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ASSOCIATION BETWEEN BEHAVIOURAL FACTORS AND OVERWEIGHT/OBESITY AMONG PEOPLE LIVING WITH HIV AT KAJJANSI HEALTH CENTRE IV. A CROSS SECTIONAL STUDY.

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Abstract

Background

Overweight and obesity are major public health concerns globally, contributing to a significant burden of chronic diseases such as cardiovascular disease, diabetes, and certain cancers. These conditions are multifactorial, with a growing body of evidence highlighting the role of behavioral factors in their development and progression. This study aimed to determine the association between behavioral factors and overweight/obesity among PLWH at Kajjansi Health Centre IV.

Methodology

A descriptive cross-sectional study with a mixed-methods approach was conducted on 50 PLWH. Data were collected through questionnaires, interviews, and medical record reviews. Descriptive statistics, chi-square tests, t-tests, and multiple logistic regression analyses were performed to examine associations between various factors and overweight/obesity status.

Results

At baseline, 80.0% (n = 40) of participants were classified as overweight or obese. Among those with low dietary diversity, 100.0% (n = 4) were overweight or obese, compared to 71.0% (n = 22) of those with moderate dietary diversity and 93.3% (n = 14) of those with high dietary diversity. However, this association was not statistically significant (χ^2 = 4.247, df = 2, p = 0.120).

Conclusion

The findings conclude no significant association between dietary diversity and obesity status, a significant association between physical activity and obesity status only at the end line, and no significant relationship between sedentary behavior and obesity.

Recommendation

There should be practical interventions that include tailored nutritional counseling and physical activity programs that consider unique sociocultural contexts.

Keywords: *Overweight and Obesity, Behaviors and Association, Kajjansi Health Center IV.*
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Background of the study

Studies from various regions, including North America (Lake et al., 2020) and Sub-Saharan Africa (Kiyimba et al., 2022), have reported a shift towards increased consumption of processed foods, sugary drinks, and unhealthy fats after ART initiation. This dietary transition, while often linked to improved food security, can contribute significantly to weight gain.

Research in Sub-Saharan Africa, including Uganda (Kiyimba et al., 2022), has highlighted the influence of cultural preferences and limited access to nutritious foods on dietary patterns among PLWH. This suggests that interventions need to be culturally sensitive and address food access barriers to effectively promote healthy eating habits.

A study conducted in Wakiso District, Uganda (Kiyimba et al., 2022), found that half of the PLWH participants were either overweight or obese, with a significant proportion experiencing abdominal obesity. This underscores the need for targeted interventions to address dietary patterns within the local context.

The literature consistently emphasizes the importance of physical activity in maintaining a healthy weight and preventing obesity in PLWH. However, studies across different regions have identified common barriers to physical activity, such as fatigue, physical limitations, and lack of access to exercise facilities (Malaza et al., 2012).

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Research in Sub-Saharan Africa, including Uganda, has not extensively explored the specific barriers to physical activity among PLWH. This highlights a potential area for further investigation to inform the development of tailored interventions.

Studies in Uganda have reported a higher prevalence of smoking among PLWH compared to the general population (Ministry of Health Uganda, 2018). However, the specific impact of smoking cessation and alcohol consumption on weight gain in the Ugandan context requires further investigation. The literature consistently identifies dietary patterns and physical inactivity as major behavioral contributors to overweight and obesity in PLWH across different regions. While the role of smoking and alcohol consumption is acknowledged, there is a need for more research to understand their specific impact in the Ugandan context. Additionally, addressing cultural preferences and barriers to accessing nutritious foods and exercise facilities is crucial for developing effective interventions to promote healthy behaviors and weight management among PLWH in Uganda. Therefore, the objective of this study is to determine the association between behavioral factors and overweight/obesity among PLWH at Kajjansi Health Centre IV.

Methodology

Research design

This study will employ a descriptive cross-sectional design with a mixed methods approach. This approach allows for the simultaneous assessment of multiple factors associated with overweight and obesity in People Living With HIV (PLWH) at a single point in time. While it facilitates the exploration of relationships between variables, it cannot establish causation.

This study will utilize both quantitative and qualitative data collection methods. Quantitative methods will gather numerical data on weight, height, and other relevant factors from interactions at the clinic. Qualitative methods will explore participants' experiences and perceptions related to weight management while living with HIV.

Study population

Target population

The target population for this study is all people living with HIV (PLWH) aged 18 years and above who are receiving care at Kajjansi Health Centre IV during the study period (three months).

This population is chosen because it represents a specific and accessible group of PLWH within a defined geographical area.

Accessible Population

The study population is adult male and female persons living with HIV/AIDS, attending and receiving Anti-Retroviral Treatment at Kajjansi Health Centre IV, Wakiso, Uganda.

Inclusion criteria

People living with HIV who are currently receiving ART at Kajjansi Health Centre IV for at least six months and are aged 18 and above.

PLWH who are willing to provide informed consent and participate in data collection activities.

Exclusion Criteria

Individuals below 18 years old receiving care at Kajjansi Health Centre IV

Those who are currently receiving care at Kajjansi Health Centre IV and are critically ill which may interfere with data collection.

Pregnant or breastfeeding women (due to potential confounding factors related to pregnancy and lactation).

Individuals with severe cognitive impairment or mental health conditions hindering informed consent or participation.

