

https://dspace.org/

Epidemiology of alcohol use and alcohol use disorders among people living with HIV on antiretroviral therapy in Northwest Tanzania implications for ART adherence and case management

P Ayieko; E Kasanga; Gerry Mshana; S Nkosi; Neo Morojele ...

ROUTLEDGE JOURNALS, TAYLOR & FRANCIS LTD
https://hdl.handle.net/10539/41200
WOS

Downloaded from a DSpace repository. https://dspace.org/

Taylor & Francis
Taylor & Francis Group



AIDS Care

Psychological and Socio-medical Aspects of AIDS/HIV

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/caic20

Epidemiology of alcohol use and alcohol use disorders among people living with HIV on antiretroviral therapy in Northwest Tanzania: implications for ART adherence and case management

Philip Ayieko, Edmund Kisanga, Gerry Mshana, Sebenzile Nkosi, Christian Holm Hansen, Charles D. H. Parry, Helen A. Weiss, Heiner Grosskurth, Richard J. Hayes, Neo K. Morojele & Saidi Kapiga

To cite this article: Philip Ayieko, Edmund Kisanga, Gerry Mshana, Sebenzile Nkosi, Christian Holm Hansen, Charles D. H. Parry, Helen A. Weiss, Heiner Grosskurth, Richard J. Hayes, Neo K. Morojele & Saidi Kapiga (2024) Epidemiology of alcohol use and alcohol use disorders among people living with HIV on antiretroviral therapy in Northwest Tanzania: implications for ART adherence and case management, AIDS Care, 36:5, 652-660, DOI: 10.1080/09540121.2023.2299324

To link to this article: https://doi.org/10.1080/09540121.2023.2299324

© 2023 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group

Published online: 31 Jan 2024.

Submit your article to this journal

Article views: 668

View related articles

View Crossmark data

Full Terms & Conditions of access and use can be found at
https://www.tandfonline.com/action/journalInformation?journalCode=caic20

AIDS CARE
2024, VOL. 36, NO. 5, 652–660
https://doi.org/10.1080/09540121.2023.2299324

Taylor & Francis
Taylor & Francis Group

OPEN ACCESS Check for updates

Epidemiology of alcohol use and alcohol use disorders among people living with HIV on antiretroviral therapy in Northwest Tanzania: implications for ART adherence and case management

Philip Ayieko[a,b], Edmund Kisanga[a], Gerry Mshana[a,c], Sebenzile Nkosi[d,e], Christian Holm Hansen[b], Charles D. H. Parry[d,f], Helen A. Weiss[b], Heiner Grosskurth[a,b], Richard J. Hayes[b], Neo K. Morojele[d,g,h,i] and Saidi Kapiga[a,b,c]

[a]Mwanza Intervention Trials Unit, Mwanza, Tanzania; [b]MRC International Statistics and Epidemiology Group, London School of Hygiene and Tropical Medicine, London, UK; [c]National Institute for Medical Research, Mwanza, Tanzania; [d]Mental Health, Alcohol, Substance Use and Tobacco Research Unit, South African Medical Research Council, Pretoria, South Africa; [e]Department of Psychology, Rhodes University, Makhanda, South Africa; [f]Department of Psychiatry, Stellenbosch University, Stellenbosch, South Africa; [g]Department of Psychology, University of Johannesburg, Johannesburg, South Africa; [h]School of Public Health and Family Medicine, University of Cape Town, Cape Town, South Africa; [i]School of Public Health, University of the Witwatersrand, Johannesburg, South Africa

ABSTRACT

Alcohol use disorders (AUD) among people living with HIV (PLHIV) are associated with poor health outcomes. This cross-sectional study examined current alcohol use and AUD among 300 PLHIV on ART at four HIV care centres in Northwest Tanzania. Participants' data were collected using questionnaires. Alcohol use was assessed using Alcohol Use Disorders Identification Test (AUDIT). Logistic regression was used to examine associations between each outcome (current drinking and AUD) and sociodemographic and clinical factors. Association between alcohol use and ART adherence was also studied. The median age of participants was 43 years (IQR 19-71) and 41.3% were male. Twenty-two (7.3%) participants failed to take ART at least once in the last seven days. The prevalence of current drinking was 29.3% (95% CI 24.2-34.8%) and that of AUD was 11.3% (8.2%−15.5%). Males had higher odds of alcohol use (OR 3.03, 95% CI 1.79-5.14) and AUD (3.89, 1.76-8.60). Alcohol use was associated with ART non-adherence (OR = 2.78, 1.10–7.04). There was a trend towards an association between AUD and non-adherence (OR = 2.91, 0.92–9.21). Alcohol use and AUD were common among PLHIV and showed evidence of associations with ART non-adherence. Screening patients for alcohol use and AUD in HIV clinics may increase ART adherence.

ARTICLE HISTORY
Received 26 September 2023
Accepted 18 December 2023

KEYWORDS
HIV; antiretroviral therapy (ART); alcohol use disorders; Good health and well-being; partnerships for the goals

Introduction

Alcohol consumption is an important contributor to the global burden of disease (Degenhardt et al., 2018). The level of alcohol-related morbidity and mortality varies across regions, with the highest age-standardized alcohol-attributable burden of disease being in Sub-Saharan Africa, and estimated at 1.73 times the global average (WHO, 2018). The average adult (15 + years) per capita alcohol consumption among drinkers in Sub-Saharan Africa in 2016 was 18.4 litres of pure alcohol per year, 22% above the global average (WHO, 2018).

Alcohol use disorders (AUD) are characterised by impaired ability to stop or control alcohol use despite its adverse effects on an individual's health, social, or functional wellbeing (American Psychiatric Association, 2013). The World Health Organization (WHO) developed the Alcohol Use Disorders Identification Test (AUDIT) for screening for alcohol consumption among patients in primary care (Saunders et al., 1993). Individuals who screen positive for AUD then undergo further clinical assessment to obtain a definitive diagnosis of AUD. An AUDIT cut-off score of ≥ 8 has 92% sensitivity and 94% specificity for detecting AUD (Saunders et al., 1993).

