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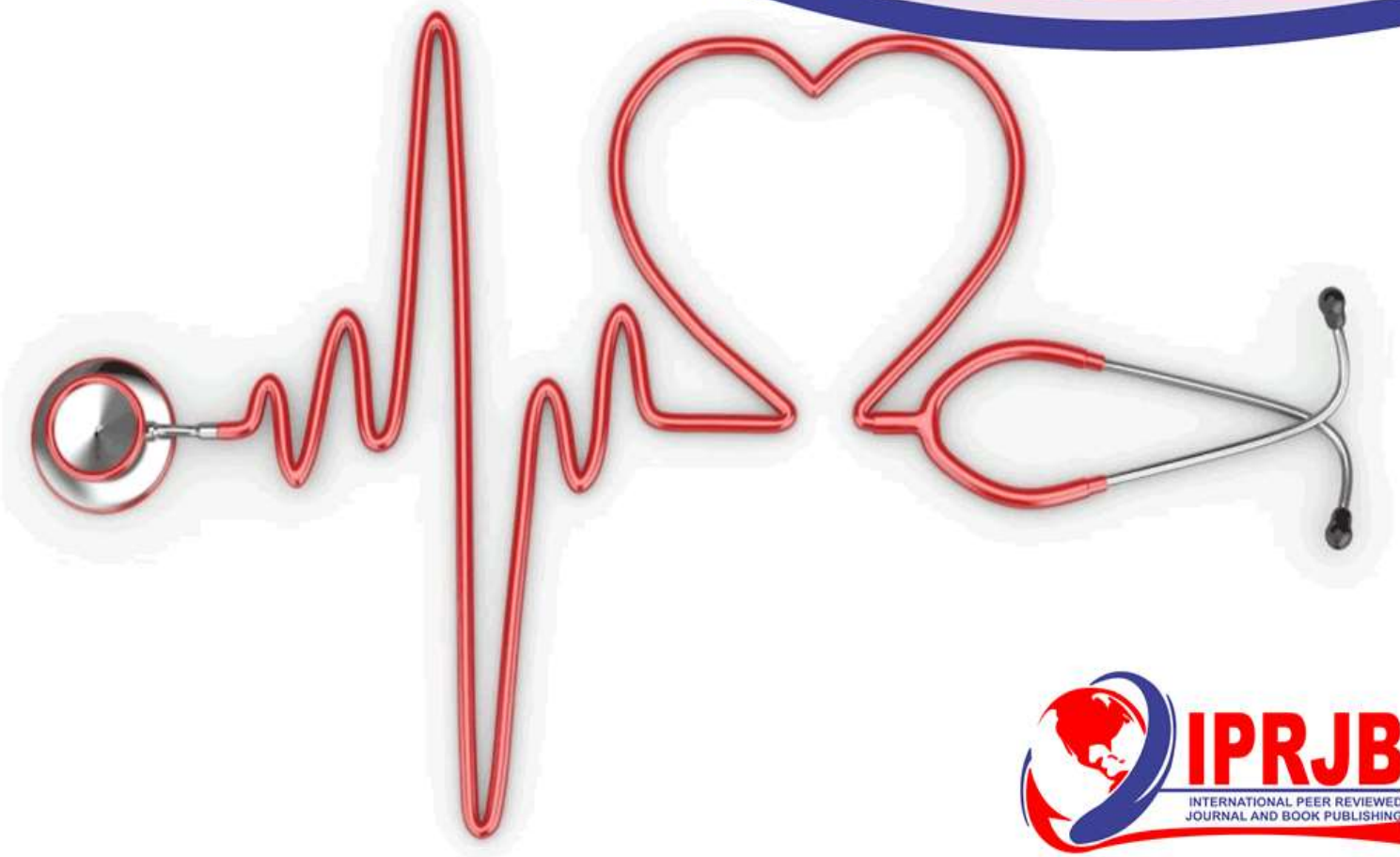

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Behavioral Correlates Associated With Diabetes and Hypertension among People Living With HIV/AIDS Attending Isiolo County Referral Hospital Comprehensive Care Clinic, Kenya

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Abstract

Purpose: The purpose of this study determines behavioral correlates associated with diabetes and hypertension among people living with HIV/AIDS attending Isiolo county referral hospital comprehensive care clinic, Kenya

Methodology: A cross-sectional analytical design was applied using data from 231 respondents selected through systematic sampling. Data were collected using structured questionnaires and analyzed using descriptive statistics and chi square tests.

Findings: The findings showed behavioral correlates such as, tobacco use and alcohol consumption were significantly associated with hypertension and overall noncommunicable disease outcomes, while tobacco use was also significantly associated with diabetes. The association between alcohol use and diabetes was statistically significant but marginal. Physical activity and dietary variety were not significantly associated with disease outcomes. The study concludes that substance use behaviors are key drivers of cardiometabolic risk and recommends strengthening integrated behavioral screening and intervention strategies within HIV care.

