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Prevalence and correlates of hypertension, diabetes, and cancer among HIV-infected adults in Guinea: Insights for healthcare policy in Sub-Saharan Africa

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Noncommunicable diseases (NCDs) have become the leading causes of morbidity and mortality worldwide, accounting for 71% of deaths worldwide in 2019. This trend extends to sub-Saharan Africa, where NCDs are expected to overtake infectious diseases by 2030 amid rapid urbanization, population growth, and changing lifestyles. People living with HIV may be at even greater risk of NCDs due to chronic inflammation caused by HIV, co-infections, side effects of antiretroviral therapy (ART), and shared risk factors. However, research on NCD/HIV comorbidities is scarce in West Africa, which bears more than 30% of the global HIV burden. This study provides insights into the burden of NCD in HIV care in Guinea and reflects a growing regional trend. The study aimed to determine the prevalence and risk factors of hypertension, diabetes, and cancer among HIV-infected adults receiving care at a national hospital in Guinea. A retrospective analysis of the anonymized medical records of 901 HIV-infected adults was conducted using data from June to December 2021. Participants were receiving care at Donka National Hospital in Guinea. NCD diagnoses and sociodemographic and clinical variables were extracted from records. Logistic regression identified factors associated with each NCD. The prevalence was 36.7% for hypertension, 34.0% for diabetes and 21.4% for cancer. Older age, alcohol use, higher BMI, and viral load predicted hypertension risk. Diabetes is associated with no alcohol use, higher viral load, older age and normal BMI. Cancer is associated with smoking, alcohol use and older age. Integrating NCD and HIV services is warranted in Guinea, given the substantial burden observed. Longitudinal research is needed to confirm these patterns and inform prevention and management strategies.

Key words: HIV, hypertension, diabetes, cancer, non-communicable diseases, comorbidities, Guinea.

INTRODUCTION

Noncommunicable diseases (NCDs) have overtaken infectious diseases as the leading causes of morbidity and mortality worldwide. NCDs caused an estimated 41 million deaths worldwide in 2016, accounting for 71% of

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all deaths. The burden of NCDs now exceeds that of communicable diseases in almost all regions of the world, including low- and middle-income countries where infectious diseases have historically predominated (Bhattacharya et al., 2023). This transition is partly driven by global trends such as urbanization, population growth, and changing lifestyle factors that increase NCD risks (Idris et al., 2020).

Data indicate that sub-Saharan Africa is undergoing an epidemiological transition, with NCDs expected to overtake infectious diseases as the most common cause of death by 2030 (Mudie et al., 2019). Rapid and uncontrolled urbanization, particularly in West African countries like Guinea, has been a significant catalyst for the rapid increase in lifestyle-related risk factors associated with noncommunicable diseases (Juma et al., 2020). These risk factors, including sedentary behavior, consumption of processed foods, smoking, and excessive alcohol use, are especially pronounced among those in lower and middle socio-economic status. The rapid pace of urban growth has escalated the prevalence of NCDs, marking a concerning trend in public health (Juma et al., 2020).

Thus, in sub-Saharan Africa, the prevalence of non-communicable diseases (NCDs) such as cardiovascular diseases, cancer, chronic respiratory diseases, and diabetes is escalating rapidly, even as infectious diseases like HIV/AIDS, malaria, and tuberculosis continue to impact the population significantly (Boutayeb, 2010). The World Health Organization (WHO) attributes this increase to increasingly sedentary lifestyles, processed food consumption, smoking, and alcohol consumption superimposed on an ongoing infectious disease epidemic (World Health Organization, 2023).

For the background and context of the study, an extensive literature search was conducted using databases such as PubMed, Scopus, and Web of Science. The search strategy involved combining HIV-related terms with non-communicable diseases and prevalence studies. Additionally, the reference lists of retrieved articles were manually searched to identify further relevant studies. This thorough literature review helped us understand the complex interplay between NCDs and HIV, particularly in sub-Saharan Africa, where evidence of the co-occurrence of these conditions remains scarce.

Particularly, individuals living with HIV in this region may be vulnerable to the development of NCDs. Suggested reasons include chronic inflammation due to uncontrolled replication of HIV, co-infections such as cytomegalovirus, and side effects of antiretroviral therapy (ART) (Patel et al., 2018). HIV infection is characterized by increased inflammation and immune activation that can directly damage end-organs and accelerate atherosclerosis (Nou et al., 2016). Older antiretrovirals such as nucleoside thymidine analog inhibitors (NRTIs; stavudine, didanosine, and zidovudine) and protease inhibitors have been associated with metabolic problems such as dyslipidemia, insulin resistance, and lipodystrophy, increasing the risks of noncommunicable diseases (NCDs). These NRTIs, now seldom included in modern antiretroviral therapy (ART) regimens, are known for causing lipid abnormalities and lipoatrophy (Zaid and Greenman, 2019).

With greater access to ART, HIV has become a manageable chronic condition for many patients who now experience near-normal lifespans (Sahay et al., 2011). However, as this population ages, they accumulate age-related NCDs on top of inflammation-driven conditions (Furman et al., 2019). For instance, several studies have reported higher rates of cardiovascular disease, hypertension, diabetes, chronic kidney disease, and certain cancers among HIV-infected individuals compared to general populations (Webel et al., 2021). The intersections between NCDs and HIV thus represent an emerging challenge in sub-Saharan Africa, warranting dedicated research and health policy attention.