PLWH currently receiving ART at Kajjansi Health Centre IV who met the inclusion criteria but did not consent to participate in the study

Sample size determination

The study sample for the quantitative research was determined using a formula developed by (Keish Leslie, 1965):

$$\mathbf{n = z^2pq / d^2}$$

Where:

n = desired sample size

z = 1.96 (for 95% confidence interval)

p = Population Proportion (prevalence of the outcome of interest= 28%)

q = (100% - prevalence (72%))

d = margin of error (set at 5% or 0.05)

In determining this, a 95% confidence interval and 5% margin of error will be used. The prevalence of metabolic syndrome and components among people living with HIV is 28% in the Wakiso district (Kiyimba et al., 2022).

Hence, the sample size will be determined as;

Calculation:

Using a 28% prevalence and a 5% margin of error, the sample size is calculated as follows:

Given that:

n =?

z = 1.96

d = 0.05 (5%)

p = 0.28 (28%)

q = 1 – p, (1- 0.28 = 0.72)

Therefore, n =

n= 309.8= 310

The formula developed by Leslie Kish (1965) was used to determine the sample size needed to achieve a 95% confidence interval and a 5% margin of error. Based on a prevalence of metabolic syndrome of 28% among PLWH in Wakiso District (Kiyimba et al., 2022), the statistically derived sample size was approximately 310. However, a sample size of 50 was deemed feasible given the project's limitations. In the discussion section, the potential limitations of a smaller sample size will be addressed.

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Therefore, the target sample size will be fifty respondents.

Sampling techniques

Purposive sampling technique

This is a sampling technique that involves intentional identification and selection of individuals, or groups of individuals that are proficient with a particular community or society (Etikan, et al., 2016). This technique will be employed for the qualitative study

The initial phase involves engaging core contacts at the health center, such as nurses and clinicians, who will introduce the study and facilitate participant recruitment. Subsequently, five focus group discussions (6-12 PLWH each) and seven key informant interviews with PLWH possessing diverse experiences related to weight management will be conducted. Participant selection will prioritize diversity in age, gender, duration of HIV diagnosis, antiretroviral therapy use, and weight management experiences to ensure a comprehensive understanding of potential triggers.

Simple random sampling technique

The researcher will utilize a systematic random sampling technique will be employed to select participants from the quantitative study.

This is a sampling technique where every item or individual in a population has an even chance or likelihood of being selected in the sample (Sharma, 2017). This method ensures an equal selection probability for all eligible participants and minimizes selection bias.

The first step involves obtaining a complete list of PLWHs aged 18 and above registered at the health center during the study period. This list serves as the sampling frame, encompassing all potential participants. Next, the sampling interval is calculated by dividing the total number of patients in the frame by the desired sample size. This interval determines the frequency at which participants will be selected from the list.

To introduce randomness and eliminate selection bias, a random starting point within the first sampling interval is chosen using a random number generator. From this starting point, every nth patient (where 'n' is the sampling interval) who meets the inclusion criteria is recruited until the desired sample size is reached. This systematic approach ensures that every eligible participant has an equal chance of being included in the study, enhancing the generalizability of the findings.

Systematic sampling technique

Systematic sampling is a probability sampling method where researchers select members of the population at regular intervals. The interval is determined by dividing the population size by the desired sample size. If the population is in a random order, this can mimic the benefits of simple random sampling while often being easier to implement.

Similar to simple random sampling, a complete list of PLWH will serve as the sampling frame. The sampling interval will be calculated, and after a random starting point, every nth individual on the list will be selected.

Data collection methods

Questionnaire Survey

A structured questionnaire will be administered to collect quantitative data from the selected PLWH participants. This questionnaire will include close-ended questions designed to assess socio-demographic information, weight management behaviors, dietary habits, physical activity levels, and relevant knowledge and attitudes related to weight management in the context of HIV. The structured format ensures standardized data collection, allowing for easy comparison and analysis of responses.

Document Review

Relevant medical records and documents at the health center will be reviewed to extract additional data related to participants' weight history and clinical parameters that may influence weight management. This will complement the data gathered through questionnaires and interviews, providing a more comprehensive understanding of the factors impacting weight among PLWH.

Interviews

Structured Interviews: Face-to-face interviews with participants using a standardized questionnaire will be conducted. This approach allows for direct interaction with participants, clarifying any ambiguities in their responses, and ensuring accurate data collection. Close-ended questions with predetermined response options will be used to facilitate data analysis and comparison.

Key Informant Interviews: In-depth interviews with purposively selected key informants, such as clinic in-charges, nurses, and doctors, will be conducted. These interviews will use a semi-structured format, allowing for open-ended questions and probing for deeper insights into the challenges and opportunities related to weight management for PLWH at the health center. The insights from key informants will enrich the understanding of the context and provide valuable information for designing effective interventions.

Data collection tools

Structured questionnaire

Structured Questionnaire is the primary tool for quantitative data collection and it will be administered by trained research assistants. The questionnaire will be translated into the local language to ensure accessibility and comprehension for all participants.

The questionnaire will undergo pre-testing at Kajjansi Health Centre IV in Wakiso District to ensure its clarity, relevance, and cultural appropriateness.

Interview guide

Qualitative data will be collected through interview guides with purposively selected individuals who have expertise and experience relevant to the research topic.

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Key Informant Interview Guide: A semi-structured interview guide will be developed to guide the KI interviews. The guide will include open-ended questions. The KI interviews will be semi-structured, allowing for flexibility and probing to elicit rich and detailed information.

Data Analysis

Data was initially cleaned, coded, and evaluated for missing data using Microsoft Excel 2013 and later transferred to IBM SPSS version 27 for detailed analysis.