Among people living with HIV (PLHIV), AUD are associated with HIV disease progression (Rehm & Parry, 2009), lower CD4 + counts, and higher viral load (Azar et al., 2010). These outcomes are due to the direct biological effects of alcohol on immunity, as well as its indirect effects mediated through poor adherence to antiretroviral therapy (ART) which is the mainstay of clinical management for HIV (Altice

CONTACT Philip Ayieko philip.ayieko@lshtm.ac.uk Mwanza Intervention Trials Unit, Mwanza, Tanzania; MRC International Statistics and Epidemiology Group, London School of Hygiene and Tropical Medicine, London, UK

© 2024 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group
This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

et al., 2010; Hendershot et al., 2009; Pinoges et al., 2015).

The Joint United Nations Programme on HIV/AIDS (UNAIDS) recently revised its HIV treatment targets to ensure that by 2025, 95% of PLHIV know their HIV-positive status, 95% of those known to be HIV-positive are on ART and 95% of those on ART are virally suppressed (UNAIDS, 2020). Significant gains have been made towards achieving the 95-95-95 targets (UNAIDS, 2023). To ensure further progress towards these targets, efforts should now focus on subpopulations of PLHIV at risk of low ART initiation and poor adherence.

Alcohol use is among the modifiable behaviours associated with poor outcomes along the HIV care continuum (Azar et al., 2010; Myers et al., 2021). Only a few prior studies on AUD prevalence have been conducted using adequate measures of alcohol use among PLHIV on ART in Tanzania (Chang et al., 2022; B.B. Kavishe et al., 2021; Medley et al., 2014; Mwiru et al., 2018; Parcesepe et al., 2019; Sangeda et al., 2018). Several of these studies were performed more than a decade ago (Medley et al., 2014; Mwiru et al., 2018; Parcesepe et al., 2019; Sangeda et al., 2018), preceding widespread use of ART (NACP, 2015; WHO, 2016). The prevalence of AUD following recent changes in HIV care is not well documented. If AUD are common among PLHIV in low income settings, this could impact progress towards achieving targets in the HIV care continuum. Updated data on prevalence of alcohol use among PLHIV in different settings (urban and rural, community-based and facility-based) are needed to monitor drinking problems, and to contribute to efforts to improve care (Hahn et al., 2016; UNAIDS, 2020). Such data can inform development of effective alcohol reduction interventions.

In Tanzania, HIV Care and Treatment Centres (CTCs) are the primary setting for providing HIV care including initiating and distributing ART (NACP, 2015). CTCs provide a suitable location for delivering alcohol-reduction interventions for PLHIV(Kalichman et al., 2019). The aim of our study was to determine the prevalence of alcohol use and AUD among PLHIV on ART in CTCs in Northwest Tanzania and to identity sociodemographic factors associated with alcohol use and AUD. The study also explored whether alcohol use is associated with lower ART adherence.

Material and methods

Design and setting

This cross-sectional study was conducted between August and November 2018 in four CTCs in Northwest Tanzania. Two CTCs were in Mwanza city and two in neighbouring Shinyanga region. The clinics were purposefully selected to include the regional referral hospitals and one district hospital from each region. Each clinic offered routine HIV clinical care according to Tanzanian national guidelines (NACP, 2015), and operated five days a week, excluding weekends. The staffing of a typical ART clinic comprises a clinician (a doctor or clinical officer) and several nurses and HIV counsellors.

Study sample

PLHIV receiving HIV care at the participating clinics were eligible for inclusion in the study if they were 18 years or older, had been on ART for at least three months, and were willing to take part in the study. PLHIV who had been on treatment for less than three months were excluded because the study aimed to abstract data on HIV treatment and adherence from clinical records of participants to validate self-reported information and this information was not available for newly enrolled patients.

Procedures

Ethical approvals to conduct the study were obtained from the National Health Research Ethical Committee in Tanzania and the London School of Hygiene & Tropical Medicine Ethics Committee. Written informed consent was obtained from all participants prior to participation in any study procedures. Data were collected by two research staff who spent about one week at each clinic. The staff obtained a list of all patients scheduled to attend CTC on each day of the week from clinic appointment registers. They then used random numbers to select 30 potentially eligible patients from among those scheduled to attend on each day. These selected patients were invited to participate in the survey when they attended their appointments. Individuals who were found not to be eligible or who refused during the recruitment process were replaced by other randomly selected participants so that the agreed target number was achieved at each participating CTC.

Interviews were conducted in secluded clinic rooms on the same day that participants were recruited. Responses were recorded using electronic tablets. Demographic data including age, sex, marital status, religion, education and employment, were collected using an interviewer administered questionnaire. For alcohol use data, participants were asked if they had ever used alcoholic beverages and if they had consumed alcohol during the last 12 months. Those reporting alcohol consumption in the last 12 months were defined as

current drinkers and were asked more detailed questions using the AUDIT questionnaire (Saunders et al., 1993). The AUDIT tool has been validated both internationally and in Tanzania (Adewuya, 2005; Atkins et al., 2021; Vissoci et al., 2018). The responses to the 10 items in the AUDIT questionnaire are summed up for each participant giving an individual score ranging between 0 and 40 which is then categorised to identify participants with AUD defined as a total score ≥ 8. To estimate the number of standard alcohol drinks consumed in a specified period, additional information was collected using the Alcohol Timeline Follow-back (TLFB) method (Sobell et al., 1988; Sobell & Sobell, 1992). As part of this calendar-based interview, participants were requested to provide retrospective estimates of their daily alcohol consumption in the last 30 days. This information was used to estimate the average number of standard alcoholic drinks consumed per week. We used a chart developed during our previous research to identify common modern and traditional (locally-brewed) alcoholic drinks using coloured pictures of locally available drinks, bottles and containers including information on volumes and alcohol content (Francis et al., 2015b). Using this chart, participants reported types and amounts of drinks taken; based on this the trained interviewers calculated the amount of standard drinks consumed.