Unique Contribution to Theory, Practice and Policy: Theoretically, the study highlights the critical role of substance use behaviors, especially tobacco and alcohol, as key pathways driving cardiometabolic risks like hypertension and diabetes among people living with HIV, suggesting that models of disease risk in this population must integrate behavioral factors more explicitly. In clinical practice, the evidence supports prioritizing systematic screening and comprehensive, patient-centered cessation interventions for substance use within routine HIV care, alongside consistent lifestyle counseling for physical activity and diet, to mitigate these risks effectively. From a policy perspective, aligning HIV programs with broader noncommunicable disease initiatives is essential; this includes incorporating behavioral risk indicators into monitoring frameworks, enhancing provider training in integrated care, and scaling community-based health promotion tailored to the specific regional context, all to improve early risk detection, preventive care continuity, and ultimately reduce the burden of hypertension and diabetes in this vulnerable population.

Keywords: *Behavioral Risk Factors, Diabetes Mellitus, Hypertension, HIV Infection*

INTRODUCTION

Globally Hypertension has been defined as disorder in which the blood vessels have increased pressure" with "systolic blood pressure equal to or greater than 140 mm Hg and/or diastolic blood pressure equal to or greater than 90 mm Hg". It leads to complications like heart attack, stroke, and kidney disease (Duko et al., 2019). In Africa, the global region has HIV burden of 25 million individuals revealing no significant association with HIV or antiretroviral therapy (ART) (Nansseu et al., 2018). The etiology of cardiometabolic diseases in PLHIV is multifactorial due to ageing, obesity, unhealthy lifestyles among HIV patients on HAART (Magodoro 2016; Dimala et al., 2016). The long-term use of HAART dysregulates glucose metabolism and dyslipidaemia, inflammation, endothelial dysfunction and Non-Communicable Diseases (NCD) while traditional cardiometabolic risk factors (diet, tobacco, alcohol) act synergistically with HIV-induced chronic inflammation and HAART-induced lipodystrophy. (Magodoro 2016; Nansseu et al., 2018). Findings of studies prior to 2017 reported a relationship between ART use and diabetes or prediabetes (Nansseu et al., 2018; Nduka et al., 2017). Nevertheless, there is need for further research to explore the interactions between prediabetes Diabetes and/or diabetes and hypertension with ART in PLHIV (Nansseu et al., 2018).

In Sub Saharan Africa, diabetes is inadequately detected and controlled leading to a rising burden linked to premature death, threatens the advances in longevity achieved with the advent of ART in PLHIV in Africa (Nansseu et al., 2018). Exploring and understanding the link between HIV and diabetes maintain the advances made in the battle against HIV (Magodoro 2016; Dimala et al., 2016). There are disparities in management with the free treatment provided for HIV but a minimal focus on diabetes, hypertension and other non-communicable disease. There are behavioral factors associated with diabetes and Hypertension that affects managements of PLHIV. Screening for hypertension and Diabetes for should include routine assessments of PLHIV in Africa, which is currently not standardized. In Kenya the effectiveness of HAART has contributed to increased longevity, subsequent ageing and the uptake of unhealthy lifestyle behaviors. In Kenya it is not well understood the association between Hypertension, diabetes and behavioral factors among PLHIV in Kenyan context to enable locally designed intervention. Isiolo is an Arid and Semi-Arid Land County with distinct socio-demographic, pastoralist, and dietary habits that differ drastically from the urban settings such as Nairobi/Kisumu, Kenya.

Statement of the Problem

The statement of the problem highlights a critical gap in the management of people living with HIV, particularly in Isiolo County, where behavioral risks associated with diabetes and hypertension are not adequately addressed within existing HIV care frameworks. Despite advancements in HIV treatment and viral suppression, the integration of behavioral risk identification such as poor dietary habits, physical inactivity, tobacco use, and harmful alcohol consumption is insufficient, especially in resource-constrained settings like Kenya. (Patel *et al.,* 2023). While HIV operational indicators (viral suppression) are well-tracked in Isiolo, comorbid NCD data remains completely unmonitored, creating a silent double burden of disease. This inadequacy poses risks to the long-term health of individuals achieving virologic stability but remaining vulnerable to preventable chronic diseases. The lack of context-specific empirical evidence regarding the behavioral correlates of diabetes and hypertension among PLHIV in Isiolo County hinders effective clinical decision-making and planning of integrated

services. Therefore, understanding these behavioral factors among patients attending the Isiolo County Referral Hospital Comprehensive Care Clinic is crucial to developing targeted interventions that can reduce chronic disease morbidity and enhance overall health outcomes for those living with HIV/AIDS.

LITERATURE REVIEW

Hypertension and Diabetes among People Living with HIV

Globally Hypertension has been recognized as a disorder in which the blood vessels have increased pressure" with "systolic blood pressure equal to or greater than 140 mm Hg and/or diastolic blood pressure equal to or greater than 90 mm Hg". It leads to complications like heart attack, stroke, and kidney disease (Singh et al., 2017). In Africa, the global region has HIV burden of 25 million individuals revealing no significant association with HIV or antiretroviral therapy (ART) (Nansseu et al., 2018). The etiology of cardiometabolic diseases in PLHIV is multifactorial due to ageing, obesity, unhealthy lifestyles among HIV patients on HAART (Magodoro 2016; Dimala et al., 2016). The long-term use of HAART dysregulates glucose metabolism and dyslipidaemia, inflammation, endothelial dysfunction and Non-Communicable Diseases (NCD) (Magodoro 2016; Nansseu et al., 2018). Findings of studies prior to 2017 reported a relationship between ART use and diabetes or prediabetes (Nansseu et al., 2018; Nduka et al., 2017). Nevertheless, there is need for further research to explore the interactions between prediabetes Diabetes and/or diabetes and hypertension with ART in PLHIV (Nansseu et al., 2018).