While extensive literature exists on NCD/HIV comorbidities in high-income settings, evidence remains limited across sub-Saharan Africa (Cheza et al., 2021). In West Africa, which shoulders over 40% of the global HIV burden, data are particularly scarce despite recognizing that the region faces a growing NCD epidemic (Joint United Nations Programme on HIV/AIDS, 2023). In Nigeria, nearly one-third of all deaths can be attributed to NCDs. Specifically, people aged 30 to 69 are at a 22% risk of early mortality from cardiovascular disease, cancers, respiratory conditions, and diabetes (World Health Organization Regional Office for Africa, 2020). Between 2010 and 2019, there was a notable increase of about 21.3% in DALYs attributed to NCDs, from 24,987.4 to 30,306.5 (Odunyem et al., 2023). The World Bank estimates that noncommunicable diseases (NCDs) increased from 29% in 2010 to 33% of deaths in Guinea in 2018 (World Bank, n.d.). Additionally, Guinea has made significant progress in expanding access to HIV treatment, from 20% in 2010 (World Bank, 2024) to 64% of people living with HIV on antiretroviral therapy (ART) in 2021. Guinea has an estimated HIV prevalence of 1.7%, with an estimated 120,000 people living with HIV according to 2020 estimates (Joint United Nations Programme on HIV/AIDS, N.D.). The country has also seen an increase in mortality attributed to noncommunicable diseases such as cardiovascular diseases, diabetes, chronic respiratory diseases, and cancers (World Bank, n.d.). However, the extent of NCD/HIV comorbidities in Guinea is unknown to date.

Therefore, this study aimed to fill this gap by determining the prevalence and correlates of three major NCDs – hypertension, diabetes, and cancer – among HIV-infected adults receiving care at a national hospital in Guinea. It provides essential insights into the co-occurrence of NCDs and HIV in Guinea, a first of its kind for the country. The insights will help shape future research and support the integration of NCD care into HIV treatment programs, aligning with the health goals of the African Union (2022). This step is crucial for improving overall patient care and well-being.

METHODS

Study design and data source

This study is a retrospective analysis of de-identified medical data from HIV-infected adults seeking care at Donka National Hospital in Guinea. Records were extracted from June 2021 to December 2021. Donka National Hospital is a key HIV care facility and referral center that receives patients from across Guinea. The hospital's infectious disease, dermatology, and dedicated HIV clinics provided records for this analysis, serving as a representative sample for urban and peri-urban HIV-infected populations in West Africa and offering insights into the regional healthcare challenges.

Participants

Inclusion criteria

Eligible participants were HIV-infected adults 18 years or older who had been confirmed to have HIV infection by rapid antibody test and laboratory confirmation (e.g., ELISA, Western blot, PCR).

Exclusion criteria

Participants were excluded if they lacked primary sociodemographic data such as age, sex, weight, body mass index, history of alcohol use, or smoking. Individuals who did not have a documented antiretroviral treatment (ART) record or whose primary HIV care facility was not Donka National Hospital were also excluded. Finally, participants were excluded if hypertension, diabetes, or cancer were diagnosed before or at the same time as their HIV diagnosis. A total of 1,087 anonymized clinical records were obtained, of which 901 contained complete data for inclusion. This final sample was used to estimate the prevalence of each NCD and identify associated factors.

Study variables

Three clinical outcomes were considered: hypertension, type 2 diabetes mellitus, and the presence of any cancer. These conditions were identified and verified according to standard clinical definitions outlined in existing medical guidelines (ICD-10 codes). Hypertension was diagnosed when the resting systolic blood pressure exceeded 139 mmHg or if the diastolic counterpart exceeded 89 mmHg. Specifically, for analysis purposes, individuals meeting these criteria were labeled as hypertensive patients.

Diabetes was diagnosed if any of the following criteria were met: hemoglobin A1c of 6.5% or greater, fasting blood glucose of 7.0 mmol/L or greater, 2 h postprandial blood glucose reaching 11.1 mmol/L or greater, or if there were overt hyperglycemic symptoms accompanied by blood glucose levels of 11.1 mmol/L or higher. For analysis purposes, individuals who met either of these criteria were classified as diabetic. Cancer, on the other hand, was diagnosed by histological tests showing the proliferation of malignant cells, regardless of the body site. In our study, individuals diagnosed through these tests were considered cancer patients.

Sociodemographic and clinical data were obtained from the participants' medical records, including age, categorized into four distinct groups: up to and including 35 years, ages spanning from 35 to 45 years, those aged above 45 but not crossing 55 years, and participants older than 55 years. Profession, another sociodemographic factor, was determined based on the intensity of physical exertion it demanded. Thus, categories were generated representing continuous physical activities (such as street vendors, sports practitioners, and laborers), non-physical vocations (like office workers or drivers), and a mixed bag of professions like teachers that involve both physical and sedentary tasks. In our analysis, we examined whether there is a correlation between occupation type and the incidence of our key clinical outcomes.