We also collected clinical data related to HIV including date of HIV diagnosis, ART initiation, and current and past treatment for HIV and co-morbid opportunistic infections. Each participant was asked to explain their ART regimen, dosage, the number of scheduled daily doses taken and missed over the past 7 days. Wherever possible, we validated ART adherence data obtained from the interview through extraction of data from the participants' ART adherence and pill counts records. These data were available for 44% of the participants following retrospective review of clinical records. Agreement between the two methods for assessing ART adherence was high (>90%) but missing data prevented use of clinical record data for analysis.

Statistical considerations

To calculate the required sample size for the study, we assumed a prevalence of AUD of 10% among PLHIV on ART (Duko et al., 2019). A sample size of 300 PLHIV would estimate the prevalence of AUD to within ±3.4% with 95% confidence.

The study had two outcomes: the proportion of participants who reported current drinking; and the proportion who had AUD (AUDIT score of ≥8). We used a conceptual model that links socio-demographic and clinical factors with possible study outcomes, informed by knowledge of the social determinants of

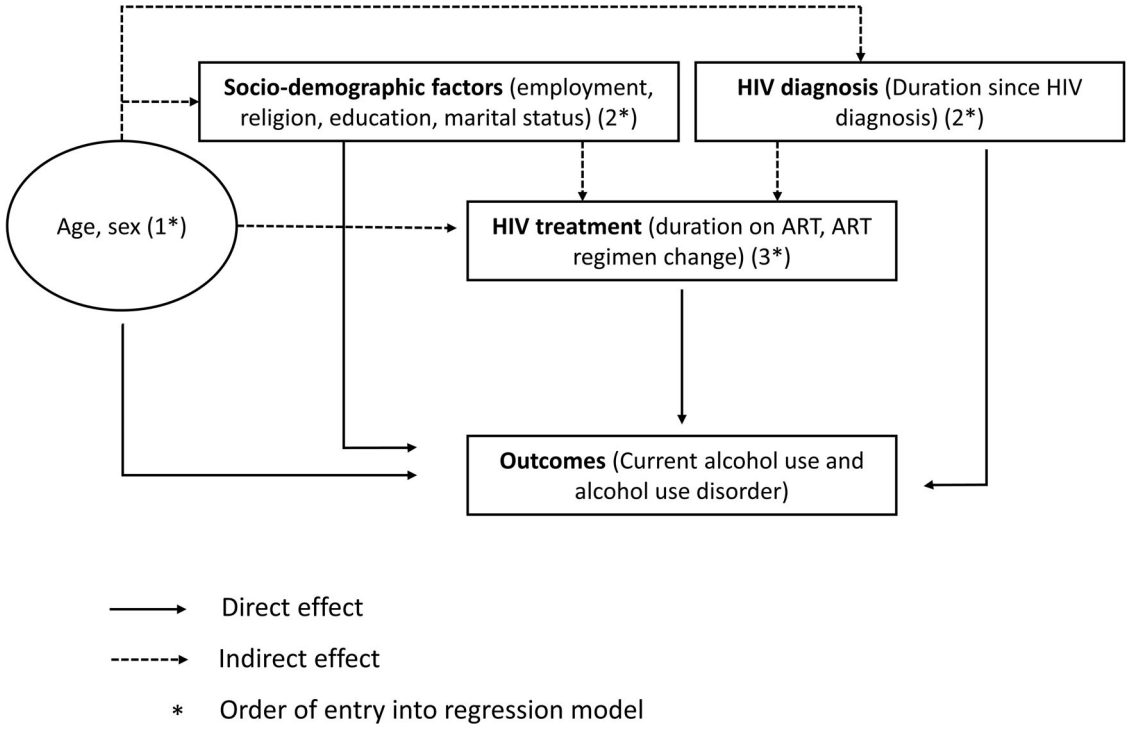


Figure 1. Conceptual hierarchical framework for multivariable modelling of factors associated with current alcohol use and alcohol use disorder.

alcohol use (Figure 1). Logistic regression was used to estimate odds ratios (ORs) for the association of each outcome with sociodemographic and clinical factors. Data were pooled from all study clinics. We adjusted for study clinic as a clustering variable in all models by including the categorical variable for clinic attended by participant as a fixed effect in each model. Based on prior knowledge, age and sex were included in all models as *apriori* confounders (Victora et al., 1997).

We first examined the association of each outcome in our analysis with the explanatory variables to generate minimally-adjusted models. We developed the minimally-adjusted models starting with a model containing the outcome, study clinic and the *apriori* confounders age and sex. We then included each sociodemographic and clinical variable, one at a time and examined the association between each variable and the outcome adjusted for study clinic and *apriori* confounders. The exposures in the models included sociodemographic (employment, religion, education, marital status); and clinical (duration since HIV diagnosis, duration on ART and previous change of ART) factors. ORs and 95% confidence intervals from this stage were reported as minimally-adjusted estimates. In the next stage, we retained the sociodemographic and clinical variables that were independently associated ($p < 0.2$) with current alcohol use or AUD. We obtained *p*-values for all models using the likelihood ratio test.

Self-reported ART adherence was examined as a secondary outcome. Participants who reported having missed any of the scheduled pills in the last 7 days were classified as non-adherent. We conducted logistic regression to determine the association between alcohol use and ART adherence. To avoid overfitting because of the small number of non-adherent participants we adjusted for only three variables – age, sex and study clinic – in the multivariable model.

Table 1. Demographic and clinical characteristics of people living with HIV receiving ART from HIV care centres in Northwest Tanzania.