In Africa, diabetes is inadequately detected and controlled leading to a rising burden linked to premature death, threatens the advances in longevity achieved with the advent of ART in PLHIV in Africa (Nansseu et al., 2018). Exploring and understanding the link between HIV and diabetes maintain the advances made in the battle against HIV (Magodoro 2016; Dimala et al., 2016). There are disparities in management with the free treatment provided for HIV but a minimal focus on diabetes, hypertension and dyslipidaemia. Screening for should include routine assessments of PLHIV in Africa, which is currently not standardized. The effectiveness of HAART with increased longevity, subsequent ageing and the uptake of unhealthy lifestyle behaviors.

Behavioral Risk Factors for Hypertension and Diabetes among PLHIV

A study on hypertension among ART patients in a largely rural Zimbabwean setting established that smoking sedentary recreation and high salt intake were the main risk factors for hypertension, Smoking and alcohol use emerged as significant contributors to hypertension among men (Kavishe et al., 2021). Behavioral factors, such as smoking and alcohol use, emerged as significant hypertension drivers, particularly among men in urban settings. (Namusoke et al., 2021). These findings highlighted the need for targeted interventions addressing social and lifestyle determinants. Hypertension was found to be widespread among ART patients even though it was not screened routinely in Makonde ART care settings.

Behavioral factors, including physical inactivity and high-salt diets, were increasingly linked to NCDs, particularly in urban centers where lifestyle changes mirrored global trends (Oni et al., 2016). Studies in South Africa and Uganda Kavishe et al., (2021) reported that PLHIV on calorie-dense diets and sedentary lifestyles had risks of obesity and glucose intolerance. Behavioral factors such as physical inactivity and high-salt diets require dietary transitions (Oni et al., 2016). In Kenya it is not well understood the association between Hypertension, diabetes

and behavioral factors among PLHIV in Kenyan context to enable locally designed intervention.

Theoretical Framework

This study utilized the Biopsychosocial Model (Engel, 1977) to link biological factors (HIV/HAART) with behavioral factors (diet/substance use) and social factors. The behavioral factors include physical activities, nutrition, consumption of tobacco, and alcohol. The socioeconomic factors operate through the various intermediary/proximate HAART determinants to influence health outcomes of socio-demographic factors to shape health behaviors and healthcare access. The influence of dietary habits, levels of physical activity and substance use, which in turn mediate risk for diabetes and hypertension. The clinical variables further contribute to the biological predisposition or protection against diabetes and hypertension as depicted in Figure 1 below.