From a clinical perspective, data points on height and weight were extracted to calculate each participant's body mass index (BMI). This BMI was further categorized: underweight, marked by a BMI under 18 kg/m²; normal weight, ranging between 18 and 25 kg/m²; overweight, designated for those between 25 and 30 kg/m²; and obesity for participants whose BMI scaled over 30 kg/m².

History of smoking and alcohol, including current and/or former use, were also obtained from medical records and categorized as users and non-users. These categories were then analyzed to understand their impact on key clinical outcomes. HIV-related outcomes included the use and duration of antiretroviral therapy (ART), CD4 count, viral load, and exact strain of HIV. We set out to determine whether there was a relationship between these HIV-related outcomes and the prevalence of hypertension, diabetes, and cancer. History of tuberculosis, diabetes, hypertension, and more were also obtained from medical records. Each condition's prevalence was analyzed in relation to the participant's HIV status and treatment.

Statistical analysis

Statistical analyses were conducted using SAS 9.4. Frequencies and percentages were calculated to describe sociodemographic characteristics, clinical parameters, ART status, and NCD outcomes. The prevalence of hypertension, diabetes, and cancer was estimated globally and stratified by population subgroups. Bivariate and multivariate logistic regression analyses were performed to identify factors associated with each NCD diagnosis. Crude and adjusted prevalence reports (PRs) with 95% confidence intervals (CIs) were generated to assess the magnitude of relationships between covariates and outcomes. Logistic models were adjusted to account for a priorconfounders, including age, sex, clinic site, and education level, regardless of bivariate significance. Missing data were minimal (<5% for all variables) and addressed using a comprehensive case analysis. Results with a p-value of <0.05 were considered statistically significant.

Ethical considerations

The principles of the Declaration of Helsinkrigorously conducted the study. It gained the necessary approval from the Ethics Committee of Donka National Hospital. This research, rooted in a retrospective analysis of de-identified medical data, underscored the importance of maintaining patient confidentiality. As a result, all data underwent meticulous anonymization, eliminating the requirement for individual informed consent. Due to the retrospective nature of the study and the guarantee of complete anonymity, the IRB granted an exemption from the typical informed consent process. In commitment to protecting patient data, several stringent measures were implemented. All personal identifiers, such as names, addresses, and medical record numbers, were systematically removed. This de-identified data was stored in a highly secure environment, with access strictly confined to authorized personnel. Furthermore, in disseminating the study's results, the pledge is to present all information in aggregate form, ensuring that no individual patient data can be recognized or disclosed.

RESULTS

Participant characteristics

Of the 901 participants included, 52.6% were male, with a mean age of 41 (Table 1). Most resided in urban areas (68%), were on ART (97%) for a median duration of 47.7 months, had type 1 HIV infection (99%), and had a normal body mass index (BMI) of 18-25 kg/m² (62%). Approximately one-third had received ART for less than 2 years, while 40.6% were on ART for over 4 years. Overall prevalence was 36.7% for hypertension, 34.0% for diabetes, and 21.4% for cancer (Table 2). Pre-existing treatment for these conditions was documented in 12.8% of hypertensive patients, 25.6% of diabetic patients, and an unknown proportion of cancer patients. All sociodemographic and clinical characteristics stratified by NCD diagnosis are presented in Table 2.

Factors associated with hypertension

In adjusted analysis, alcohol consumption was associated with a 40% higher prevalence of hypertension relative to non-drinkers (adjusted PR [aPR]=1.40, 95% CI: 1.18-1.66) (Table 3). The prevalence of hypertension was also higher among those with HIV viral loads >75 copies/mL compared to ≤75 copies/mL. Hypertension was more prevalent among older patients, with prevalence ratios (PRs) of 1.73 for ages 35-45 years and 1.73 for ages 45-55 years compared to those ≤35 years old. Overweight BMstatus (25-30 kg/m²) compared to normal BMwas related to 29% higher hypertension prevalence. In contrast, underweight BM (<18.5 kg/m²) was associated with 31% lower hypertension prevalence versus normal BM (aPR=0.69, 95% CI: 0.49-0.98). Hypertension diagnosis was also less common among those receiving ART for over 4 years compared to less than 2 years (aPR=0.77, 95% CI: 0.64-0.94).

Factors associated with diabetes

In adjusted models, participants who did not consume alcohol had twice the prevalence of diabetes compared to drinkers (aPR=2.01, 95% CI: 1.69-2.39) (Table 4). Diabetes diagnosis was also more likely among individuals with HIV viral loads >75 copies/mL relative to those virally suppressed. Prevalence was 49% higher for ages 35-45 versus ≤35 but similar across older age groups. Underweight BMwas associated with 40% lower diabetes prevalence than normal BM(aPR=0.60, 95% CI: 0.40-0.89). Those on ART for over 4 years had 23% lower diabetes prevalence than individuals on ART for less than 2 years (aPR=0.77, 95% CI: 0.62-0.94).

Factors associated with cancer

In adjusted analysis, alcohol consumption and smoking were associated with lower cancer prevalence (aPR=0.80, 95% CI: 0.59-0.97 and aPR=0.53, 95% CI: 0.41-1.69, respectively) (Table 5). Older age strongly predicted higher cancer prevalence, especially ages 45-55 years (aPR=2.56, 95% CI: 1.83-3.57) and >55 years (aPR=4.13, 95% CI: 2.99-5.70) relative to ≤35 years. No other covariates were significantly related to cancer prevalence after adjustment.

