

Knowledge about modifiable risk factors for non-communicable diseases adults living with HIV in Rwanda

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Abstract

Background: Non-communicable diseases (NCD) are of international public health concern. Of more concern are people living with HIV (PLHIV), who have the increased risk of developing NCDs, such as hypertension, stroke and diabetes. Research has revealed that there is a relationship between knowledge of NCD risk factors and risk perceptions in the general population. Therefore, an assessment of PLHIV's NCD risk factors knowledge is quite critical, to design effective NCD prevention programmes.

Objective: To assess the level of knowledge of modifiable risk factors for NCDs and its associated factors among adults living with HIV in Rwanda.

Methods: A cross-sectional quantitative design was used to collect the data. The study targeted PLHIV who visited the out-patients' public health centres in three purposively selected provinces of Rwanda. The knowledge assessment questionnaire relating to risk factors for chronic diseases of lifestyle was used to collect the data. Data were analysed using SPSS version 23.

Results: Of the 794 respondents, 64.6% were women, and the mean age was 37.9 (± 10.8) years. The results revealed that the majority of the respondents (65.0%) had low levels of knowledge about NCD risk factors, while some (35.6%) were of the opinion that they had a low risk of contracting NCDs. Good knowledge was significantly associated with high educational status, a low CD4+ cell count (< 350 cells/mm³) and normotension.

Conclusion: The current study findings highlight the need for comprehensive health education, to raise awareness of non-communicable diseases' risk factors for adults living with HIV in Rwanda.

Keywords: Non-communicable diseases, Risk factors, HIV infection, Knowledge, Rwanda.

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Introduction

The burden of non-communicable diseases (NCDs), and their associated risk factors, continue to increase in Af-

rican countries, due to the process of ageing, rapid unplanned urbanisation, and the globalisation of unhealthy lifestyles^{1,2}. Simultaneously, the life expectancy of those infected with HIV has increased dramatically, as a result of combination antiretroviral therapy (cART)³. Therefore, people living with HIV (PLHIV) may live longer, but with the increasing rates of non-HIV chronic diseases. The excess risk of NCDs in PLHIV is attributable to chronic inflammation, immune activation associated with HIV infection, opportunistic infections, certain ART drug side-effects, and traditional risk factors, such as tobacco use, hypertension, diabetes, and hyperlipidaemia⁴. Additionally, most previous studies have revealed

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that NCDs, especially cardiometabolic diseases (CMDs), such as hypertension, stroke and diabetes, are more prevalent in person living with HIV, than uninfected individuals^{5,6}. This is also complemented by other researchers who found that adult PLHIV will be twice as likely to suffer from at least one key NCD in 2035 compared with uninfected adults². While Chhoun et al.⁷ found that the prevalence of diabetes mellitus, hypertension and hypercholesterolemia in adults living HIV in Cambodia was considerably high. Another study by Biraguma, Mutimura and Frantz⁸ determined the association between physical and mental health-related dimension of quality of life with behavioural and biological risk factors in adults living with HIV in Rwanda. The authors found that behavioural and biological risk factors for NCDs were significantly associated with a lower health-related quality of life. These studies indicate the need for more research, to understand the determinants of NCDs in this population. Therefore, the identification of these determinants may help to develop targeted NCD interventions and policies in PLHIV.

Various studies have identified numerous predictors of NCD risk factors in non-HIV+ subjects, including the knowledge about risk factors⁹⁻¹¹. In addition, as demonstrated by various researchers, there is a relationship between the knowledge of NCD risk factors and risk perceptions in non-HIV+ subjects^{12,13}. Along with the health belief model (HBM), people may adopt preventive health behaviours, if they perceive themselves at risk for NCDs, and are aware the serious consequences of NCDs on their health¹⁴. In this vein, a study, aimed at exploring the level of knowledge and perceptions of type 2 diabetes (T2D) mellitus, was conducted in Rwanda¹⁵. The authors concluded that the respondents' knowledge and perceptions of T2D mellitus were poor and inadequate, and deemed improving their knowledge and risk perceptions of type T2D mellitus, as important. However, very few studies are available to confirm this association in PLHIV. Cioe, Crawford and Stein¹⁶ conducted a study to describe cardio-vascular disease (CVD) risk factor knowledge and risk perception in HIV+ adults. The results indicated that CVD risk factor knowledge was adequate, but risk perception was inaccurate. These findings have been confirmed in another study conducted in Kenya¹⁷. On the other hand, a recent study conducted in Tanzania found that the level of knowledge among PLHIV on type 2 diabetes and hypertension and their associated risks and