	Frequency, n (%)* *N* = 300
Demographic characteristics	
Age in years	
18–29	31(10.3)
30–39	76(25.3)
40–49	110(36.7)
50 and above	83(27.7)
Sex	
Male	124(41.3)
Female	176(58.7)
Marital status	
Married	148(49.3)
Divorced or widowed	133(44.3)
Single (never married)	19(6.3)
Education level	
Never attended school	52(17.3)
Incomplete primary education	42(14.0)
Completed primary education	162(54.0)
Secondary or high school	31(10.3)
Tertiary level	13(4.3)
Religion	
Catholic	119(39.7)
Protestant	114(38.0)
Muslim	63(21.0)
None	4(1.3)
Employment	
Self-employment	205(68.3)
Formal employment	38(12.7)
Other activities	57(19.0)
Clinical features	
Duration since HIV diagnosis (years)	
Less than 2 years	49(16.3)
2–5 years	95(31.7)
More than 5 years	156(52.0)
Median (IQR) duration since HIV diagnosis in years	6.3 (2.9–10.4)
Current ART regimen	
TDF + (3TC or FTC)+ EFV	226(75.3)
AZT + 3TC + (EFV or NVP)	69(23)
Other regimen	5(1.7)
Median (IQR) duration of use for current ART regimen in years	3.2 (1.5–5.2)
ART adherence in the past 7 days, n(%)	
Patient took all ART pills	278(92.7)
Patient missed at least one pill	22(7.3)
Ever used a different ART regimen prior to the current ART regimen	97(32.3)

*Figures represent number(%) unless otherwise stated

Results

Participants

Three hundred participants were recruited across the four HIV clinics. The median age of participants was 43 years (IQR 19-71). There were 124 (41.3%) males; 148 (49.3%) participants were married; 206 (68.7%) had at least fully completed primary level education; and 253 (68.3%) were self-employed (Table 1).

The median duration since HIV diagnosis and median duration of current ART use were 6.3 (IQR 2.9–10.4) years and 3.2 (IQR 1.5–5.2) years, respectively. Most participants (75.3%) received a tenofovir disoproxil fumarate (TDF)-based ART regimen, in line with Tanzania's HIV care policy at the time of the survey.

Alcohol use

Of the 300 participants, 212 (70.7%; 95% CI 65.2–75.8%) reported ever having used alcohol, and 88 (29.3%; 24.2–34.8%) reported that they had consumed alcohol in the last 12 months ("current drinkers"). Overall, 27 of the 88 (30.7%) current drinkers reported having 10 or more standard drinks on a typical day when drinking, and 19 (21.5%) had six or more standard drinks on one occasion every week. The

median AUDIT score among current drinkers was 6 (IQR 3–13).

Of the 300 participants, 34 (11.3%; 8.2–15.5) had an AUDIT score of 8 or above. These comprised 22 (7.3%) participants with hazardous or harmful use of alcohol (AUDIT score of 8-19), and 12 (4.0%) who had probable alcohol dependence (AUDIT score ≥ 20).

Factors associated with alcohol use among current drinkers

The prevalence of current alcohol use was 41.9% (52/124) in males and 20.5% (36/176) in females (OR = 3.03; 95%CI:1.79-5.14 adjusted for age and clinic). After adjustment for study clinic, age, and sex, the use of alcohol was lower among Protestants compared to Catholics (20.2% versus 37.0%; OR = 0.45; 95%CI:0.24-0.86) but did not show evidence of difference in alcohol use between Muslims and Catholics (30.2% versus 37.0%; OR = 0.72; 95%CI:0.35-1.48). There was little evidence that current drinking was associated with age, marital status, level of education, employment status, duration of ART or change of ART regimen since initiation on ART (Table 2).

Factors associated with AUD

We observed strong evidence of an association between AUD and sex of the participant (19.7% prevalence in males versus 5.7% in females; OR = 3.89; 95%CI:1.76–8.60) (Table 3). There was some evidence of an association between AUD and being on the same ART regimen since initiating treatment (OR = 3.36; 1.01–11.15). There was no evidence of an association between AUD and participants' age group ($p = 0.94$), marital status ($p = 0.55$), level of education ($p = 0.26$), duration since HIV diagnosis ($p = 0.188$) or current ART regimen ($p = 0.57$).

Table 2. Factors associated with current alcohol use among patients receiving ART from HIV clinics in Northwest Tanzania.

	Current drinker		Minimally – adjusted model*		Fully-adjusted model†	
	Yes	No	OR (95% CI)	*P* value	OR (95% CI)	*P* value
Demographic characteristics						
Age in years						
18–29	8(25.8)	23(74.2)	1.0		1.0	
30–39	20(26.3)	56(73.7)	1.03(0.40-2.69)	0.36	1.10(0.40-2.89)	0.32
40–49	39(35.5)	71(64.5)	1.63(0.66-4.02)		1.66(0.66-4.20)	
50 and above	21(25.3)	62(74.7)	1.01(0.39-2.61)		0.95(0.36-2.50)	
Sex						
Female	36(20.5)	140(79.5)	1.0		1.00	
Male	52(41.9)	72(58.1)	2.97(1.76-5.01)	< 0.001	3.03(1.79-5.14)	<0.001
Marital status						
Married	53(35.8)	95(64.2)	1.00		1.0	
Divorced or widowed	31(23.3)	102(76.7)	0.53(0.31-0.90)	0.04	0.69(0.38-1.25)	0.21
Single (never married)	4(21.1)	15(78.9)	0.49(0.15-1.55)		0.36(0.08-1.55)	
Education level						
Never attended school	16(30.8)	36(69.2)	1.0		1.0	
Incomplete primary education	16(38.1)	26(61.9)	1.51(0.63-3.61)	0.15	1.28(0.50-3.29)	0.26
Completed primary education	44(27.2)	118(72.8)	0.89(0.45-1.78)		0.72(0.34-1.54)	
Secondary or high school	11(35.5)	20(64.5)	1.30(0.50-3.40)		0.82(0.28-2.43)	
Tertiary level	1(7.7)	12(92.3)	0.18(0.02-1.53)		0.18(0.02-1.60)	
Religion						
Catholic	44(37.0)	75(63.0)	1.0		1.0	
Protestant	23(20.2)	91(79.8)	0.44(0.24-0.79)	0.04	0.45(0.24-0.86)	0.08
Muslim	19(30.2)	44(69.8)	0.73(0.38-1.41)		0.72(0.35-1.48)	
None	2(50.0)	2(50.0)	1.77(0.24-13.28)		1.77(0.22-14.10)	
Employment						
Self-employment	141(68.8)	64(31.2)	1.0			
Formal employment	27(71.1)	11(28.9)	0.91(0.42-1.95)	0.40		
Other activities	44(77.2)	13(22.8)	0.63(0.32-1.25)			
Clinical features						
Duration since HIV diagnosis						
< 2 years	17(34.7)	32(65.3)	1.0			
2–5 years	32(33.7)	63(66.3)	0.95(0.46-1.97)	0.34		
> 5 years	39(25.0)	117(75.0)	0.65(0.32-1.33)			
Ever used a different ART regimen prior to the current ART regimen						
Yes	23(23.7)	74(76.3)	1.0		1.0	0.239
No	65(32.0)	138(68.0)	1.47(0.83-2.59)	0.18	1.47(0.77-2.78)	