DISCUSSION

This study aimed to characterize the burden of hypertension, diabetes, and cancer and their associated factors among HIV-infected adults receiving care at a national referral hospital in Guinea. Among the 901 participants analyzed, a staggering prevalence of 36.7% for hypertension, 34.0% for diabetes, and 21.4% for cancer was found. Notably, the 36.7% hypertension prevalence observed is higher than the general adult hypertension prevalence of 30% reported for Guinea (Camara et al., 2016). Such rates mirror findings from HIV-infected populations throughout sub-Saharan Africa, with hypertension and diabetes prevalences typically eclipsing general population-level estimates (NCD Alliance, 2023; McCombe et al., 2021). The detected cancer prevalence also corresponds with 1-2% rates found in other regional HIV cohorts (National Cancer Institute, n.d.).

Diving into the regional landscape, distinct patterns are visible. For instance, research at the Joint Clinical Research Centre in Lubowa, Uganda, manifested an overall 20.7% prevalence for at least one NCD among HIV-positive patients on antiretroviral therapy; the prevalence of hypertension and diabetes were 12.4% and 4.7%, respectively (Kansiime et al., 2019). A study in Nigeria found an increase in hypertension rates (26.7%) among HIV-positive people. In addition, dyslipidemia was notable at 29.1%, with a high incidence of low-density lipoprotein c at 42.6% in the same group (Ekrikpo et al., 2018). This detailed analysis of dyslipidemia adds to the complexity and highlights the multifaceted challenges of NCDs in HIV-positive populations in West Africa.

Notably, the prevalences of hypertension, diabetes, and cancer identified among HIV-infected adults were significantly higher than recent general population estimates for these conditions in Guinea (Divala et al., 2016). This finding is consistent with existing literature that suggests increased vulnerability to certain noncommunicable diseases (NCDs) among people living with HIV compared to the general population (Yang et al., 2021). This suggests the necessity for Guinea, and by extension other African nations, to prioritize NCD screening within HIV care to address the dual burden of disease.

Table 1. Covariates descriptive statistics by time on ART treatment.

Variable	N (%) 901	Time[1]≤2 years 282 (31.30)	Time [1]> 2 years and ≤ 4 years 253 (28.08)	Time [1]> years 366 (40.62)	P-value <0.0001
Profession					
Always physical activities	553 (61.3)	179 (19.9)	157 (17.4)	216 (24.0)	
Sometimes physical activities	162 (18.0)	47 (5.2)	44 (4.9)	71 (7.9)	0.80
No physical activities	186 (20.7)	55 (6.1)	52 (5.8)	79 (8.8)	
Residence					
Rural	286 (31.7)	90 (9.9)	80 (8.9)	116 (12.9)	0.99
Urban	615 (68.3)	192 (21.3)	173 (12.2)	250 (27.8)	
5 fruits daily consumption					
5 or more fruits daily	274 (30.4)	85 (9.4)	77 (8.6)	112 (12.4)	0.99
Less than 5 fruits daily	627 (69.6)	197(21.9)	176 (19.5)	254 (28.2)	
Alcohol Consumption					
No alcohol intake	609 (67.6)	173 (19.2)	184 (20.4)	252 (27.9)	
Alcohol intake	292 (32.4)	109 (12.1)	69 (7.7)	114 (12.7	0.01
ART Treatment					
Patients on ART treatment	874 (97.1)	273 (30.3)	245 (27.2)	356 (39.6)	
Patients not on ART treatment	26 (2.9)	8 (1.0)	8 (1.0)	10 (1.1)	0.95
HIV TYPE					
HIV TYPE1	892 (99.0)	282 (31.3)	251 (27.8)	359 (39.9)	
HIV TYPE2	9 (1.0)	0	2 (0.2)	7 (0.8)	0.04
Smoking status					
Smoker	159 (17.7)	49 (5.4%)	44 (4.9)	66 (7.3)	
No smoker	742 (82.3)	233 (25.9)	209 (23.2)	300 (33.3)	0.96
Immunodepression status					
75/ML ≥ VIRAL LOAD	391 (42.3)	107 (11.9)	106 (11.8)	168 (18.6)	
75/ML<VIRAL LOAD≤200 ML^{-1}	414 (46.0)	140 (15.5)	115 (12.8)	159 (17.6)	0.35
VIRAL LOAD > 200	106 (11.7)	35 (3.9)	32 (3.6)	39 (4.3)	
Age					
Less or equal to 35-year-old	574 (63.7)	165 (18.3)	173 (19.2)	236 (26.2)	
Between 35 and 45-year-old	225 (25.0)	79 (8.8)	54 (6.0)	92 (10.3)	0.33
Greater than 45 and less or equal	69 (7.7)	27 (3.0)	1.78 (1.8)	26 (2.9)	
Greater than 55-year-old	33 (3.6)	11 (1.22)	10 (1.1)	12 (1.3)	
BMI Categories					
Under Weight (18 kg/m^2)	100 (11.1)	34 (3.8)	22 (2.4)	44 (4.9)	
Normal (18-25 kg/m^2)	554 (61.5)	173 (19.2)	160 (17.8)	221 (24.5)	
Overweight (>25-30 kg/m^2)	215 (23.8)	69 (7.7)	62 (6.9)	84 (9.3)	
Obesity (>30 kg/m^2)	32 (3.6)	6 (0.7)	9 (1.0)	17 (1.9)	0.53
Sex					
Males	427 (47.4)	143 (15.9)	120 (13.3)	164 (18.2)	0.32
Females	474 (52.6)	139 (15.4)	133 (14.8)	202 (22.4)	