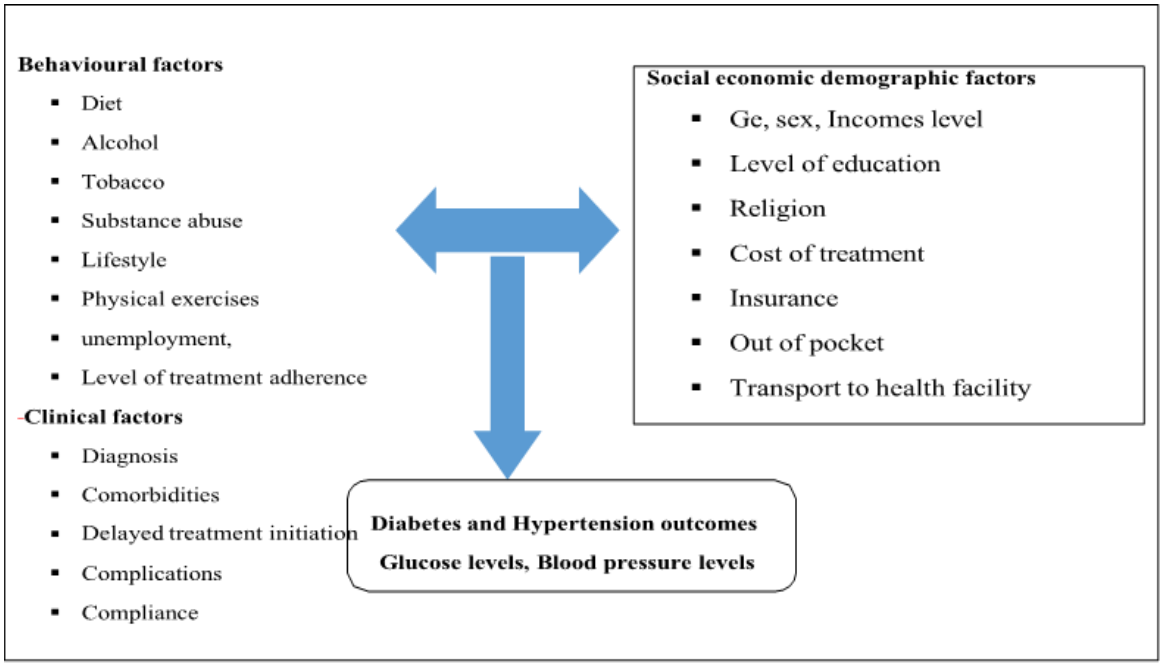

Figure 1: Conceptual Framework

Conceptual Framework

This framework depicts how behavioral and socioeconomic factors mediate the risk of diabetes and hypertension in people living with HIV/AIDS through their influence on health behaviors, clinical status, and healthcare access. It highlights the importance of integrated care addressing behavioral modification, socio-economic support, and clinical management. This study focuses on behavioral correlates such as Diet, Alcohol, Tobacco, Substance Use, lifestyle physical exercises, unemployment and lever of treatment adherence associated with diabetes and hypertension among people living with HIV/AIDS attending Isiolo county referral hospital comprehensive care clinic.

Research Gaps

Despite advances in HIV care, there remains a significant research gap concerning the behavioral factors linked to hypertension and diabetes among people living with HIV in arid and semi-arid regions like Isiolo County, Kenya. Existing studies in Kenya and Sub-Saharan

Africa focus mainly on disease prevalence and clinical or treatment-related metabolic risks, offering limited insight into how modifiable behaviors such as diet, physical activity, and substance use specifically influence noncommunicable disease such as diabetes and Hypertension outcomes in underserved northern populations living with HIV. This lack of context-specific empirical evidence undermines the ability to design targeted, integrated interventions within HIV care programs, leading to missed opportunities for prevention and behavioral risk screening. Addressing this gap is essential to inform localized clinical decision-making and health policy, ensuring comprehensive care models effectively reduce chronic disease burdens in resource-constrained settings

METHODOLOGY

Study Design

This study adopted a hospital-based cross-sectional analytical design to assess behavioral correlates associated with diabetes and hypertension among people living with HIV attending the Comprehensive Care Clinic at Isiolo County Referral Hospital.Kenya

Study Area

The study was conducted at Isiolo County Referral Hospital, a Level 5 referral facility located in Isiolo County in Northern Kenya and serving a predominantly arid and semi-arid population characterized by mixed pastoralist, agro-pastoralist, and urban livelihoods. The hospital hosts a Comprehensive Care Clinic that provides routine HIV prevention, treatment, monitoring, and follow-up services for adults receiving antiretroviral therapy, and serves as a major referral point for HIV care within the county. The study setting was considered appropriate because it provides access to a population of people living with HIV exposed to both chronic HIV care and emerging noncommunicable disease risks within a context marked by geographic access challenges, livelihood transitions, and health system constraints that may influence behavioral risk patterns.

Study Population

The study population comprised adults living with HIV receiving care at the Comprehensive Care Clinic at Isiolo County Referral Hospital during the study period. Eligibility was restricted to adults aged 18 years and above who had been on antiretroviral therapy for at least six months, consistent with the study's focus on examining behavioral correlates within a population with established engagement in HIV care and sufficient exposure to routine treatment and clinical follow-up. Individuals were included if they provided informed consent and were clinically stable to participate in interviews and clinical assessment procedures at the time of data collection. Exclusion criteria included individuals who were critically ill, unable to complete study procedures, unwilling to participate, or had previously been enrolled in the study to avoid duplication. These eligibility criteria were applied to ensure the study population was appropriate for examining the relationship between modifiable behavioral factors and noncommunicable disease outcomes among adults in routine HIV care.

Sample Size

A target sample of 301 participants was initially determined using the Yamane formula for finite populations, although 231 valid responses were available for final analysis. The achieved analytical sample was considered adequate to support both descriptive estimation and

inferential analysis of associations between behavioral correlates and diabetes and hypertension outcomes.

Sampling

The study sample was drawn from an active clinic population using systematic random sampling to enhance representativeness and reduce selection bias in participant recruitment. Based on the sampling frame of eligible adults attending the clinic, participants were selected at a fixed sampling interval following random identification of the initial participant, after which every kth eligible patient meeting inclusion criteria was recruited until the required sample was attained.

Data Collection

Data were collected using a structured interviewer-administered questionnaire adapted to capture socio-demographic characteristics, behavioral risk factors, and clinical information relevant to diabetes and hypertension among people living with HIV. Behavioral data collection was informed by the WHO STEPwise approach to noncommunicable disease risk factor surveillance, particularly in relation to dietary practices, physical activity, tobacco use, and alcohol consumption. The questionnaire was administered to eligible participants following informed consent, and was complemented by review of relevant patient records to obtain clinical information related to HIV treatment and selected health indicators. To strengthen data quality, the tool was pretested prior to field implementation and standardized procedures were applied during data collection to enhance consistency across participants. This combined approach supported the collection of both self-reported behavioral exposures and clinically relevant supporting information required for the study. Data were collected within the clinic setting by trained personnel under routine service conditions to ensure procedural consistency and minimize measurement variability