complications was generally low¹⁸. However, NCD risk factors knowledge in PLHIV remains unknown in other Sub-Saharan African (SSA) countries, including Rwanda. Therefore, it is evident that researchers in Rwanda cannot base their interventions entirely on information from the other countries, since interventions need to be context-specific. Again, understanding the influence of psychosocial factors will complement the STEPS data and will help researchers to reach a better understanding of NCDs in PLHIV. In this regard, the current study aimed to assess the level of knowledge of modifiable risk factors for NCDs and its associated factors among adults living with HIV in Rwanda.

Methods

Study setting and design

A cross-sectional quantitative design was employed to collect the data. This current study was conducted in randomly selected public health centres, in three purposively selected provinces, namely Kigali City, Southern and Eastern provinces of Rwanda, in out-patient HIV clinics that provide HIV services.

Sample and inclusion criteria

The study targeted PLHIV who visited the out-patients' public health centres to receive ARV drugs, health care consultations, counseling supports as well as those who need laboratory testing and those who needed assessment of their CD4 cell counts. The inclusion criteria for PLHIV were all adult males and females aged over 18 years who were able to provide written informed consent. Both HIV+ on ART patients and HIV+ ART naïve patients were included.

A multi-stage sampling frame was employed. Multi-stage sampling was chosen for this study since a list of all PLHIV in Rwanda was not available. Additionally, a non-probability sampling method was used for the selection of rural and urban residents. For this reason, purposive sampling of two provinces; the Southern and Eastern provinces (represent rural) and Kigali City was selected. Each province (big cluster) contains a number of districts (small clusters) and each district contains health centres (sub-clusters). In this case, purposive sampling referred to a selection of the sample based on the researcher's knowledge of the population, its elements, and the nature of the research's aim. This was followed by a simple random selection of one district from each of the selected provinces, and two districts from Kigali City. This

was again followed by purposive sampling of all health centres that offer HIV care and treatment in each selected district was done, followed by a simple random sampling of one health centre in each selected district.

The study participants were selected by using a systematic random sampling technique. Patients' registers at the selected health centres was used to create sampling frames of all eligible patients per health centre. Sample size calculation was based on the relative contribution of eligible participants identified in each selected health centre. In this case, sample size estimation was determined using the formula $n = Z^2 P (1-P) / d^2$ 19. The representative sample size of PLHIV was 806. The weighting method was applied to avoid a biased estimate of the population, as the majority of PLHIV in Rwanda, live in an urban area.

Ethical considerations

Ethical clearance was obtained from the relevant authorities at the University of the Western Cape (Registration no: 13/6/34), and permission was obtained from the relevant Rwandan committees (MINEDUC/S&/263/214, NHRC/2014/PROT/0133, 248/RNEC/2014). Written informed consent was obtained from the participants, before completing the questionnaires, and prior to accessing their medical records. Participation was free and voluntary. The respondents were assured of complete confidentiality throughout of the study, and their names were kept anonymous.

Data collection instrument

Knowledge about risk factors for NCDs was assessed with an adapted, validated and reliable knowledge assessment questionnaire about risk factors for chronic diseases of lifestyle^{17,20}. The questionnaire comprised various sections of questions: five questions on hypertension; 11 questions on diabetes; and 10 questions on stroke, and the respondents could obtain a maximum score of 5, 11, and 10, respectively, with a total score of 26 correct answers. Specifically, lifestyle changes, risk factors, as well as signs and symptoms were covered in this questionnaire. The reliability and validity of the knowledge assessment questionnaire, relating to the risk factors for chronic lifestyle diseases, have been reported to be appropriate. According to Frantz¹⁷, the knowledge assessment questionnaire has good, acceptable psychometric properties, with a Cronbach Alpha coefficient of .80.

