	0.66
Leukemia	8.4 (2.7-26)	9.1 (2.3-36.4)	7.3 (1-51.6)	0.90
Anal cancer	-	9.1 (2.3-36.4)	-	NA
CA skin	5.6 (1.4-22.4)	4.6 (0.6-32.3)	7.3 (1-51.6)	0.77
Nasopharyngeal carcinoma	5.6 (1.4-22.4)	4.6 (0.6-32.3)	7.3 (1-51.6)	0.77
Other*	19.6 (9.3-41.1)	22.8 (9.5-54.7)	14.5 (3.6-58.1)	0.63

\*1 CA tonsil, 1 Basaloid carcinoma of vulva, 1 Malignant neoplasm of pyloric antrum,

1 Parotid cancer. 1 Tongue cancer. 1 Adenoid Cystic Carcinoma

- Incidence of cancer among PWH in this cohort. Over a median follow-up time of 9.8 (IQR:3.4-18.5) years, 93 PWH developed new cancers, yielding a crude cancer incidence of 260 (95%CI 212-318.9) per 100,000 person-year of follow-up (PYFU) (Table2.)

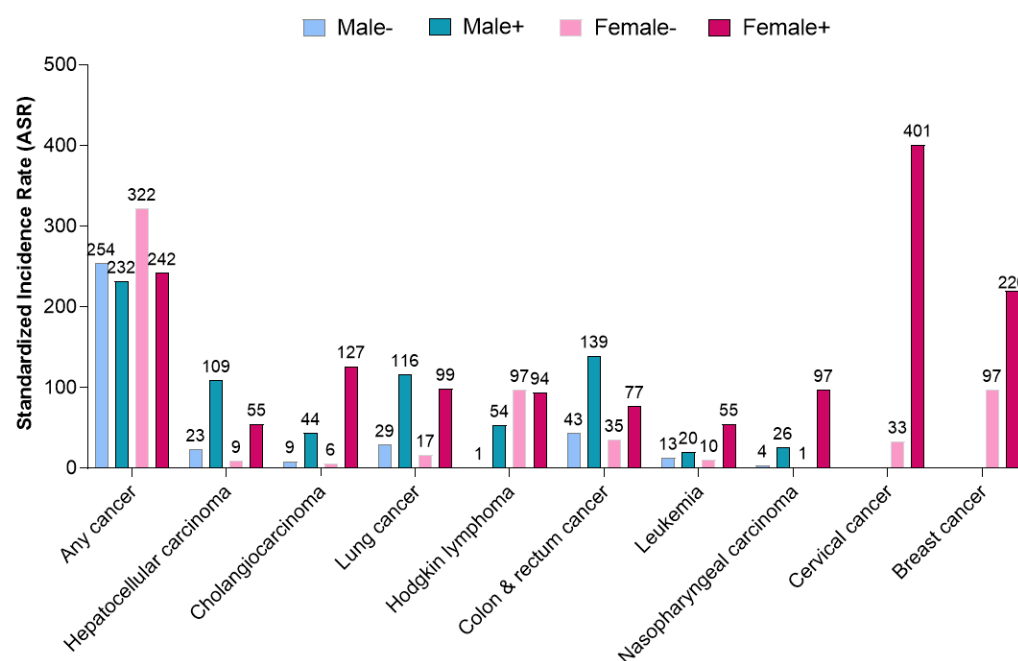


Figure 1. Age-standardized incidence rates (ASR) per 100,000 person-years by gender and cancer sites among general population and PWH<sup>1</sup>

- The ASR for all cancers was 232 per 100000PY in men and 242 in women.
- In men the highest ASR were hepatocellular carcinoma(HCC) 109 per 100000PY, Lung cancer (ASR = 116), and colon cancer (ASR = 67.2).
- In women the highest ASR were cervical carcinoma 401 per 100000PY, breast cancer (ASR = 220.2), and lung cancer(ASR = 98.7) (figure 1)

**Table3b. Risk factor associated with Hepatocellular carcinoma (HCC) in PWH**

Factors	Univariate		Multivariate	
	HR (95%CI)	P-value	aHR (95%CI)	P-value
Age ≥ 35 years	6.61 (2.15-20.26)	0.001	4.93 (1.59-15.24)	0.006
Gender: Male	11.4 (1.51-86.43)	0.02	6.26 (0.82-47.0)	0.08
BMI ≥ 25 kg/m <sup>2</sup>	0.71 (0.09-5.65)	0.74		
CD4 cell count<350	1.15 (0.35-3.82)	0.82		
CDC Classification: C	3.34 (1.24-9.05)	0.02	2.96 (1.06-8.32)	0.04
Diabetes mellitus	0.88 (0.20-3.89)	0.87		
Hypertension	1.27 (0.44-3.67)	0.66		
HCV	9.18 (3.53-23.90)	<0.001	7.32 (2.76-19.35)	<0.001
HBV	4.70 (1.83-12.32)	0.001	4.78 (1.77-12.87)	0.002
Smoking	0.78 (0.27-2.21)	0.64		
Alcohol consumption	0.61 (0.17-2.14)	0.45		

- age >35 years (aHR 4.93, p=0.006), CDC C classification (aHR 2.96, p=0.04), HCV (aHR 7.32, p<0.001) and HBV (aHR 4.38, p=0.002) co-infection were significantly associated with HCC (Table3b.)

Reference1. Vichapat V. Unveiling cancer burden: An epidemiological study in a tertiary cancer center, Thailand. Asian Pacific Journal of Environment and Cancer. 2023;6(1):39-48. doi:10.31557/apjec.2023.6.1.39-48

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