Descriptive Statistics

The study began with a comprehensive overview of the sample characteristics. Sociodemographic factors such as age, gender, education level, employment status, and household size were summarized using frequencies, percentages, means, and standard deviations. This provided a clear picture of the study population. Similarly, key variables of interest, including dietary diversity scores, physical activity levels, and sedentary behavior, were described using means, standard deviations, and frequency distributions. HIV-related factors and comorbidities were presented as frequencies and percentages, while biochemical and health data were summarized using means and standard deviations. These descriptive statistics offered a foundational understanding of the dataset.

Inferential Statistics

To examine relationships between variables, the researchers employed a variety of inferential statistical methods. Chi-square tests of independence were used to investigate associations between categorical variables, such as obesity status and dietary diversity, physical activity levels, and comorbidities. This allowed for the identification of significant relationships between these factors. For continuous variables, independent samples t-tests were conducted, particularly to compare sedentary behavior between obese and non-obese participants. Correlation analyses, likely using Pearson's correlation coefficient, were performed to assess relationships between biochemical indicators and BMI at different time points, providing insights into the strength and direction of these associations.

Longitudinal Analysis and Regression Modelling

A key strength of this study was its longitudinal design, collecting data at three-time points: baseline, midline, and end-line. This allowed for the tracking of changes in variables over time, providing a dynamic view of the factors associated with overweight and obesity. To further explore the complex relationships between variables, multiple logistic regression analyses were employed. These models investigated the influence of sociodemographic factors on BMI at each time point, controlling for multiple variables simultaneously. The researchers reported standardized coefficients, significance levels, and collinearity diagnostics, ensuring a thorough examination of the predictors' effects on BMI.

Visual Representations

To enhance the interpretation and presentation of results, the researchers utilized various visual representations. Bar charts and histograms were used to visualize distributions of different factors, while box plots were employed to display the distribution of dietary diversity scores. These visual aids complemented the numerical results, making the findings more accessible. While not explicitly mentioned, the types of analyses performed suggest the use of advanced statistical software such as SPSS, SAS, or R.

Statistical Significance and Multicollinearity

Throughout the analysis, a p-value of less than 0.05 was generally considered statistically significant, aligning with common practices in health research. In the regression analyses, particular attention was paid to potential multicollinearity issues. The researchers reported collinearity diagnostics, including Tolerance and Variance Inflation Factor (VIF), ensuring the reliability of their regression models.

Data Quality Control

Validity

Validity refers to the extent to which a research instrument measures what it is intended to measure.

Instrument Validation

Structured Questionnaires: The questionnaires used for data collection will be based on established and validated instruments such as the IPAQ and the Household Dietary Diversity Score. Modifications or adaptations will be made with careful consideration to maintain validity.

Anthropometric Measurements: Standard operating procedures (SOPs) for anthropometric measurements will be followed, and the measurement tools (height board, weighing scale, tape measure, sphygmomanometer, stethoscope) will be calibrated regularly to ensure accuracy.

Pilot Testing

A pilot study will be conducted with a small sample of PLWHIV to test the feasibility and validity of the data collection tools and procedures. Feedback from the pilot study will be used to refine the instruments and improve the overall data collection process.

Expert Review

The research instruments and data analysis plan will be reviewed by experts in the field of HIV/AIDS and nutrition at Uganda Christian University to ensure the validity of the research design and methodology.

Participant Selection:

Purposive sampling for the qualitative component will be used to select participants with diverse experiences and

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perspectives, enhancing the richness and validity of the qualitative data.

Member Checking

Key findings from the qualitative data will be shared with participants to verify their accuracy and ensure that the interpretations align with their experiences.

Reliability

Reliability refers to the consistency and stability of research findings over time and across different observers or measurements. In this study, the following strategies will be employed to ensure the reliability of the data:

Standardized Procedures

Data Collection: Detailed standard operating procedures (SOPs) will be developed for all data collection methods (interviews, anthropometric measurements, biochemical assessments, dietary assessments). These SOPs will outline step-by-step instructions to ensure consistency in how data is collected across participants.

Data Coding: A codebook will be developed for the qualitative data to ensure consistent coding practices during the research. The codebook will define each code and provide examples from the data to guide the coding process.

Anthropometric Measurements: An effort will be taken to independently take measurements on a subset of participants to assess inter-rater reliability for anthropometric data. Any discrepancies will be discussed and addressed to ensure consistency in measurement techniques.

Training and Calibration

Research assistants: All research assistants involved in data collection will undergo comprehensive training on the study protocol, data collection procedures, and the use of measurement tools. This will ensure that they are familiar with the study methods and can apply them consistently.

Equipment: All measurement tools (weighing scale, sphygmomanometer, glucometer, CardioChek device) will be regularly calibrated to ensure their accuracy and reliability over time.

Pilot Testing

A pilot study will be conducted to test the reliability of the data collection tools and procedures. The results of the pilot study will be used to refine the methodology and address any inconsistencies or issues before the main data collection phase.

Ethical considerations

To ensure the ethical conduct of this study, the following principles will be strictly adhered to:

Informed Consent: All participants will be provided with clear and comprehensive information about the study's purpose, procedures, potential risks and benefits, and their right to withdraw at any time without consequences. Written informed consent will be obtained from each participant before enrolment.

Confidentiality: All participant data will be kept confidential and anonymous. Personal identifiers will be removed from data records, and data will be stored securely to protect participant privacy.

Beneficence: The study will strive to maximize benefits and minimize any potential harm to participants. Participants will be offered information about available resources for weight management and will be referred to appropriate healthcare providers if any health concerns arise during the study.