Procedure for data collection

Once permission was obtained, the researcher conducted initial visits to selected health centres, to interact with the health centre heads and the out-patient HIV clinic staff, regarding the research's interests and purpose, and to request their permission for the study. The researcher and a team of four research assistants visited selected health centres, on different days, between November 2014 and June 2015, based on a fixed schedule, which had been arranged between the researcher and the health centre administrative staff, until the sample size, required at each selected health centre, was reached. On each day of the data collection, the researcher introduced the research assistants to the respondents, prior to explaining the purpose of the study to them, after which the respondents voluntarily participated, or abstained from participating. Data collection began by obtaining informed written consent from the participants. Information related to HIV data such as duration of awareness of HIV diagnosis, CD4 cell count, ART status, duration on ART, type of ART regimen, and adherence to ART were collected from the participants' medical/clinical records to ensure the accuracy of the information. The questionnaire was administered by well-trained research assistants, who engaged in face-to-face interaction to gather the information from the respondents. In addition, the anthropometric measurements such as weight, height, waist and hip circumference, and BP were taken based on the WHO stepwise approach for the investigation of NCDs risk factors²¹.

Data analysis

Data entry and statistical analysis were performed using the statistical Package for the Social Sciences (SPSS) version 23. Descriptive statistics for all variables were generated. Continuous variables were summarised with mean and standard deviations. Additionally, categorical variables were summarised with frequencies and percentages. The data were presented in the form of tables. In the bivariate analysis, a Chi-square test for independence was used to demonstrate the association between socio-demographic characteristics such as age and levels of knowledge of risk factors for NCDs, at the 0.05 level of significance.

Results

A total number of 806 PLHIV were approached in the four selected health centres, and 794 respondents

consented to participate, yielding a response rate of 98.5%. The mean age of the respondents was 38 years (SD=10.8), and the ages ranged from 18 years to 70 years, while women accounted for 64.6% of the population (n=513). Overweight or obese respondents (BMI \geq 25 kg/m²) comprised 18.4%; male participants with a waist-hip-ratio (WHR) \geq 0.95, comprised 15.6%, while female participants with a WHR \geq 0.85, totalled 58.8%. Respondents with high blood pressure (systolic blood pressure \geq 140 mmHg, or diastolic blood pressure \geq 90 mmHg) totalled 24.4%.

Knowledge of modifiable risk factors for non-communicable diseases

In Table 1, the frequencies and percentages of individual items, for general knowledge of the risk factors for NCDs, are presented. The majority of the respondents (90.4%)

had heard of diabetes, and 75.7% of them perceived that NCDs could be prevented, whereas more than 65% reported that they had never heard of a stroke. The perception that obesity could result in contracting an NCD, was the most frequently reported risk (71.2%), followed by unbalanced diet (56.9%), while factors least considered to contribute to NCDs, were alcohol consumption and physical inactivity (15.2% and 17.1%, respectively). Additionally, the respondents were asked to agree, or disagree, with various statements relating to their perceptions of NCDs. More than 65% of the respondents were worried about having NCDs, while some (35.6%) believed that they had a low risk of contracting NCDs. Less than half (46.5%) of the subjects reported that they were confident about controlling the risk of contracting NCDs. Only 21.7% of the respondents reported that they had information on how to prevent NCDs.

Table 1: Frequency and percentage of participants who answered ‘yes’ on general knowledge about NCDs (N=794)

Items	n (%)
Ever heard of NCDs?	521(65.6)
Ever heard of stroke?	270 (34.0)
Ever heard of hypertension?	685 (86.3)
Ever heard of diabetes?	718 (90.4)
Can an NCD be prevented?	601 (75.7)
Have you been taught in a health centre about NCDs?	694 (87.4)
Factors that contribute to NCDs	
Smoking	424 (53.4)
Physical inactivity	136 (17.1)
Obesity	565 (71.2)
Unbalanced diet	452 (56.9)
Alcohol	121 (15.2)
Stress	361 (45.5)
Perception of NCDs	
Compared to others my age and sex, I am at lower risk of NCD	283 (35.6)
I worry about having NCD	518 (65.2)
I think my personal effort will help control my risk of having NCD	369 (46.5)
I have information on how to prevent NCD	172 (21.7)