* adjusted for clinic, age and sex.

†Only variables with $p < 0.2$ in the minimally adjusted model were included in the fully adjusted model that adjusted for clinic, age and sex, and the variables with $p < 0.2$ in the minimally-adjusted model.

Table 3. Factors associated with alcohol use disorder among patients receiving ART from HIV clinics in Northwest Tanzania.

	Alcohol use disorder		Minimally – adjusted model*		Fully-adjusted model†	
	Yes	No	OR (95% CI)	*P* value	OR (95% CI)	*P* value
Demographic characteristics						
Age in years						
18–29	4(12.9)	27(87.1)	1.0	0.99	1.0	0.94
30–39	9(11.8)	67(88.2)	1.02(0.28-3.66)		1.16(0.31-4.33)	
40–49	12(10.9)	98(89.1)	1.02(0.30-3.49)		1.03(0.29-3.65)	
50 and above	9(10.8)	47(89.2)	0.90(0.25-3.20)		0.84(0.23-3.10)	
Sex						
Female	10(5.7)	166(94.3)	1.0	< 0.001	1.0	<0.001
Male	24(19.4)	100(80.6)	3.80(1.73-8.37)		3.89(1.76-8.60)	
Marital status						
Married	19(12.8)	129(87.2)	1.0	0.55		
Divorced or widowed	14(10.5)	119(89.4)	0.89(0.42-1.88)			
Single (never married)	1(5.3)	18(94.7)	0.36(0.04-2.89)			
Education level						
Never attended school	8(15.4)	44(84.6)	1.0	0.26		
Incomplete primary education	7(16.7)	35(83.3)	1.31(0.42-4.10)			
Completed primary education	14(8.6)	148(91.4)	0.58(0.22-1.51)			
Secondary or high school	5(16.1)	26(83.9)	1.40(0.39-4.99)			
Tertiary level	0(0)	13(100)	-			
Religion						
Catholic	14(11.8)	105(88.2)	1.0	0.06	1.0	0.101
Protestant	7(6.1)	107(93.9)	0.50(0.19-1.31)		0.56(0.21-1.52)	
Muslim	11(17.5)	52(82.5)	1.51(0.63-3.61)		1.52(0.59-3.89)	
None	2(50.0)	2(50.0)	5.23(0.67-40.97)		6.41(0.65-63.27)	
Employment						
Self-employment	26(12.7)	179(87.3)	1.0	0.184		0.270
Formal employment	5(13.2)	33(86.8)	1.14(0.40-3.26)		0.90(0.30-2.70)	
Other activities	3(5.3)	54(94.7)	0.37(0.11-1.27)		0.37(0.10-1.38)	
Clinical features						
Current ART regimen						
TDF based regimen	27(12.0)	199(88.0)	1.0	0.57		
AZT based regimen	7(10.1)	62(89.9)	0.77(0.31-1.92)			
Other regimen	0(0)	5(100)	-			
Duration since HIV diagnosis						
< 2 years	7(14.3)	42(85.7)	1.0	0.07	1.0	0.188
2–5 years	15(15.8)	80(84.2)	1.08(0.40-2.91)		1.13(0.39-3.31)	
> 5 years	12(7.7)	144(92.3)	0.42(0.15-1.19)		0.50(0.17-1.54)	
Ever used a different ART regimen prior to the current ART regimen						
Yes	5(5.2)	92(94.8)	1.0		1.0	
No	29(14.3)	174(85.7)	3.24(1.20-8.80)	0.01	3.36(1.01-11.15)	0.038

* adjusted for clinic, age and sex.

†Only variables with $p < 0.2$ in the minimally adjusted model were included in the fully adjusted model that adjusted for clinic, age and sex, and the variables with $p < 0.2$ in the minimally-adjusted model.

Use of alcohol and ART adherence

Twenty-two (7.3%) participants reported having missed at least one ART pill during the last seven days. There was evidence of an association between current drinking and failing to take ART medications as scheduled after adjustment for age and sex. Non-adherence was 12.5% (11/88) versus 5.2% (11/202) among drinkers and non-drinkers, respectively (OR = 2.78, 95%CI:1.10–7.04). There was a trend towards an association between AUD and non-adherence; of the 34 participants with AUD, 5 (14.7%) were non-adherent versus 17/266 (6.4%) participants who did not have AUD (OR = 2.91, 95%CI: 0.92–9.21).

Discussion

This study aimed to estimate the prevalence of alcohol use and AUD and their risk factors among PLHIV on ART attending care in Tanzania. There have been few recent studies that have assessed AUD in PLHIV on ART using adequate measures of alcohol use in Tanzania and other low and middle income settings. Overall, our findings show that 29.3% of PLHIV on ART were current drinkers and that 11.3% screened positive for AUD. Male participants had at least double the odds of both alcohol use and AUD compared to females. We also found a trend towards an association between alcohol use or AUD and ART non-adherence.