The study identified several factors related to age, sociodemographic characteristics, and clinical characteristics that increased the risk of noncommunicable diseases (NCDs), even after adjusting

Table 2. Covariates descriptive statistics by outcome variables.

Characteristics	N (%)	Hypertension [331 (36.74%)]	Diabetes [315 (34.96%)]	Cancer [193 (21.42%)]
Profession				
Always physical activities	552 (61.3)	208 (62.8)	177 (56.2)	118 (61.2)
Sometimes physical activities	162 (18.0)	55 (16.6)	60 (19.0)	29 (15.0)
No physical activities	186 (20.7)	68 (20.6)	78 (24.8)	46 (23.8)
Residence				
Rural	286 (31.7)	229 (69.2)	96 (30.5)	133 (68.9)
Urban	615 (68.3)	102 (30.8)	219 (69.5)	60 (31.1)
5 fruits daily consumption				
5 or more fruits daily	274 (30.4)	102 (30.8)	93 (29.5)	56 (29.0)
Less than 5 fruits daily	627 (69.6)	229 (69.2)	222 (70.5)	137 (71.0)
Alcohol consumption				
No alcohol intake	609 (67.6)	135 (40.8)	155 (49.2)	46 (23.8)
Alcohol intake	292 (32.4)	196 (52.2)	160 (50.8)	147 (76.2)
ART treatment				
Patients on ART treatment	874 (97.1)	329 (97.6)	310 (98.4)	189 (98.0)
Patients not on ART treatment	26 (2.9)	2 (2.4)	5 (1.6)	4 (2.0)
HIV type				
HIV TYPE1	892 (99.0)	329 (99.4)	312 (99.5)	191 (99.0)
HIV TYPE2	9 (1.0)	2 (0.6)	3 (0.5)	2 (1.00)
Smoking status				
Smoker	159 (17.7)	60 (6.7)	55 (17.4)	55 (28.5)
No smoker	742 (82.3)	271 (82.3)	260 (82.6)	138 (71.5)
Immunodepression status				
75/ML≥VIRAL LOAD	391 (42.3)	121 (36.6)	99 (31.4)	75 (38.8)
75/ML<VIRAL LOAD≤200 ML^{-1}	414 (46.0)	164 (49.5)	162 (51.4)	95 (49.2)
VIRAL LOAD > 200	106 (11.7)	46 (13.9)	54 (17.2)	23 (12.0)
Age				
Less or equal to 35-year-old	574 (63.7)	166 (50.1)	176 (55.9)	91 (47.1)
Greater than 35 to 45-year-old	225 (25.0)	116 (35.0)	106 (33.7)	53 (27.5)
Greater than 45 to 55 years old	69 (7.7)	36 (10.9)	24 (7.6)	27 (14.0)
Greater than 55-year-old	33 (3.6)	13 (3.9)	9 (2.8)	22 (2.4)
BMI categories				
Under Weight (18 kg/m^2)	100 (11.1)	24 (7.3)	19 (6.0)	22 (11.4)
Normal (18-25 kg/m^2)	554 (61.5)	193 (58.3)	195 (61.9)	122 (63.2)
Overweight (>25-30 kg/m^2)	215 (23.8)	100 (30.2)	88 (28.0)	45 (23.3)
Obesity (>30 kg/m^2)	32 (3.6)	14 (4.2)	13 (4.1)	4 (2.1)
Time under ART treatment				
Less or equal to 2 years	282 (31.3)	124 (37.4)	116 (36.8)	56 (29.0)
Between 2 and 4 years	253 (28.0)	87 (26.3)	91 (28.9)	61 (31.6)
More than 4 years	366 (40.7)	120 (36.3)	108 (34.3)	76 (39.4)
Sex				
Male	427 (47.4)	142 (42.9)	157 (49.8)	97 (50.2)
Female	474 (52.6)	189 (59.1)	158 (50.2)	96 (48.8)

Table 3. Adjusted and Unadjusted Risk Ratio for Hypertension.