In Table 2, the classification of knowledge for each individual section, as well as the overall knowledge score are presented. Regarding the individual sections of the questionnaire, a mean score of 3.68 ± 1.492 was observed for the hypertension section, 5.24 ± 3.475 for the diabetes section, and 2.76 ± 1.659 for the stroke section. With ref-

erence to the overall score for the knowledge questionnaire, the mean score was observed to be 10.91 ± 5.572 (42%), with a range of 1-26 of possible value. The majority of the respondents, namely, 518 (65.2%), had poor knowledge, 223 (28.1%) had average knowledge, while only a few, 53 (6.7%), had good knowledge.

Table 2: Distribution of the classification of the knowledge for each individual section and overall knowledge score (N=794)

Knowledge Level	n (%)
Hypertension	
Poor knowledge <50% (0-2.4/5)	173 (21.8)
Average knowledge 51-70% (2.5-3.5/5)	137 (17.3)
Good knowledge > 70% (3.6-5/5)	484 (61.0)
Diabetes	
Poor knowledge <50% (0-5.4/11)	425 (53.5)
Average knowledge 51-70% (5.5-7.7/11)	118 (14.9)
Good knowledge > 70% (7.8-11/11)	251 (31.6)
Stroke	
Poor knowledge <50% (0-4.9/10)	644 (81.1)
Average knowledge 51-70% (5-7/10)	150 (18.9)
Good knowledge > 70% (7.1-10/10)	0 (0.0)
Overall knowledge	
Poor knowledge <50% (0-12/26)	518 (65.2)
Average knowledge 51-70% (13-18/26)	223 (28.1)
Good knowledge > 70% (19-26/26)	53 (6.7)

Association between non-communicable disease risk factors' knowledge and other variables

Subsequently, the three categories of overall knowledge were classified into 'poor' or 'good' levels. The 'poor' level included respondents, who were classified as being in the poor knowledge category, while 'good' level comprised respondents in the average and good knowledge categories. The researcher observed that 34.8% (276 of the 794 respondents) had a good level of knowledge about the modifiable risk factors for NCDs.

In Table 3, the association between the knowledge of NCD risk factors and other variables are indicated. A chi-square test for independence was conducted to examine whether, or not, there was a relationship between knowledge and various other variables. The results revealed

that females were more knowledgeable about NCD risk factors than males ($p=0.040$) were. In terms of educational level, 43.7% of the respondents, with secondary schooling, or more, had significantly better knowledge, compared to those who had had only primary, or less, schooling ($p=0.005$). Rural residents, respondents who had CD4 counts of <350 cells/ μl , as well as public service employees, were more likely to be knowledgeable, than their urban counterparts, respondents who had ≥ 350 cell counts, as well as other employee counterparts ($p=0.002$; $p=0.002$; $p=0.014$, respectively). Additionally, respondents who were normotensive (228 subjects or 38.0%), displayed good knowledge, compared to those who were hypertensive (48 subjects or 24.7%) ($p=0.001$). Other variables studied did not reveal any significant association.

Table 3: Levels of knowledge of non-communicable diseases risk factors by socio-demographic, clinical and biological characteristics (N=794)