Respect for Autonomy: Participants' right to make autonomous decisions about their participation will be respected throughout the study. They will be free to decline to answer any questions or participate in any procedures that they feel uncomfortable with.

Justice: Participant selection will be fair and equitable, and the study will strive to avoid any discrimination or bias based on age, gender, socioeconomic status, or other factors.

Ethical Review: The study protocol has been reviewed and approved by the relevant ethics committee to ensure that it adheres to all ethical guidelines and regulations for research involving human subjects.

Data Integrity: Data will be collected and analyzed with the utmost integrity and transparency. The study findings will be reported accurately and honestly, without fabrication or falsification of data.

Ethical Review and Approval

The study protocol will be reviewed by the Uganda Christian University Institutional Research and Ethics Committee. Upon approval, permission will be sought from the District Health Offices. An introductory and approval letter from Mild May Institute of Health Sciences affiliated with Uganda Christian University will also be presented to Kajjansi Health Centre IV authorities. Potential participants will be informed of the study's voluntary nature and purpose. Written informed consent, detailing study procedures, risks, benefits, and the right to withdraw, will be obtained from each participant prior to data collection.

Results

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Table 1. Sociodemographic characteristics of participants

Variable	Frequency (n)	Percentage (%)	Mean (±SD)
Age (years)	50	100	45.82 (±10.50)
Household size	50	100	4.56 (±2.18)
Gender			
Female	41	82.0	
Male	9	18.0	
Highest level of education			
Tertiary certificate/University	15	30.0	
Secondary school certificate	14	28.0	
Primary Seven	16	32.0	
None	5	10.0	
Current employment status			
Employed	37	74.0	
Not employed	11	22.0	
Student	2	4.0	
Occupation Group			
Volunteer Work and Miscellaneous	12	24.0	
Food Services	8	16.0	
Manual Labor	3	6.0	
Business and Services	13	26.0	
Education	4	8.0	
Healthcare	10	20.0	

Figure 1. Shows the Gender distribution

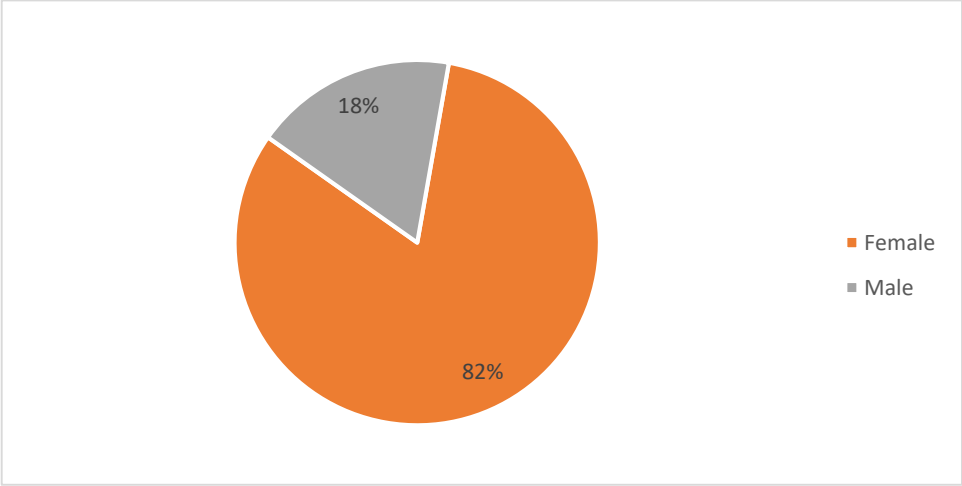

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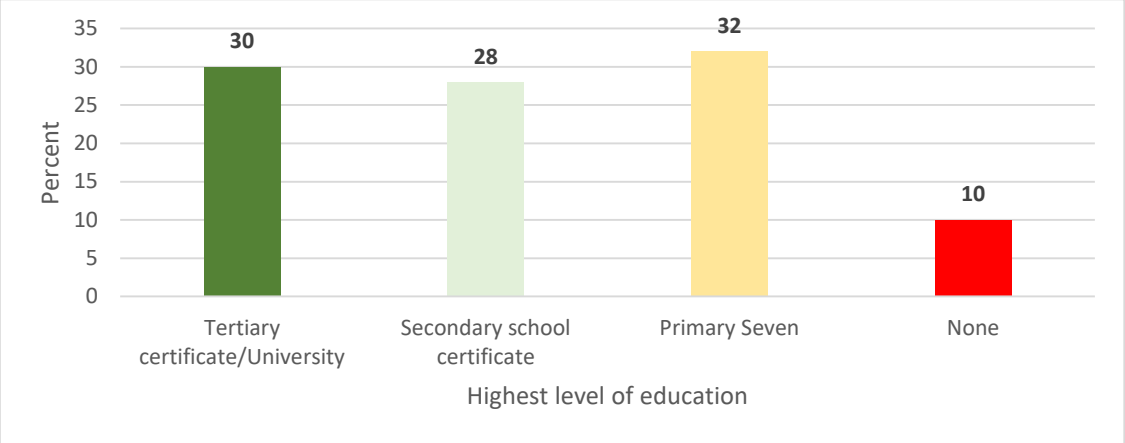
Figure 2. Shows the highest level of education distribution



The sociodemographic characteristics of the study participants are presented in Table 1. The sample consisted of 50 individuals with a mean age of 45.82 years (SD = 10.50). The average household size was 4.56 members (SD = 2.18).