Data Analysis

Data were entered, cleaned, coded, and analyzed using Statistical Package for the Social Sciences (SPSS) version 25.0. Descriptive was done including frequencies, proportions were used to summarize respondent characteristics, statistics and behavioral risk factors. Inferential analysis was undertaken to examine associations between behavioral correlates and noncommunicable disease outcomes, with Chi-square tests used to assess relationships between categorical variables and binary logistic regression applied to estimate odds ratios and identify behavioral factors significantly associated with diabetes and hypertension. Variables meeting analytical criteria were considered in multivariable models to assess independent associations while controlling for potential confounding. Statistical significance was assessed at $p < 0.05$, and results were presented using tables and narrative interpretation consistent with the study objectives.

Ethical Consideration

The researcher obtained ethical clearance from the Pwani University Ethics and Scientific Review Committee. Permission was also sought from and Isiolo County Referral Hospital. A written informed consent was obtained from respondents and high level of privacy and confidentiality was maintained among them. Participants were recruited without any coercion, informed about voluntary study participation and any decline to participate in the study will not affect health care delivery. The normal treatment patterns and health promotion were administered to study participants. The obtained data was handled with high level of integrity

where it was kept under lock and key. Double data entry was done for validity and completeness.

FINDINGS

Descriptive Statistics on the Distribution and Patterns of Key Behavioral Variables Examined

The results section presents the empirical findings of the study based on data collected from 231 respondents attending the Comprehensive Care Clinic at Isiolo County Referral Hospital. This study presents tobacco consumption patterns and cessation history among respondents, highlighting both the prevalence and behavioral dynamics of tobacco use within the study population. The findings show that although the majority (77.1%) were non-users, a considerable proportion (22.9%) reported current tobacco use, indicating a meaningful level of exposure to tobacco-related health risks. Among users, tobacco use was largely long-term, with 79.3% reporting use for three years or more, suggesting sustained exposure that may increase vulnerability to hypertension and other cardiometabolic conditions. Consumption intensity was predominantly moderate, as 71.6% reported smoking ten or fewer units per day, though a smaller proportion engaged in heavier use. Notably, 62.3% of users had attempted to quit, with many reporting multiple attempts, yet continued use indicates challenges in achieving sustained cessation. Table 1.

Table 1: Tobacco Consumption Profiles and Cessation History

Variable	Category	Frequency (n)	Percentage (%)
Do you currently use any tobacco product	No	178	77.1
	Yes	53	22.9
Duration of current tobacco use	< 1 year	2	3.8
	1–2 years	9	17
	3–4 years	18	34
	≥ 5 years	24	45.3
Average cigarettes or equivalent per day	< 5 units	19	35.8
	6–10 units	19	35.8
	11–16 units	9	17
	≥ 17 units	6	11.3
Have you ever tried to quit cessation attempt	Previous attempt (Yes)	33	62.3
	No previous attempt	20	37.7
Number of quit attempts	1 attempt	12	36.4
	2–3 attempts	15	45.5
	≥ 4 attempts	6	18.2

Distribution of Alcohol Consumption Patterns among Respondents

The findings indicate that while a majority of respondents (67.5%) reported not consuming alcohol, a substantial proportion (32.5%) were current users, reflecting notable exposure to alcohol-related health risks. Among those who consumed alcohol, use was largely long-term, with 46.7% reporting consumption for five years or more, suggesting prolonged behavioral exposure that may contribute to increased cardiometabolic risk. Drinking frequency patterns further indicate regular consumption, as 70.8% reported drinking at least weekly, including 48.6% who consumed alcohol two or more times per week and 11.1% who reported daily intake, pointing to sustained and potentially harmful use patterns among a segment of respondents. Although most users (80.6%) did not report strong cravings, a significant minority

(19.4%) experienced frequent urges to drink, indicating potential early signs of dependency. Table 2

Table 2: Distribution of Alcohol Consumption Patterns among Respondents

Variable	Category	Frequency (n)	Percentage (%)
Do you currently consume alcohol	No	156	67.5
	Yes	75	32.5
Duration of current alcohol use	< 1 year	12	16
	1–2 years	11	14.7
	3–4 years	14	18.7
	≥ 5 years	35	46.7
How often do you drink on average	Monthly or less	13	18.1
	Weekly	24	33.3
	2–3 times per week	19	26.4
	4–6 times per week	8	11.1
	Daily	8	11.1
Do you experience a strong urge craving to drink on most days	Yes	14	19.4
	No	58	80.6

Distribution of Physical Activity Engagement and Clinical Advice

The findings indicate that a majority of respondents (64.5%) reported engaging in some form of physical activity, suggesting relatively moderate activity levels within the population, although a substantial proportion (35.5%) remained inactive and therefore at increased risk of sedentary-related health outcomes. Despite this, only 57.6% reported receiving physical activity advice from a clinician in the past 12 months, indicating that a significant proportion of respondents were not reached with preventive counseling within routine HIV care. Table 3.