Knowledge about modifiable risk factors for NCDs				
Characteristics	Total N=794	Poor n (%)	Good n (%)	p-value
All		518 (65.2)	276 (34.8)	
Gender				0.040
Female	513 (64.6)	323 (63.0)	190 (37.0)	
Male	281 (35.4)	195 (69.4)	86 (30.6)	
Age group/ years				0.120
18-30	240 (30.2)	159 (66.3)	81 (33.8)	
31-40	245 (30.9)	157 (64.1)	88 (35.9)	
41-50	204 (25.7)	124 (60.8)	80 (39.2)	
> 50	105 (13.2)	78 (74.3)	27 (25.7)	
Marital status				0.128
Never married	145 (18.3)	86 (59.3)	59 (40.7)	
Currently married	507 (63.9)	335 (66.1)	172 (33.9)	
Separated/Divorced	52 (6.5)	40 (76.9)	12 (23.1)	
Widowed	90 (11.3)	57 (63.3)	33 (36.7)	
Educational level				0.005
No formal education	160 (20.2)	118 (73.8)	42 (26.3)	
Primary	476 (59.9)	311 (65.3)	165 (34.7)	
≥ Secondary	158 (19.9)	89 (56.3)	69 (43.7)	
Employment status				0.014
Public service	81 (10.2)	42 (51.9)	39 (48.1)	
Self-employed	264 (33.2)	184 (69.7)	80 (30.3)	
Peasant/Farmer	252 (31.7)	157 (62.3)	95 (37.7)	
Unemployed	197 (24.8)	135 (68.5)	62 (31.5)	
Monthly household income				0.459
≤ 20000 RWF	179 (22.5)	120 (67.0)	59 (33.0)	
20001-40000 RWF	311 (39.2)	204 (65.6)	107 (34.4)	
40001-60000 RWF	129 (16.2)	89 (69.0)	40 (31.0)	
60001-80000 RWF	65 (8.2)	41 (63.1)	24 (36.9)	
> 80000 RWF	110 (13.9)	64 (58.2)	46 (41.8)	
Residence location				0.002
Rural	259 (32.6)	149 (57.5)	110 (42.5)	
Urban	535 (67.4)	369 (69.0)	166 (31.0)	
Time since HIV diagnosis				0.630
1-3 years	338 (42.6)	223 (66.0)	115 (34.0)	
4-6 years	265 (33.4)	167 (63.0)	98 (37.0)	
≥ 7 years	191 (24.1)	128 (67.0)	63 (33.0)	
Most recent CD4 cell count				0.002
≥ 350 cells/μl	545 (68.6)	375 (68.8)	170 (31.2)	
< 350 cells/μl	249 (31.4)	143 (57.4)	106 (42.6)	
ART use status				0.376
ART-naïve	96 (12.1)	67 (69.8)	29 (30.2)	
ART use	698 (87.9)	451 (64.6)	247 (35.4)	
BMI/ kg/m² category^a				0.326
Underweight	98 (12.3)	64 (65.3)	34 (34.7)	
Normal weight	550 (69.3)	361 (65.6)	189 (34.4)	
Overweight	115 (14.5)	69 (60.0)	46 (40.0)	
Obese	31 (3.9)	24 (77.4)	7 (22.6)	
Abdominal obesity^b				0.386
No	427 (56.2)	291 (68.1)	136 (31.9)	
Yes	333 (43.8)	217 (65.2)	116 (34.8)	
Hypertension^c				0.001
No	600 (75.6)	372 (62.0)	228 (38.0)	
Yes	194 (24.4)	146 (75.3)	48 (24.7)	

^a Underweight: <18.5; normal:18.50–24.99; overweight:25.00–29.99; obese: ≥ 30.0
^b Having WHR greater than 0.95 for men and 0.85 for women
^c A SBP of 140mm Hg or more, or a DBP of 90mm Hg or more

Discussion

This current study assessed the level of knowledge of modifiable risk factors for NCDs and its associated factors among adults living with HIV in Rwanda. The results revealed that the majority of the respondents (65.0%) had low levels of knowledge about NCD risk factors. These findings are consistent with recent findings in non-HIV+ subjects²². In this vein, a study that aimed to assess the level of type 2 diabetes and hypertension knowledge and perception among PLHIV and utilising care and treatment clinic services was conducted in Tanzania¹⁸, and researchers concluded that there is low level of knowledge on type 2 diabetes and hypertension risk factors and associated complications between both HIV+ clients on ART and ART-naive. The same authors recommended that continued health education should be an integral part of care and treatment clinic services. These findings highlight the importance of comprehensive health education and health promotion programmes for PLHIV. Additionally, there is an extensive body of literature showing that NCDs are becoming increasingly prevalent in PLHIV^{2,23}. Evidence from these studies highlights the need for specific strategies to prevent and control NCDs in the long-term care of PLHIV. In contrast to this current study, Cioe et al.,¹⁶ observed fairly high knowledge about CVD risk factors, among HIV+ adults. However, Cioe et al's study, conducted in a developed country, used the Heart Disease Fact Questionnaire (HDFQ) that assesses major risk factors associated with the development of CVDs, which is not similar to the knowledge assessment questionnaire, relating to the risk factors for chronic lifestyle diseases, and measures risk factors for the development of hypertension, diabetes, and stroke²⁰. These findings, therefore, are not really comparable, which suggests that interventions to improve the knowledge of NCD risk factors need to be context-specific.