Gender distribution showed a predominance of female participants, with 82% (n = 41) being female and 18% (n = 9) see Figure 1 being male. Educational attainment varied among the participants, with the majority having completed primary education (32%, n = 16) or obtained a tertiary certificate/university degree (30%, n = 15). A smaller proportion had completed secondary school (28%, n = 14), while 10% (n = 5) reported no formal education.

Regarding employment status, nearly three-quarters of the participants (74%, n = 37) were employed at the time of the study. The remaining participants were either not employed (22%, n = 11) or students (4%, n = 2). Among those employed, the most common occupational groups were business and services (26%, n = 13), volunteer work and miscellaneous (24%, n = 12), and healthcare (20%, n = 10). Food services accounted for 16% (n = 8) of the participants' occupations, while education and manual labor represented smaller proportions at 8% (n = 4) and 6% (n = 3), respectively. Association between behavioral factors and overweight/obesity

Association between Obesity Status and Dietary Diversity across timelines

The association between obesity status and dietary diversity was examined across three-time points using chi-square tests of independence (Table 2 and Figure 3).

Table 2. Association between Obesity Status and Dietary Diversity across timelines

	Obesity Status	Low Dietary Diversity Score	Moderate Dietary Diversity Score	High Dietary Diversity Score	Total	Chi-Square Value	df	p-value
Baseline	Overweight or Obese	4 (100.0%)	22 (71.0%)	14 (93.3%)	40 (80.0%)	4.247	2	0.120
	Not Overweight or Obese	0 (0.0%)	9 (29.0%)	1 (6.7%)	10 (20.0%)			
	Total	4 (100.0%)	31 (100.0%)	15 (100.0%)	50 (100.0%)			
Midline	Overweight or Obese	4 (100.0%)	23 (74.2%)	13 (86.7%)	40 (80.0%)	2.070	2	0.355
	Not Overweight or Obese	0 (0.0%)	8 (25.8%)	2 (13.3%)	10 (20.0%)			
	Total	4 (100.0%)	31 (100.0%)	15 (100.0%)	50 (100.0%)			
End line	Overweight or Obese	4 (100.0%)	23 (74.2%)	13 (86.7%)	40 (80.0%)	2.070	2	0.355
	Not Overweight or Obese	0 (0.0%)	8 (25.8%)	2 (13.3%)	10 (20.0%)			
	Total	4 (100.0%)	31 (100.0%)	15 (100.0%)	50(100.0%)			

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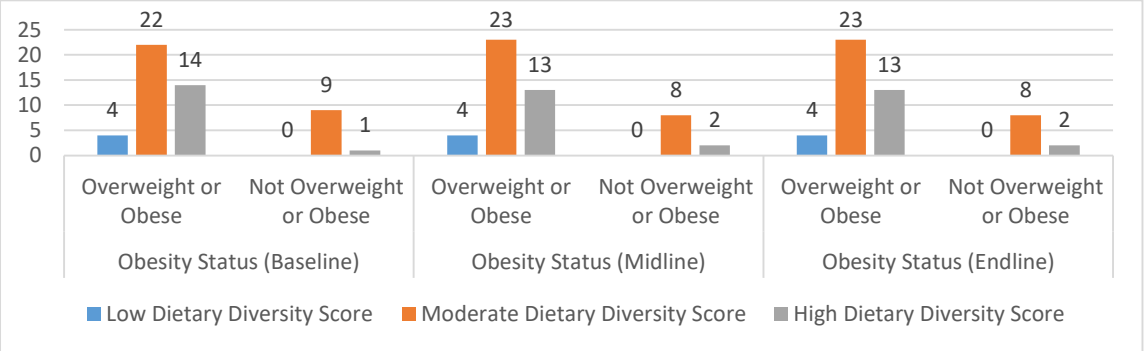
Figure 3. Obesity status across timelines



At baseline, 80.0% (n = 40) of participants were classified as overweight or obese. Among those with low dietary diversity, 100.0% (n = 4) were overweight or obese, compared to 71.0% (n = 22) of those with moderate dietary diversity and 93.3% (n = 14) of those with high dietary diversity. However, this association was not statistically significant ($\chi^2 = 4.247$, df = 2, p = 0.120).

Similar patterns were observed at the midline and end line. At both time points, 80.0% (n = 40) of participants remained overweight or obese. The distribution across dietary diversity categories showed slight variations, with 100.0% (n = 4) of those with low dietary diversity, 74.2% (n = 23) with moderate dietary diversity, and 86.7% (n = 13) with high dietary diversity being overweight or obese. However, these associations were also not statistically significant ($\chi^2 = 2.070$, df = 2, p = 0.355 for both midline and end lines).

Throughout the study period, the proportion of participants who were not overweight or obese remained constant at 20.0% (n = 10). Notably, none of the participants with low dietary diversity were in the not overweight or obese category across all time points.

Association between physical activity levels and overweight/obesity status

The association between physical activity levels and overweight/obesity status at baseline was examined using a chi-square test of independence (Table 3, Figure 4).