The prevalence of current drinking among PLHIV in our study was higher than in the general population of Tanzanian adults where it ranged from 4.4% to 28.5%

with significant variations by gender and rural versus urban location (B. Kavishe et al., 2015). There are no recent data on the prevalence of AUD among otherwise healthy adults in Tanzanian, but among young people (15-24 years) from different occupational groups, AUD prevalence ranged from 6.5% to 27.5% (Francis et al., 2015b). A recent Tanzanian study among 812 PLHIV assessing AUD using the CAGE questionnaire reported a prevalence of 13%, similar to our findings (Parcesepe et al., 2019). This earlier study was conducted among a population enrolling in care (within 90 days of first clinical visit) – our study extends these findings by focussing on PLHIV who have been in care for a longer duration. A higher prevalence of AUD in PLHIV has been reported from South Africa (range, 37% to 54%), and also in a meta-analysis of studies conducted in sub-Saharan Africa which reported a prevalence of 24.5% (Duko et al., 2019; Kader et al., 2014; Morojele et al., 2014; Parcesepe et al., 2019). These differences are consistent with variations in AUD documented in regional analysis of alcohol use in sub-Saharan Africa (Duko et al., 2019).

Males in our study were more likely to drink alcohol as reported in other studies in Africa (O'Connell et al., 2013; Parcesepe et al., 2019; Wagman et al., 2020). This is likely to represent a real difference but there still remains a possibility of underreporting of alcohol use by women as demonstrated in studies of self-reported alcohol use in pregnancy (Gomez-Roig et al., 2018). Our study also confirms that the high prevalence of alcohol use among males that has been reported during enrolment into HIV care, (Parcesepe et al., 2019) persists during treatment. Interestingly, AUD prevalence was high among participants in religious groups that discourage alcohol use. A plausible explanation is the fact that 98.7% of participants reported a religious affiliation, implying that most individuals in our setting reported affiliation to a religious group regardless of their compliance to the religious groups' norms. The high prevalence of alcohol use highlights the need for alcohol-reduction-support for PLHIV on ART, especially for males. Such interventions should be targeted at care providers, to strengthen their competence in managing patients who drink alcohol. This might involve adopting a non-judgemental attitude towards patients and training in alcohol reduction techniques such as brief interventions.

There was evidence that self-reported ART adherence was lower among alcohol users compared to non-drinkers confirming findings of a recent systematic review and meta-analysis of 32 studies in sub-Saharan Africa which found that individuals who used alcohol had twice the odds of ART non-adherence (Velloza et al., 2020). Although the negative impact of AUD on treatment outcomes for HIV is well established, the prevalence of these disorders has not been extensively studied in PLHIV in Tanzania following the more widespread delivery of ART. Our data provide estimates of the prevalence of AUD in Tanzania determined using adequate measures of alcohol use among a subpopulation at high risk of poor outcomes along the HIV care continuum. These data from HIV care clinics will supplement existing community-based estimates of AUD in PLHIV.

Our study had several limitations. First, the data on both alcohol use and ART adherence were self-reported. Despite this, self-reported alcohol use in our previous validation study using the alcohol biomarker Phosphatidylethanol showed that self-reported use of alcohol determined using a different tool – the MINI (DSM IV) – provided a valid assessment for alcohol dependence in our setting (Francis et al., 2015a). The AUDIT tool has also been shown to have a high sensitivity (92%) and specificity (94%) to detect AUD (Saunders et al., 1993). It is also noteworthy that our study was conducted among patients who had been enrolled and retained in ART care for a considerable time, and therefore likely have high adherence. In addition, response desirability bias may have led to higher self-reported adherence than it is in reality.

In conclusion, our study has shown high levels of heavy drinking among PLHIV who drink. Alcohol use and AUD were more prevalent in male patients, and there was evidence of an association between alcohol use and ART non-adherence. These findings may help to inform the development and targeting of alcohol reduction interventions for patients on ART.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This study was funded by a grant from the UK Medical Research Council awarded to SK though the Public Health Intervention Development (PHIND) Scheme (Grant Ref: MR/R00255X/1). RH and HAW are part funded by the UK Medical Research Council (MRC) and the UK Department for International Development (DFID) under the MRC/DFID Concordat agreement and is also part of the EDCTP2 programme supported by the European Union (Grant Ref: MR/R010161/1). CDHP and SN were part-funded by the South African Medical Research Council (SAMRC) for their work on the project through their salaries as employees of the SAMRC.

References

Adewuya, A. O. (2005). Validation of the alcohol use disorders identification test (AUDIT) as a screening tool for alcohol-related problems among Nigerian University students. *Alcohol and Alcoholism*, *40*(6), 575–577. https://doi.org/10.1093/alcalc/agh197

Altice, F. L., Kamarulzaman, A., Soriano, V. V., Schechter, M., & Friedland, G. H. (2010). Treatment of medical, psychiatric, and substance-use comorbidities in people infected with HIV who use drugs. *The Lancet*, *376*(9738), 367–387. https://doi.org/10.1016/S0140-6736(10)60829-X

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). American Psychiatric Publishing.