Besides, the low mean knowledge score of 11.80 ± 5.40 (45.4%), reported in this current study, was similar (11.59 ± 4.49) to that reported in an earlier study on the prevalence and knowledge of chronic lifestyle disease risk factors, among high school learners, in a study conducted in the Northern Cape Province in South Africa, using a similar questionnaire¹⁹. Available evidence indicates that good knowledge of NCD risk factors is associated with an increased risk perception of NCDs¹², which is confirmed in this current study, where the majority of the

respondents had limited knowledge of NCD risk factors and a low risk perception of NCDs. Therefore, the provision of general and specific information about NCD risk factors, in terms of lifestyle changes, risk factors, as well as signs and symptoms, may improve knowledge, increase risk perception about NCDs in PLHIV, and encourage them to adopt the desired health behaviours.

Knowledge about risk factors for NCDs is an essential step towards modifying a behavioural lifestyle for NCDs. Interestingly, in this current study, a few respondents reported that they had no information on how to prevent NCDs, despite the majority of them disclosing that they had been informed about NCDs in health centres. This implies that health care providers at HIV clinics may not be discussing NCD risk factors with PLHIV in sufficient detail. A possible explanation is that health care professionals in some HIV clinics are still relying on an 'infectious disease' model of care. Adopting the chronic care model could be the most important step towards improving HIV care, and raising awareness about co-morbidities, in the context of the HIV care continuum.

In addition, these findings highlight the need for NCD risk factor screening, as well as comprehensive prevention strategies in HIV care of PLHIV. An effective way of preventing NCDs, is early identification and treatment of those who are at high risk of NCDs. In cases where the risk factors for NCDs are known, PLHIV are more likely to perceive their risk for NCDs, present themselves for early screening and treatment, and achieve better outcomes. In this current study, more than half of the respondents reported that they were confident about controlling the risk of having NCDs. This indicates that PLHIV are motivated to take action against NCDs. In this regard, behavioural goal setting may improve motivation.

The respondents' levels of knowledge are associated with their education level, CD4 cell counts, and BP hypertension. Highly educated respondents had good knowledge of NCD risk factors, compared to their counterparts. This information is not surprising, as a higher level of education is usually associated with health literacy. The respondents who were normotensive revealed better knowledge, than those who were hypertensive. A good level of knowledge among those who had a low CD4 count, reflects the benefits of regular clinical attendance for this population. These results highlight the need for

NCD educational programmes among PLHIV, both on ART, as well as those who are ART-naïve. The promotion of health and well-being relies on health literacy. For people with chronic diseases, high levels of health literacy are useful for self-management, the use of health services, as well as improved health outcomes^{25,26}. Poor knowledge was associated with hypertension. These results concur with that of a prior study, which revealed that people with poor knowledge, were significantly more likely to be drinkers, and poor knowledge was predictive of the likelihood of becoming overweight¹¹. Adequate and appropriate knowledge of lifestyle diseases and lifestyle modification, are the main components in the prevention and management of NCDs. On the other hand, educational strategies should include, but not be limited to, verbal exchange of information, demonstration, videotapes, and tailored printed materials, among others.

Limitations of the study

This current study only focused on PLHIV adults (individuals over 18 years old), the respondents were not randomly selected from the population, and the recruitment of the respondents occurred in health centres only; therefore, the sample may not be generalizable to the total the population of PLHIV in Rwanda.

Conclusion

In this current study, the findings revealed that knowledge about non-communicable disease risk factors, among person living with HIV adults in Rwanda, was poor. Based on the serious implications for PLHIV, who are exposed to risk factors for NCDs, it is crucial to identify methods of intervention that are suitable for this population. A comprehensive health education programme needs to be developed for PLHIV, in order to raise their awareness about the adverse effects of the risk factors for NCDs, as well as how they can change behavioural risk factors. In addition, the programme needs to be culturally and health literacy appropriate for this population.

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Competing interests

Authors declare that they have no competing interests.

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