Table 3. Association between physical activity levels (Baseline) and overweight/obesity status

		Overweight/Obesity status (Baseline)				Total		Chi-Square	df	p-value
		Not Overweight or Obese		Overweight or Obese						
		n	%	n	%	n	%	1.083[a]	2	0.582
Physical activity level (Baseline)	High	8	80.0%	26	65.0%	34	68.0%			
	Moderate	1	10.0%	10	25.0%	11	22.0%			
	Low	1	10.0%	4	10.0%	5	10.0%			
Total		10	100.0%	40	100.0%	50	100.0%			

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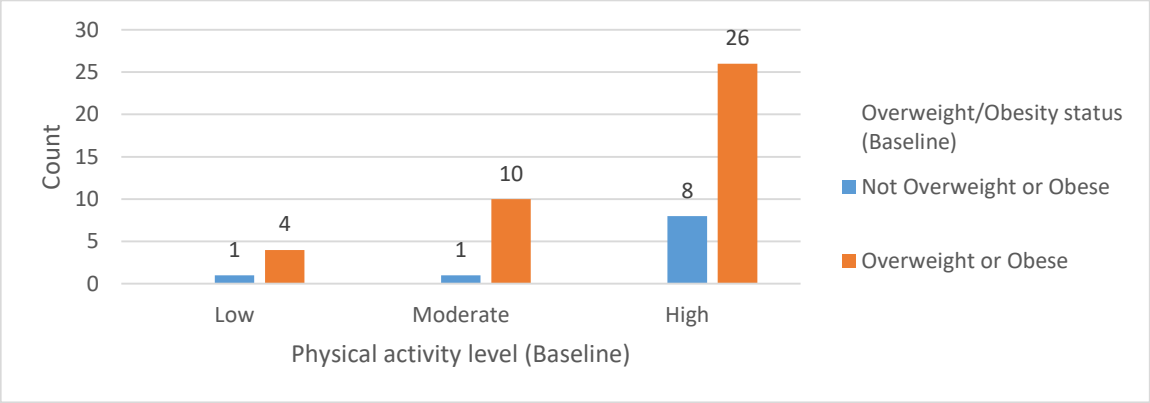
Figure 4. Association between physical activity levels (Baseline) and overweight/obesity status



Among participants classified as not overweight or obese, the majority (80.0%, n=8) reported high physical activity levels, while 10.0% (n=1) each reported moderate and low activity levels. For those categorized as overweight or obese, 65.0% (n=26) exhibited high physical activity levels, 25.0% (n=10) moderate levels, and 10.0% (n=4) low levels.

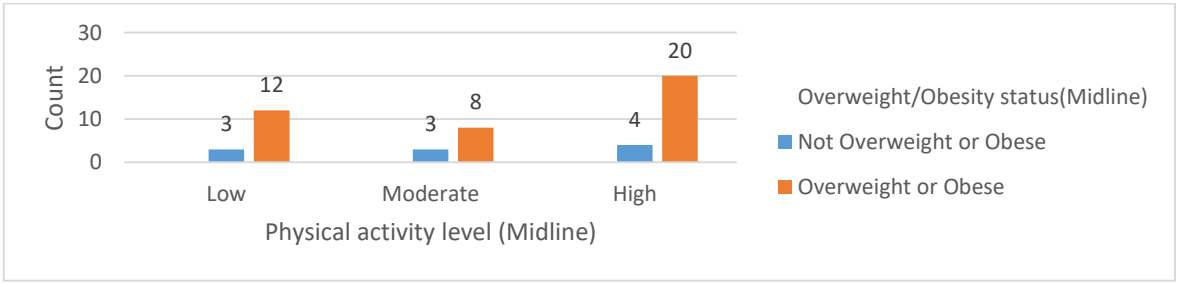
Overall, high physical activity was the most prevalent category across both weight status groups, with 68.0% (n=34) of all participants falling into this category. Moderate activity levels were observed in 22.0% (n=11) of participants, while 10.0% (n=5) reported low activity levels. Despite these observed differences, the chi-square analysis revealed no statistically significant association between physical activity levels and overweight/obesity status ($\chi^2 = 1.083$, df = 2, p = 0.582).

The bar chart (Figure 4) visually represents these findings, illustrating the distribution of physical activity levels within each weight status category.

Table 4. Association between physical activity levels (Midline) and overweight/obesity status

		Overweight/Obesity status (Midline)				Total		**Chi-Square Tests**		
		Not Overweight or Obese		Overweight or Obese				Value	df	Asymptotic Significance (2-sided)
		n	%	n	%	n	%			
Physical activity level (Midline)	High	4	40.0%	20	50.0%	24	48.0%	.530[a]	2	0.767
	Moderate	3	30.0%	8	20.0%	11	22.0%			
	Low	3	30.0%	12	30.0%	15	30.0%			
Total		10	100.0%	40	100.0%	50	100.0%			

Figure 5. Association between physical activity levels (Midline) and overweight/obesity status



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The relationship between physical activity levels and overweight/obesity status at the midline was analyzed using a chi-square test of independence (Table 4, Figure 5). Among participants not classified as overweight or obese, 40.0% (n=4) reported high physical activity levels, while 30.0% (n=3) each reported moderate and low activity levels. For those categorized as overweight or obese, 50.0% (n=20) exhibited high physical activity levels, 20.0% (n=8) moderate levels, and 30.0% (n=12) low levels.