Characteristics	Total (%)	Unadjusted Risk Ratio (95% CI)	Adjusted Risk Ratio (95% CI)
Profession			
Always physical activities	552 (61.33)	Ref	Ref
Sometimes physical activities	162 (18.00)	0.9; 95% CI (0.71 - 1.10)	0.91; 95% CI (0.72 -1.15)
No physical activities	186 (20.67)	0.97; 95% CI (0.78 - 1.21)	0.94; 95% CI (0.76 -1.16)
Residence			
Rural	286 (31.74)	Ref	Ref
Urban	615 (68.26)	1.04; 95% CI (0.87- 1.26)	2.38; 95% CI (1.15 - 4.94)
5 fruits daily consumption			
Less than 5 fruits daily	627 (69.59)	Ref	Ref
5 or more fruits daily	274 (30.41)	1.02; 95% CI (0.85 - 1.23)	1.99; 95% CI (1.16 – 3.40)
Alcohol consumption			
Alcohol intake	292 (32.41)	Ref	Ref
No Alcohol intake	609 (67.59)	0.70; 95% CI (0.59 - 0.82)	0.69; 95% CI (0.59 – 0.82)
ART treatment			
Patients on ART treatment	874 (97.11)	Ref	Ref
Patients not on ART treatment	26 (2.89)	0.83; 95% CI (0.46 - 1.49)	0.93; 95% CI (0.55 - 1.56)
HIV Type			
HIV Type2	9 (1)	Ref	Ref
HIV Type1	892 (99)	1.66; 95% CI (0.49 - 5.66)	1.84; 95% CI (0.48 - 7.10)
Smoking status			
No smoker	159 (17.65)	Ref	Ref
Smoker	742 (82.35)	1.03; 95% CI (0.83 - 1.29)	1.06; 95% CI (0.86 - 1.32)
Immunodepression status			
75 ml^{-1} ≥ Viral load	381 (42.29)	Ref	Ref
75 ml^{-1}<Viral load≤200 ml^{-1}	414 (45.95)	1.25; 95% CI (1.03 - 1.51)	1.18; 95% CI (0.98 - 1.42)
Viral load > 200	106 (11.76)	1.37; 95% CI (1.05 - 1.78)	1.21; 95% CI (0.93 - 1.57)
Age			
Less or equal to 35-year-old	574 (63.71)	Ref	Ref
Greater than 35 to 45-year-old	225 (24.97)	1.78; 95% CI (1.49 - 2.14)	1.73; 95% CI (1.45 - 2.07)
Greater than 45 to 55 year-old	69 (7.66)	1.80; 95% CI (1.39 - 2.34)	1.73; 95% CI (1.34 - 2.24)
Greater than 55-year-old	33 (3.66)	1.36; 95% CI (0.87 – 2.12)	1.39; 95% CI (0.91 - 2.12)
BMI Categories			
Normal (18-25 kg/m^2)	554 (61.69)	Ref	Ref
Under Weight (18 kg/m^2)	100 (11.10)	0.69; 95% CI (0.48 - 0.99)	0.69; 95% CI (0.49 - 0.98)
Overweight (>25-30 kg/m^2)	215 (7.66)	1.34; 95% CI (1.11 - 1.60)	1.29; 95% CI (1.07 - 1.56)
Obesity (>30 kg/m^2)	32 (3.66)	1.26; 95% CI (0.83 - 1.89)	1.27; 95% CI (0.89 - 1.83)
Time under ART treatment			
Less or equal to 2 years	282 (31.30)	Ref	Ref
Between 2 and 4 years	253 (28.08)	0.78; 95% CI (0.63-0.97)	0.82; 95% CI (0.67- 1.02)
More than 4 years	366 (40.62)	0.75; 95% CI (0.61-0.91)	0.77; 95% CI (0.64 - 0.94)
Sex			
Male	427 (47.4)	Ref	Ref
Females	474 (52.6)	1.20; 95% CI (1.01-1.43)	1.27; 95% CI (1.06-1.51)

Table 4. Adjusted and unadjusted risk ratio for diabetes.