Atkins, D. L., Cumbe, V. F. J., Muanido, A., Manaca, N., Fumo, H., Chiruca, P., Hicks, L., Wagenaar, B.H. (2021). Validity and item response theory properties of the Alcohol Use Disorders Identification Test for primary care alcohol use screening in Mozambique (AUDIT-MZ). *Journal of Substance Abuse Treatment*, *127*, 108441. https://doi.org/10.1016/j.jsat.2021.108441

Azar, M. M., Springer, S. A., Meyer, J. P., & Altice, F. L. (2010). A systematic review of the impact of alcohol use disorders on HIV treatment outcomes, adherence to antiretroviral therapy and health care utilization. *Drug and Alcohol Dependence*, *112*(3), 178–193. https://doi.org/10.1016/j.drugalcdep.2010.06.014

Chang, G. C., West, C. A., Kim, E., Low, A. J., Lancaster, K. E., Behel, S. S., Hong, S. Y., Miller, L. A., Silver, R., Mgomella, G. S., Imaa, J., Maokola, W. M., Carpino, T., Hrusa, G., Bray, R. M., Mwila, A., Musuka, G., O'Connell, C., McCracken, S., & Voetsch, A. C. (2022). Hazardous alcohol use and HIV indicators in six African countries: results from the Population-based HIV Impact Assessments, 2015-2017. *Journal of the International AIDS Society*, *25*(11), e26029–e26029. https://doi.org/10.1002/jia2.26029

Degenhardt, L., Charlson, F., Ferrari, A., Santomauro, D., Erskine, H., Mantilla-Herrara, A., Whiteford, H., Leung, J., Naghavi, M., Griswold, M., Rehm, J., Hall, W., Sartorius, B., Scott, J., Vollset, S. E., Knudsen, A. K., Haro, J. M., Patton, G., Kopec, J., … Vos, T. (2018). The global burden of disease attributable to alcohol and drug use in 195 countries and territories, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. *The Lancet Psychiatry*, *5*(12), 987–1012. https://doi.org/10.1016/S2215-0366(18)30337-7

Duko, B., Ayalew, M., & Ayano, G. (2019). The prevalence of alcohol use disorders among people living with HIV/AIDS: A systematic review and meta-analysis. *Substance Abuse: Treatment, Prevention, and Policy*, *14*(1), 52. https://doi.org/10.1186/s13011-019-0240-3

Francis, J. M., Weiss, H. A., Helander, A., Kapiga, S. H., Changalucha, J., & Grosskurth, H. (2015a). Comparison of self-reported alcohol use with the alcohol biomarker phosphatidylethanol among young people in northern Tanzania. *Drug and Alcohol Dependence*, *156*, 289–296. https://doi.org/10.1016/j.drugalcdep.2015.09.027

Francis, J. M., Weiss, H. A., Mshana, G., Baisley, K., Grosskurth, H., & Kapiga, S. H. (2015b). The epidemiology of alcohol use and alcohol use disorders among young people in Northern Tanzania. *PLoS One*, *10*(10), e0140041. https://doi.org/10.1371/journal.pone.0140041

Gomez-Roig, M. D., Marchei, E., Sabra, S., Busardò, F. P., Mastrobattista, L., Pichini, S., Gratacós, E., & Garcia-Algar, O. (2018). Maternal hair testing to disclose self-misreporting in drinking and smoking behavior during pregnancy. *Alcohol*, *67*, 1–6. https://doi.org/10.1016/j.alcohol.2017.08.010

Hahn, J. A., Emenyonu, N. I., Fatch, R., Muyindike, W. R., Kekiibina, A., Carrico, A. W., Woolf-King, S., & Shiboski, S. (2016). Declining and rebounding unhealthy alcohol consumption during the first year of HIV care in rural Uganda, using phosphatidylethanol to augment self-report. *Addiction*, *111*(2), 272–279. https://doi.org/10.1111/add.13173

Hendershot, C. S., Stoner, S. A., Pantalone, D. W., & Simoni, J. M. (2009). Alcohol use and antiretroviral adherence: Review and meta-analysis. *JAIDS Journal of Acquired Immune Deficiency Syndromes*, *52*(2), 180–202. https://doi.org/10.1097/QAI.0b013e3181b18b6e

Kader, R., Seedat, S., Govender, R., Koch, J. R., & Parry, C. D. (2014). Hazardous and harmful use of alcohol and/or other drugs and health status among South African patients attending HIV clinics. *AIDS and Behavior*, *18*(3), 525–534. https://doi.org/10.1007/s10461-013-0587-9

Kalichman, S., Mathews, C., Banas, E., & Kalichman, M. (2019). Alcohol-related intentional nonadherence to antiretroviral therapy among people living with HIV, Cape Town, South Africa. *AIDS Care*, *31*(8), 951–957. https://doi.org/10.1080/09540121.2019.1587357

Kavishe, B., Biraro, S., Baisley, K., Vanobberghen, F., Kapiga, S., Munderi, P., Smeeth, L., Peck, R., Mghamba, J., Mutungi, G., Ikoona, E., Levin, J., Bou Monclús, M. A., Katende, D., Kisanga, E., Hayes, R., & Grosskurth, H. (2015). High prevalence of hypertension and of risk factors for non-communicable diseases (NCDs): A population based cross-sectional survey of NCDS and HIV infection in Northwestern Tanzania and Southern Uganda. *BMC Medicine*, *13*(1), 126. https://doi.org/10.1186/s12916-015-0357-9

Kavishe, B. B., Kweka, B. V., Nitsch, D., PrayGod, G., Jeremiah, K., Faurholt-Jepsen, D., Filteau, S., Olsen, M. F., Kitilya, B. W., Krogh-Madsen, R., Friis, H., & Peck, R. (2021). Risk factors for impaired renal function in HIV-infected and HIV-uninfected adults: Cross-sectional study in North-Western Tanzania. *BMC Nephrology*, *22*(1), 355. https://doi.org/10.1186/s12882-021-02563-z

Medley, A., Seth, P., Pathak, S., Howard, A. A., Deluca, N., Matiko, E., Mwinyi, A., Katuta, F., Sheriff, M., Makyao, N., Wanjiku, L., Ngare, C., & Bachanas, P. (2014). Alcohol use and its association with HIV risk behaviors among a cohort of patients attending HIV clinical care in Tanzania, Kenya, and Namibia. *AIDS Care*, *26*, 1288–1297. https://doi.org/10.1080/09540121.2014.911809