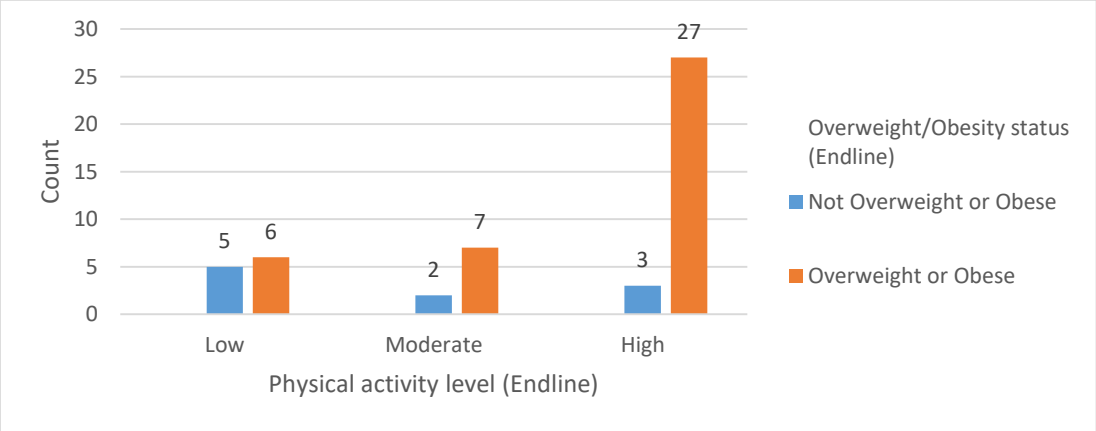
Overall, high physical activity remained the most common category across both weight status groups, with 48.0% (n=24) of all participants falling into this category. Low activity levels were observed in 30.0% (n=15) of participants, while 22.0% (n=11) reported moderate activity levels. The chi-square analysis revealed no statistically significant association between physical activity levels and overweight/obesity status at the midline ($\chi^2 = 0.530$, df = 2, p = 0.767).

The bar chart (Figure 5) visually represents these findings, illustrating the distribution of physical activity levels within each weight status category at the midline.

Table 5. Association between physical activity levels (End line) and overweight/obesity status

		Overweight/Obesity status (Endline)				Total		Chi-Square Tests		
		Not Overweight or Obese		Overweight or Obese				Value	df	Asymptotic Significance (2-sided)
		n	%	n	%	n	%			
Physical activity level (Endline)	High	3	30.0%	27	67.5%	30	60.0%	6.357[a]	2	0.042
	Moderate	2	20.0%	7	17.5%	9	18.0%			
	Low	5	50.0%	6	15.0%	11	22.0%			
Total		10	100.0%	40	100.0%	50	100.0%			

Figure 6. Association between physical activity levels (End line) and overweight/obesity status



The association between physical activity levels and overweight/obesity status at the end line was examined using a chi-square test of independence (Table 5, Figure 6). Among participants not classified as overweight or obese, 50.0% (n=5) reported low physical activity levels, 30.0% (n=3) high levels, and 20.0% (n=2) moderate levels. For those categorized as overweight or obese, the majority (67.5%, n=27) exhibited high physical activity levels, while 17.5% (n=7) reported moderate levels and 15.0% (n=6) low levels.

Overall, high physical activity remained the most prevalent category, with 60.0% (n=30) of all participants falling into this group. Low activity levels were observed in 22.0% (n=11) of participants, while 18.0% (n=9) reported moderate activity levels. The chi-square analysis revealed a statistically significant association between physical activity levels and overweight/obesity status at the end line ($\chi^2 = 6.357$, df = 2, p = 0.042).

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The bar chart (Figure 6) visually represents these findings, illustrating the distribution of physical activity levels within each weight status category at the end line.

Sedentary Behaviour

Based on the data presented in Tables 4.6, 4.7, and 4.8, an independent samples t-test was conducted to examine the association between minutes spent sitting and obesity status at three-time points: baseline, midline, and end line.

Table 6. Association between minutes spent sitting (baseline) and obesity status

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Minutes per day spent sitting on a weekday (Baseline)	Equal variances assumed	4.835	.033	-.437	48	.664	-23.250	53.231	-130.278	83.778
	Equal variances are not assumed.			-.640	29.234	.527	-23.250	36.324	-97.514	51.014

At baseline (Table 6), Levene's test indicated unequal variances (F = 4.835, p = .033), so the results for unequal variances were interpreted. The analysis revealed no significant difference in minutes spent sitting between obese and non-obese participants, t(29.234) = -0.640, p = .527. The mean difference of -23.250 minutes (95% CI [-97.514, 51.014]) suggested that obese participants spent slightly more time sitting, but this difference was not statistically significant.

Table 7. Association between minutes spent sitting (Midline) and obesity status

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Minutes per day spent sitting on a weekday (Midline)	Equal variances assumed	.509	.479	-.833	48	.409	-39.250	47.099	-133.949	55.449
	Equal variances are not assumed.			-.883	14.941	.391	-39.250	44.461	-134.049	55.549

For the midline assessment (Table 7), equal variances were assumed (F = 0.509, p = .479). The t-test results showed no significant difference in sitting time between obese and non-obese participants, t(48) = -0.833, p = .409. The mean difference of -39.250 minutes (95% CI [-133.949, 55.449]) indicated a trend towards obese participants spending more time sitting, but this difference did not reach statistical significance.

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Table 8. Association between minutes spent sitting (End line) and obesity status

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Minutes per day spent sitting on a weekday (Endline)	Equal variances assumed	.111	.741	-1.009	48	.318	-44.000	43.595	-131.654	43.654
	Equal variances are not assumed.			-.982	13.430	.343	-44.000	44.787	-140.443	52.443

At the end line (Table 8), Levene's test again indicated equal variances (F = 0.111, p = .741). The t-test results showed no significant difference in sitting time between obese and non-obese participants, t(48) = -1.009, p = .318. The mean difference of -44.000 minutes (95% CI [-131.654, 43.654]) suggested that obese participants spent more time sitting, but this difference was not statistically significant.