Table 3: Distribution of Physical Activity Engagement and Clinical Advice

Variable (Survey Question)	Category	Frequency (n)	Percentage (%)
In a typical week, do you do any physical activity, exercise, sport, physically active chores?	Yes	149	64.5
	No	82	35.5
In the last 12 months, did a clinician give you activity advice?	Yes	133	57.6
	No	98	42.4
Walking (days per week) a	3 days	32	33.3
	4 days	24	25
	5 days	14	14.6
	6 days	15	15.6
	7 days	11	11.5
Jogging (days per week) a	2 days	14	26.4
	3 days	22	41.5
	4 days	17	32.1
Farming livestock (days per week) a	3 days	7	23.3
	4 days	3	10
	5 days	13	43.3
	6 days	7	23.3

Dietary Profiles, Consumption Patterns, and Counseling Reach

The findings indicate that dietary patterns within the study population are largely suboptimal. Only 29% of respondents reported high dietary variety, while the majority fell within moderate (36.8%) and low (34.2%) dietary diversity categories, suggesting limited nutritional balance for a significant proportion of participants. Consistent with this, 34.2% reported diets dominated by processed or fried foods, while only 29% consumed predominantly unprocessed

or natural foods, reflecting a shift toward less healthy dietary practices. The frequency of processed food consumption was notably high, with 73.5% of respondents consuming such foods at least two times per week and 22.5% reporting daily intake, indicating sustained exposure to unhealthy dietary components. Despite these patterns, only 44.6% of respondents reported receiving dietary counseling within the past 12 months, leaving a majority (55.4%) without structured nutritional guidance. Table 4.

Table 4: Dietary Profiles, Consumption Patterns, and Counseling

Variable	Category	Frequency (n)	Percentage (%)
Overall diet variety and balance	Low variety	79	34.2
	Moderate variety	85	36.8
	High variety	67	29
Which best describes your usual diet?	Mostly processed/fried foods	79	34.2
	A mix of processed and unprocessed foods	85	36.8
	Mostly unprocessed/natural foods	67	29
In a typical week, how many times do you eat processed fried foods?	Monthly or less	28	12.1
	Weekly	33	14.3
	2–3 times per week	62	26.8
	4–6 times per week	56	24.2
	Daily	52	22.5
In the last 12 months, did you receive dietary lifestyle counselling?	Yes	103	44.6
	No	128	55.4

Inferential Statistics

Building on the descriptive findings, further analysis was conducted to examine whether the observed behavioral patterns are statistically associated with noncommunicable disease outcomes among respondents. The study employed inferential statistical techniques to test the relationship between key behavioral risk factors, including tobacco use, alcohol consumption, physical activity, and dietary patterns, and the prevalence of hypertension and diabetes. Chi-square tests were applied to assess associations between categorical variables, with statistical significance evaluated at the 5% level.

An analysis was conducted to determine whether tobacco use is significantly associated with the occurrence of hypertension, diabetes, and overall noncommunicable disease outcomes among respondents. The comparison between tobacco users and non-users provides insight into the extent to which tobacco consumption contributes to disease burden within the study population.

Association between Tobacco Use and NCD Outcomes among Respondents

The results reveal a statistically significant association between tobacco use and all examined outcomes. The prevalence of hypertension was notably higher among tobacco users (60.4%) compared to non-users (37.1%), indicating a strong relationship between tobacco exposure and elevated blood pressure ($p = 0.0043$). A similar pattern was observed for diabetes, where 35.8% of tobacco users were affected compared to 19.7% of non-users, with the association also reaching statistical significance ($p = 0.0239$). When considering any noncommunicable disease outcome, tobacco users exhibited a substantially higher prevalence (64.2%) relative to non-users (42.1%), further reinforcing the strength of this relationship ($p = 0.0078$). These findings demonstrate that tobacco use is a significant behavioral correlate of hypertension and diabetes,

with consistent evidence across all outcome measures indicating increased risk among users within the study population. Table 5.

Table 5: Association between Tobacco Use and NCD Outcomes among Respondents

Outcome	Predictor Category	Outcome Absent	Outcome Present	P value
Hypertension	No	112 (62.9%)	66 (37.1%)	0.0043*
	Yes	21 (39.6%)	32 (60.4%)	
Diabetes	No	143 (80.3%)	35 (19.7%)	0.0239*
	Yes	34 (64.2%)	19 (35.8%)	
Any NCD	No	103 (57.9%)	75 (42.1%)	0.0078*
	Yes	19 (35.8%)	34 (64.2%)	

Association between Alcohol Use and NCD Outcomes among Respondents

The findings indicate a statistically significant association between alcohol use and all assessed outcomes. Hypertension was more prevalent among alcohol users (54.7%) compared to non-users (36.5%), with the association being statistically significant ($p = 0.0136$), suggesting a meaningful relationship between alcohol consumption and elevated blood pressure. For diabetes, although a higher proportion of alcohol users (32%) were affected compared to non-users (19.2%), the level of significance was marginal ($p = 0.0476$), indicating a weaker and less robust association relative to other outcomes. In terms of overall NCD burden, alcohol users had a substantially higher prevalence (60%) compared to non-users (41%), with this association also statistically significant ($p = 0.0103$). These results suggest that alcohol consumption is an important behavioral correlate of hypertension and overall NCD outcomes, while its association with diabetes, though statistically significant, appears comparatively modest and less pronounced within this population. Table 6.