Characteristics	Total (%)	Unadjusted Risk Ratio (95% CI)	Adjusted Risk Ratio (95% CI)
Profession			
Always physical activities	552 (61.33)	Ref	Ref
Sometimes physical activities	162 (18.00)	1.16; 95% CI (0.91 - 1.46)	1.06; 95% CI (0.84 - 1.34)
No physical activities	186 (20.67)	1.31; 95% CI (1.06 - 1.61)	1.16; 95% CI (0.94 - 1.43)
Residence			
Rural	286 (31.74)	Ref	Ref
Urban	615 (68.26)	1.06; 95% CI (0.87 - 1.29)	1.19; 95% CI (0.65 - 2.18)
5 fruits daily consumption			
Less than 5 fruits daily	627 (69.59)	Ref	Ref
5 or more fruits daily	274 (30.41)	1.96; 95% CI (0.79 - 1.17)	1.12; 95% CI (0.63 - 1.99)
Alcohol consumption			
Alcohol intake	292 (32.41)	Ref	Ref
No Alcohol intake	609 (67.59)	2.15; 95% CI (1.81 - 2.56)	2.01; 95% CI (1.69 - 2.39)
ART Treatment			
Patients on ART treatment	874 (97.11)	Ref	Ref
Patients not on ART treatment	26 (2.89)	0.54; 95% CI (0.25 - 1.20)	0.57; 95% CI (0.31 - 1.07)
HIV type			
HIV type2	9 (1)	Ref	Ref
HIV type1	892 (99)	1.05; 95% CI (0.41 - 2.66)	1.19; 95% CI (0.41 - 3.46)
Smoking status			
Smoker	159 (17.65)	Ref	Ref
No smoker	742 (82.35)	1.01; 95% CI (0.8-1.28)	1.05; 95% CI (0.84 - 1.32)
Immunodepression status			
75 ml^{-1} ≥Viral load	381 (42.29)	Ref	
75 ml^{-1}<Viral load≤200 ml^{-1}	414 (45.95)	1.51; 95% CI (1.22 - 1.85)	1.38; 95% CI (1.13 - 1.68)
Viral load > 200	106 (11.76)	1.96; 95% CI (1.52 - 2.52)	1.66; 95% CI (1.29 - 2.13)
Age			
Less or equal to 35-year-old	574 (63.71)	Ref	Ref
Greater than 35 to 45-year-old	225 (24.97)	1.54; 95% CI (1.28 – 1.85)	1.49; 95% CI (1.29 - 1.78)
Greater than 45 to 55 years old	69 (7.66)	1.13; 95% CI (0.80 – 1.60)	1.08; 95% CI (0.78 - 1.49)
Greater than 55-year-old	33 (3.66)	0.89; 95% CI (0.50 - 1.58)	0.96; 95% CI (0.56 - 1.63)
BMI Categories			
Normal (18-25 kg/m^2)	554 (61.69)	Ref	Ref
Under Weight (18 kg/m^2)	100 (11.10)	0.54; 95% CI (0.34 - 0.82)	0.60; 95% CI (0.40 - 0.89)
Overweight (>25-30 kg/m^2)	215 (7.66)	1.16; 95% CI (0.98 – 1.37)	1.08; 95% CI (0.87 - 1.34)
Obesity (>30 kg/m^2)	32 (3.66)	1.15; 95% CI (0.75 - 1.78)	1.07; 95%CI (1.66 - 1.73)
Time under ART treatment			
Less or equal to 2 years	282 (31.30)	Ref	Ref
Between 2 and 4 years	253 (28.08)	0.87; 95% CI (0.70 - 1.09)	0.95; 95% CI (0.77 - 1.66)
More than 4 years	366 (40.62)	0.72; 95% CI (0.58 - 0.89)	0.77; 95% CI (0.62 - 0.94)
Sex			
Male	427 (47.4)	Ref	Ref
Females	474 (52.6)	0.91; 95% CI (0.76- 1.08)	1.04; 95% CI (0.87 - 1.24)

Table 5. Adjusted and unadjusted risk ratio for cancer.

Characteristics	Total (%)	Unadjusted Risk Ratio (95% CI)	Adjusted Risk Ratio (95% CI)
Profession			
Always physical activities	552 (61.33)	Ref	Ref
Sometimes physical activities	162 (18.00)	0.84; 95% CI (0.58 - 1.21)	0.89; 95% CI (0.62 -1.29)
No physical activities	186 (20.67)	1.16; 95% CI (0.86 - 1.56)	1.14; 95% CI (0.84 -1.55)
Residence			
Rural	286 (31.74)	Ref	Ref
Urban	615 (68.26)	1.03; 95% CI (0.79 - 1.35)	0.57; 95% CI (0.30 – 1.08)
5 fruits daily consumption			
Less than 5 fruits daily	627 (69.59)	Ref	Ref
5 or more fruits daily	274 (30.41)	0.94; 95% CI (0.71 – 1.21)	0.53; 95% CI (0.25 – 1.16)
Alcohol Consumption			
Alcohol intake	292 (32.41)	Ref	Ref
No Alcohol intake	609 (67.59)	0.65; 95% CI (0.48 - 0.68)	1.63; 95% CI (0.47 – 0.85)
ART Treatment			
Patients on ART treatment	874 (97.11)	Ref	Ref
Patients not on ART treatment	26 (2.89)	0.71; 95% CI (0.29 – 0.77)	0.83; 95% CI (0.36 - 1.91)
HIV TYPE			
HIV TYPE2	9 (1)	Ref	Ref
HIV TYPE1	892 (99)	0.96; 95% CI (0.28 – 3.30)	0.99; 95% CI (0.33 – 3.01)
Smoking status			
Smoker	159 (17.65)	Ref	Ref
No smoker	742 (82.35)	0.54; 95% CI (0.41 – 0.70)	0.53; 95% CI (0.41 - 1.69)
Immunodepression status			
75 ml^{-1} ≥ Viral load	381 (42.29)	Ref	
75 ml^{-1} < Viral load ≤ 200 ml^{-1}	414 (45.95)	1.17; 95% CI (0.89 –1.53)	1.09; 95% CI (0.85 - 1.41)
Viral load > 200	106 (11.76)	1.10; 95% CI (0.73 - 1.67)	1.00; 95% CI (0.66 - 1.50)
Age			
Less or equal to 35-year-old	574 (63.71)	Ref	Ref
Greater than 35 to 45-year-old	225 (24.97)	1.49; 95% CI (1.10 – 2.01)	1.46; 95% CI(1.08 – 1.97)
Greater than 45 to 55 year-old	69 (7.66)	2.47; 95% CI (1.74 – 3.50)	2.56; 95% CI(1.83 – 3.57)
Greater than 55-year-old	33 (3.66)	4.21; 95% CI (3.09 – 5.71)	4.13; 95% CI(2.99 – 5.70)
BMI Categories			
Normal (18-25 kg/m^2)	554 (61.69)	Ref	Ref
Under Weight (18 kg/m^2)	100 (11.10)	1.00; 95% CI (0.67 – 1.49)	0.86; 95% CI (0.58 - 1.29)
Overweight (>25-30 kg/m^2)	215 (7.66)	0.95; 95% CI (0.70 - 1.29)	1.00; 95% CI (0.75 - 1.32)
Obesity (>30 kg/m^2)	32 (3.66)	0.57; 95% CI (0.22 - 1.44)	0.66; 95% CI (0.27 - 1.58)
Time under ART treatment			
Less or equal to 2 years	282 (31.30)	Ref	Ref
Between 2 and 4 years	253 (28.08)	1.21; 95% CI (0.88 – 1.67)	1.24; 95% CI (0.91 - 1.68)
More than 4 years	366 (40.62)	1.05; 95% CI (0.77 – 1.42)	1.06; 95% CI (0.79 - 1.43)
Sex			
Male	427 (47.4)	Ref	Ref
Female	474 (52.6)	0.89; 95% CI (0.69 -1.15)	0.91; 95% CI (0.71 -1.16)