Discussion

The study explored the association between behavioral factors and overweight/obesity among people living with HIV (PLWH) at Kajjansi Health Centre IV and yielded several important findings. The results indicate no statistically significant association between dietary diversity and obesity status across the study timeline. However, all participants with low dietary diversity were consistently classified as overweight or obese. Regarding physical activity, no significant association with obesity status was found at baseline and midline, but a statistically significant association emerged at the end line (p = 0.042). Interestingly, a higher proportion of overweight or obese participants reported high physical activity levels compared to those not overweight or obese. The analysis of sedentary behavior showed no significant differences in sitting time between obese and non-obese participants across all time points, although there was a trend toward obese participants spending more time sitting.

These findings suggest a complex interplay between behavioral factors and obesity status among PLWH. The lack of a clear linear relationship between dietary diversity and obesity status challenges simplistic assumptions about diet and weight. The emergence of a significant association between physical activity and obesity status only at the end line indicates a potential time-dependent effect or the influence of other factors not captured in the study. The unexpected pattern of higher reported physical activity among overweight/obese participants raises questions about the nature of this relationship and the potential influence of confounding variables.

Comparing these results with previous research reveals both similarities and differences. The lack of association between dietary diversity and obesity status contrasts with studies like Kiyimba et al. (2022) in Wakiso District, Uganda, which found a high prevalence of overweight and obesity among PLWH. This discrepancy might be due to differences in sample size, specific population characteristics, or the complexity of factors influencing weight status in PLWH. The observation that all participants with low dietary diversity were overweight or obese aligns with literature suggesting a shift towards increased consumption of processed foods and unhealthy fats after ART initiation (Lake et al., 2020).

The varying patterns of association between physical activity and obesity status across the study timeline partially support the literature emphasizing the importance of physical activity in weight management among PLWH (Malaza et al., 2012). However, the higher reported physical activity levels among overweight/obese participants at the end line is an unexpected finding that warrants further investigation. This could reflect increased efforts at weight management among this group or limitations in self-reported physical activity measures.

The lack of a significant association between sedentary behavior and obesity status differs from some previous research in the general population. This suggests that the relationship between sedentary behavior and obesity may be more complex in PLWH, possibly due to the influence of HIV-specific factors such as medication effects or metabolic changes associated with the infection.

These findings have important implications for understanding and addressing obesity among PLWH in

Uganda. Theoretically, they challenge simplistic models of obesity that focus solely on diet and exercise, highlighting the need for more nuanced frameworks that account for the unique physiological and social contexts of PLWH. The results suggest that the relationships between behavioral factors and obesity in this population may be non-linear and influenced by multiple interacting variables.

Practically, these findings indicate that healthcare providers and public health interventions should adopt multifaceted approaches to address obesity among PLWH. While promoting dietary diversity and physical activity remains important, interventions may need to be tailored to address the specific barriers and facilitators of healthy weight management in this population. For example, nutrition education programs should consider both the quantity and quality of dietary diversity, potentially focusing on increasing consumption of nutrient-dense foods rather than simply increasing variety. The significant association between physical activity and obesity status at the end line, coupled with the unexpected pattern of higher activity levels among overweight/obese participants, highlights the need for targeted physical activity interventions. These interventions should address potential barriers to effective exercise, such as fatigue or physical limitations, which have been identified in previous research (Malaza et al., 2012).

This study provides valuable insights into the complex relationships between behavioral factors and obesity among PLWH in Uganda. The findings contribute to a clearer understanding of the unique challenges in weight management for this population and underscore the need for comprehensive, context-specific approaches to obesity prevention and management. Future research should build on these results to develop more sophisticated models of obesity risk in PLWH and to design evidence-based interventions that account for the multifaceted nature of weight management in this vulnerable population.

Conclusion

This study revealed complex relationships between behavioral factors and overweight/obesity among PLWH at Kajjansi Health Centre IV. Key findings include no significant association between dietary diversity and obesity status, a significant association between physical activity and obesity status only at the end line, and no significant relationship between sedentary behavior and obesity. These results challenge simplistic models of obesity in PLWH and highlight the need for a multifaceted approach to weight management, focusing on both dietary quality and physical activity promotion. The findings suggest that future research should focus on longitudinal studies to better understand the temporal dynamics of behavioral factors and weight changes in PLWH, potentially leading to more targeted and effective interventions.

This study acknowledges several limitations inherent in its design and methodology:

Cross-sectional Design: The cross-sectional nature precludes the establishment of causal relationships, limiting the ability to determine if identified factors directly cause overweight/obesity.

Self-Reported Data: Reliance on self-reported data, such as weight history and dietary recall, may introduce recall and social desirability biases, potentially affecting the accuracy of information.

Generalizability: Findings may not be fully generalizable beyond the specific PLWH population at Kajjansi Health Centre IV due to potential variations in demographics, healthcare access, and cultural practices.

Study Duration: The three-month study period may not capture seasonal variations in diet or fluctuations in weight management behaviors.

External Factors: Unforeseen events like policy changes or health crises could influence outcomes but are beyond the researcher's control.

Recommendation

There should be practical interventions that include tailored nutritional counseling and physical activity programs that consider unique sociocultural contexts.

Regular comprehensive metabolic health monitoring should be implemented for all PLWH, regardless of weight status, including lipid profile assessments.

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List of Abbreviations

AIDS: Acquired Immunodeficiency Syndrome
ART: Antiretroviral Therapy
BMI: Body Mass Index
HIV: Human Immunodeficiency Virus
IPAQ: International Physical Activity Questionnaire
PLWH: People Living With HIV/AIDS
SOPs: Standard operating procedures

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Conflict of interest

No conflict of interest declared

Author Biography

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