Table 6: Association between Alcohol Use and NCD Outcomes among Respondents

Outcome	Predictor Category	Outcome Absent	Outcome Present	P value
Hypertension	No	99 (63.5%)	57 (36.5%)	0.0136*
	Yes	34 (45.3%)	41 (54.7%)	
Diabetes	No	126 (80.8%)	30 (19.2%)	0.0476*
	Yes	51 (68%)	24 (32%)	
Any NCD	No	92 (59%)	64 (41%)	0.0103*
	Yes	30 (40%)	45 (60%)	

Association between Physical Activity Status and NCD Outcomes among Respondents

The results indicate that physical activity was not significantly associated with any of the assessed noncommunicable disease outcomes. For hypertension, the prevalence was comparable between inactive (43.9%) and active individuals (41.6%), with no statistically significant difference ($p = 0.8429$). A similar pattern was observed for diabetes, where inactive respondents had a prevalence of 26.8% compared to 21.5% among active respondents, though this difference was not statistically significant ($p = 0.4488$). For overall NCD outcomes, the distribution was also closely aligned, with 50% prevalence among inactive individuals and 45.6% among those who were active ($p = 0.6186$). These findings suggest that, within this study population, physical activity status did not demonstrate a meaningful or statistically significant relationship with hypertension, diabetes, or combined NCD outcomes, indicating that other behavioral or contextual factors may play a more prominent role in shaping disease risk. Table 7.

Table 7: Association between Physical Activity Status and NCD Outcomes among Respondents

Outcome	Predictor Category	Outcome Absent	Outcome Present	P value
Hypertension	No	46 (56.1%)	36 (43.9%)	0.8429*
	Yes	87 (58.4%)	62 (41.6%)	
Diabetes	No	60 (73.2%)	22 (26.8%)	0.4488*
	Yes	117 (78.5%)	32 (21.5%)	
Any NCD	No	41 (50%)	41 (50%)	0.6186*
	Yes	81 (54.4%)	68 (45.6%)	

Association between Dietary Variety and NCD Outcomes among Respondents

The findings indicate that dietary variety was not significantly associated with any of the assessed outcomes. For hypertension, prevalence varied modestly across categories, with 47.8% among those with high dietary variety, 42.4% among those with moderate variety, and 38% among those with low variety, though these differences were not statistically significant ($p = 0.4912$). A similar pattern was observed for diabetes, where prevalence ranged from 18.8% among respondents with moderate dietary variety to 26.6% among those with low variety, yet the association remained non-significant ($p = 0.4525$). For overall NCD outcomes, the distribution was also relatively similar across groups, with slightly higher prevalence among those with high dietary variety (52.2%) compared to moderate (43.5%) and low variety (46.8%), but again without statistical significance ($p = 0.5637$). These results suggest that, within this study population, dietary variety alone does not demonstrate a meaningful or statistically significant relationship with hypertension, diabetes, or combined NCD outcomes.

Table 8: Association between Dietary Variety and NCD Outcomes among Respondents

Outcome	Predictor Category	Outcome Absent	Outcome Present	P value
Hypertension	High variety	35 (52.2%)	32 (47.8%)	0.4912*
	Low variety	49 (62%)	30 (38%)	
	Moderate variety	49 (57.6%)	36 (42.4%)	
Diabetes	High variety	50 (74.6%)	17 (25.4%)	0.4525*
	Low variety	58 (73.4%)	21 (26.6%)	
	Moderate variety	69 (81.2%)	16 (18.8%)	
Any NCD	High variety	32 (47.8%)	35 (52.2%)	0.5637*
	Low variety	42 (53.2%)	37 (46.8%)	
	Moderate variety	48 (56.5%)	37 (43.5%)	

Discussion

The study sought to examine behavioral correlates associated with hypertension and diabetes among people living with HIV attending the Comprehensive Care Clinic at Isiolo County Referral Hospital. The findings reveal a clear pattern in which substance use behaviors, particularly tobacco and alcohol consumption, are significantly associated with noncommunicable disease outcomes, while physical activity and dietary variety do not demonstrate statistically significant relationships.

The findings of this study are largely consistent with existing evidence on the role of behavioral risk factors in shaping noncommunicable disease outcomes among people living with HIV, particularly within Sub-Saharan Africa. The significant association observed between tobacco use and hypertension and diabetes aligns with prior studies that have identified tobacco consumption as a major contributor to cardiovascular and metabolic disorders in HIV populations (Bigna et al., 2021; Patel et al., 2023). These studies emphasize that tobacco use

exacerbates inflammation, endothelial dysfunction, and metabolic disturbances, thereby compounding existing vulnerabilities associated with chronic HIV infection and antiretroviral therapy. The current findings reinforce this evidence by demonstrating a strong and consistent association across multiple NCD outcomes within a rural and underserved Kenyan context.This study found, the association between alcohol consumption and hypertension is consistent with regional studies that link alcohol use to elevated blood pressure and increased cardiovascular risk among people living with HIV (Kagaruki et al., 2018; Patel et al., 2023). The marginal association between alcohol use and diabetes observed in this study also reflects mixed evidence in the literature, where alcohol's effect on glucose metabolism has been shown to vary depending on consumption patterns, duration, and individual metabolic factors. This suggests that while alcohol is an important risk factor, its influence on diabetes may be less direct or more context-dependent compared to its impact on hypertension.