for potential confounding variables (Wood et al., 2021). Older age strongly predicted the three NCDs examined (Wu Fan et al., 2015). This finding mirrors the general population's increased risk for these conditions with advancing age (Budreviciute et al., 2020). Moreover, a pronounced HIV viral load was independently linked with heightened hypertension and diabetes prevalence, suggesting potential underlying mechanisms driven by unchecked HIV replication and related inflammation (HIV info, n.d.).

Again, the cross-sectional nature of the study warrants a cautious interpretation. The sample would not include people who developed cancer from smoking and subsequently died. This could give the impression that other tobacco users in the cohort are less susceptible to cancer, thus underestimating the true relationship between smoking and cancer risk. However, limited insights into smoking behaviors hindered a comprehensive understanding of this relationship.

Furthermore, extended ART use (beyond 4 years) was inversely linked with hypertension and diabetes prevalence compared to those who had commenced ART within the preceding two years. This might indicate that sustained viral suppression via ART could dampen the inflammation-driven risks for NCDs. However, the inherent limitations of the cross-sectional design deter solid causal interpretations; longitudinal studies will be needed to explore these possible effects.

Language and grammar considerations

Given that the author is not a native English speaker, Grammarly, a grammar editing tool using AI, was employed to enhance the linguistic quality of the document. This step was undertaken to streamline the content and amplify its coherence before disseminating it to colleagues for further input and feedback.

CONCLUSION AND RECOMMENDATION

The comprehensive research underscores a marked prevalence of hypertension, diabetes, and cancer among HIV-infected adults at a principal national referral hospital in Guinea. Many sociodemographic and clinical facets correlating with NCD risks have been unearthed, offering a platform to fine-tune screening processes and galvanize specialized prevention measures for this cohort. Parallel to international observations within HIV populations, the results unequivocally signal the exigency for coalescing NCD management and HIV care, especially in environments like Guinea, marked by resource constraints.

Given the cross-sectional essence of the study, there is a palpable urgency for in-depth longitudinal analyses. Such endeavors are crucial for corroborating the insights and decoding causal associations, laying the groundwork for evidence-based strategies. This would enable prompt NCD detection and holistic management of chronic conditions in the HIV-positive community. Future investigative pursuits should also pivot towards discerning the nuances of unaccounted confounders, including lifestyle determinants, and assessing the adaptability of integrated care blueprints across varying healthcare terrains.

Specifically, given the elevated rates of hypertension and diabetes observed, there is a pressing recommendation to embed hypertension and diabetes screening within HIV care regimens in Guinea. Such an integrated approach would be instrumental in unearthing and mitigating NCDs at their nascence within this particularly susceptible demographic. Moreover, with the evident overlap of conditions and the high rates of NCDs among HIV-infected adults, Guinea should replicate regionally successful strategies, including routine NCD screenings in HIV care programs for better outcomes for HIV-infected people.

Study limitations

Nonetheless, there are paramount caveats in the study. The retrospective cross-sectional foundation inherently curtails the ability to deduce causality and pinpoint incident diagnoses, presenting a pivotal constraint. This design also means the sample would not include people who developed cancer from smoking and subsequently died, potentially underestimating the true relationship between smoking and cancer risk. This additional caveat regarding the cross-sectional nature warrants a cautious interpretation, as it could give the impression that other tobacco users in the cohort are less susceptible to cancer, thus skewing the perceived risk.

While the national referral hospital provides a diverse patient sample, it is uncertain whether these results accurately represent the broader HIV-positive adult population in Guinea, let alone West Africa. Furthermore, the absence of data on factors such as diet, central obesity metrics, physical activity, and specific smoking habits introduces potential confounders vital in NCDs, possibly influencing the observed associations.

In summary, the study bestows invaluable perspectives into the NCD trajectory among Guinea's HIV-positive adults and its associated nuances. However, such revelations should be consumed with caution due to the abovementioned limitations. Successive research ventures, adopting longitudinal frameworks, and encompassing varied facilities are imperative to substantiate and broaden the current understanding.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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