In contrast, the absence of significant associations between physical activity and NCD outcomes diverges somewhat from existing literature, which generally identifies physical inactivity as a key risk factor for cardiometabolic diseases (WHO, 2023). However, this discrepancy may be explained by contextual factors specific to the study setting, where physical activity is often embedded within daily livelihood practices rather than structured exercise. Previous studies in similar settings have highlighted that not all forms of physical activity confer equal health benefits, particularly when intensity and duration are inconsistent (Todowede et al., 2019).

This study found out that there is lack of a significant relationship between dietary variety and NCD outcomes also contrasts with broader evidence linking poor diet to hypertension and diabetes (MoH, 2023; KNBS et al., 2015). However, this may reflect limitations in using dietary variety as a proxy for nutritional quality, as well as the cross-sectional nature of the study, which may not capture long-term dietary effects. Existing literature suggests that specific dietary components, such as high salt, sugar, and fat intake, may be more predictive of NCD risk than overall variety alone (Masyuko et al., 2021).The study findings both align with and extend existing literature by highlighting the dominant role of substance use behaviors while also revealing context-specific nuances in the influence of physical activity and diet. These results contribute to the growing body of evidence emphasizing the need for localized understanding of behavioral risk factors within HIV care settings.

CONCLUSION AND RECOMMENDATION

Conclusion

The study concludes that behavioral risk factors play a differentiated but significant role in shaping the burden of hypertension and diabetes among people living with HIV attending Isiolo County Referral Hospital. The findings demonstrate that tobacco use and alcohol consumption are the most influential behavioral correlates, with both showing statistically significant associations with hypertension and overall noncommunicable disease outcomes, and tobacco use additionally showing a strong relationship with diabetes. These results indicate that substance use behaviors constitute a major pathway through which cardiometabolic risk accumulates within this population. The persistence of long-term use and repeated but unsuccessful cessation attempt further underscores the entrenched nature of these behaviors and the limited effectiveness of existing support systems within routine care.

At the same time, the study finds that physical activity and dietary variety were not significantly associated with the assessed noncommunicable disease outcomes, despite descriptive evidence indicating notable levels of inactivity and suboptimal dietary practices. This suggests that the relationship between lifestyle factors and disease outcomes in this context may be more complex, potentially influenced by measurement limitations, variability in behavior quality and intensity, or longer-term exposure effects not captured in a cross-sectional design.

The study concludes that while multiple behavioral risks coexist, substance use behaviors represent the most immediate and measurable drivers of hypertension and diabetes in this population, highlighting the need for targeted, evidence-based interventions within integrated HIV care frameworks.

Recommendation

The findings point to the urgent need for county health systems to strengthen the integration of behavioral risk management within routine HIV care, with particular emphasis on tobacco and alcohol control. Comprehensive Care Clinics should institutionalize systematic screening for substance use, coupled with structured cessation programs that include counseling, follow-up support, and where feasible, pharmacological interventions.

Given the high proportion of respondents who have attempted to quit tobacco without sustained success, interventions must move beyond brief advice to more intensive, patient-centered cessation strategies supported by trained healthcare providers. In addition, routine clinical encounters should be leveraged to deliver consistent and standardized lifestyle counseling on physical activity and diet, addressing the observed gaps in preventive guidance.

At the policy level, Isiolo County should align HIV programming with broader noncommunicable disease strategies by incorporating behavioral risk indicators into monitoring systems, strengthening provider training on integrated care delivery, and investing in community-based health promotion initiatives tailored to the local arid and semi-arid context. Such approaches would enhance early risk identification, improve continuity of preventive care, and contribute to reducing the growing burden of hypertension and diabetes among people living with HIV.

Implication to Theory, Practice and Policy

The study's findings have important implications across theory, practice, and policy. Theoretically, they highlight the critical role of substance use behaviors, especially tobacco and alcohol, as key pathways driving cardiometabolic risks like hypertension and diabetes among people living with HIV, suggesting that models of disease risk in this population must integrate behavioral factors more explicitly. In clinical practice, the evidence supports prioritizing systematic screening and comprehensive, patient-centered cessation interventions for substance use within routine HIV care, alongside consistent lifestyle counseling for physical activity and diet, to mitigate these risks effectively. From a policy perspective, aligning HIV programs with broader noncommunicable disease initiatives is essential; this includes incorporating behavioral risk indicators into monitoring frameworks, enhancing provider training in integrated care, and scaling community-based health promotion tailored to the specific regional context, all to improve early risk detection, preventive care continuity, and ultimately reduce the burden of hypertension and diabetes in this vulnerable population.

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