Morojele, N. K., Kekwaletswe, C. T., & Nkosi, S. (2014). Associations between alcohol use, other psychosocial factors, structural factors and antiretroviral therapy (ART) adherence among South African ART recipients. *AIDS and Behavior*, *18*(3), 519–524. https://doi.org/10.1007/s10461-013-0583-0

Mwiru, R. S., Nagu, T. J., Kaduri, P., Fawzi, W., & Mugusi, F. (2018). Prevalence and factors associated with alcohol drinking among HIV and tuberculosis co-infected patients

in Dar es Salaam, Tanzania. *AIDS Care*, *30*, 173–177. https://doi.org/10.1080/09540121.2017.1344183

Myers, B., Lombard, C., Joska, J. A., Abdullah, F., Naledi, T., Lund, C., Petersen Williams, P., Stein, D. J., & Sorsdahl, K. R. (2021). Associations between patterns of alcohol use and viral load suppression amongst women living with HIV in South Africa. *AIDS and Behavior*, *25*(11), 3758–3769. https://doi.org/10.1007/s10461-021-03263-3

NACP. (2015). *National AIDS control programme, Ministry of Health and Social Welfare, The United Republic of Tanzania. National guidelines for the management of HIV and AIDS*.

O'Connell, R., Chishinga, N., Kinyanda, E., Patel, V., Ayles, H., Weiss, H. A., & Seedat, S. (2013). Prevalence and correlates of alcohol dependence disorder among TB and HIV infected patients in Zambia. *PLoS One*, *8*(9), e74406. https://doi.org/10.1371/journal.pone.0074406

Parcesepe, A. M., Nash, D., Tymejczyk, O., Reidy, W., Kulkarni, S. G., & Elul, B. (2019). Gender differences and psychosocial factors associated with problem drinking among adults enrolling in HIV care in Tanzania. *AIDS and Behavior*, *23*(6), 1612–1622. https://doi.org/10.1007/s10461-018-2340-x

Pinoges, L., Schramm, B., Poulet, E., Balkan, S., Szumilin, E., Ferreyra, C., & Pujades-Rodríguez, M. (2015). Risk factors and mortality associated with resistance to first-line antiretroviral therapy: Multicentric cross-sectional and longitudinal analyses. *JAIDS Journal of Acquired Immune Deficiency Syndromes*, *68*(5), 527–535. https://doi.org/10.1097/QAI.0000000000000513

Rehm, J., & Parry, C. D. (2009). Alcohol consumption and infectious diseases in South Africa. *The Lancet*, *374* (9797), 2053–2053. https://doi.org/10.1016/S0140-6736(09)62150-4

Sangeda, R. Z., Mosha, F., Aboud, S., Kamuhabwa, A., Chalamilla, G., Vercauteren, J., Van Wijngaerden, E., Lyamuya, E., & Vandamme, A.-M. (2018). Predictors of non adherence to antiretroviral therapy at an urban HIV care and treatment center in Tanzania. *Drug, Healthcare and Patient Safety*, *10*, 79–88. https://doi.org/10.2147/DHPS.S143178

Saunders, J. B., Aasland, O. G., Babor, T. F., De La Fuente, J. R., & Grant, M. (1993). Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption-II. *Addiction*, *88*(6), 791–804. https://doi.org/10.1111/j.1360-0443.1993.tb02093.x

Sobell, L. C., & Sobell, M. B. (1992). A technique for assessing self-reported alcohol consumption. In R. Z. Litten & J. P. Allen (Eds.). (pp. 41–72). Totowa, NJ: Humana Press.

Sobell, L. C., Sobell, M. B., Leo, G. I., & Cancilla, A. (1988). Reliability of a timeline method: Assessing normal drinkers' reports of recent drinking and a comparative evaluation across several populations. *British Journal of Addiction*, *83*(4), 393–402. https://doi.org/10.1111/j.1360-0443.1988.tb00485.x

UNAIDS. (2020). *World AIDS day report* 2020. Geneva: https://www.unaids.org/sites/default/files/media_asset/2020_aids-data-book_en.pdf

UNAIDS. (2023). *The path that ends AIDS: UNAIDS global AIDS update* 2023. unaids.org/sites/default/files/media_asset/2023-unaids-global-aids-update_en.pdf.

Velloza, J., Kemp, C. G., Aunon, F. M., Ramaiya, M. K., Creegan, E., & Simoni, J. M. (2020). Alcohol use and antiretroviral therapy non-adherence among adults living with HIV/AIDS in Sub-Saharan Africa: A systematic review and meta-analysis. *AIDS and Behavior*, *24*(6), 1727–1742. https://doi.org/10.1007/s10461-019-02716-0

Victora, C. G., Huttly, S. R., Fuchs, S. C., & Olinto, M. T. A. (1997). The role of conceptual frameworks in epidemiological analysis: A hierarchical approach. *International Journal of Epidemiology*, *26*(1), 224–227. https://doi.org/10.1093/ije/26.1.224

Vissoci, J. R. N., Hertz, J., El-Gabri, D., Do Nascimento, J. R. A., De Oliveira, L. P., Mmbaga, B. T., Mvungi, M., & Staton, C. A. (2018). Cross-cultural adaptation and psychometric properties of the AUDIT and CAGE questionnaires in Tanzanian Swahili for a traumatic brain injury population. *Alcohol and Alcoholism*, *53*(1), 112–120. https://doi.org/10.1093/alcalc/agx058

Wagman, J. A., Nabukalu, D., Miller, A. P., Wawer, M. J., Ssekubugu, R., Nakowooya, H., Nantume, B., Park, E., Hahn, J. A., Serwadda, D. M., Sewankambo, N. K., Nalugoda, F., & Kigozi, G. (2020). Prevalence and correlates of men's and women's alcohol use in agrarian, trading and fishing communities in Rakai, Uganda. *PLoS One*, *15*(10), e0240796. https://doi.org/10.1371/journal.pone.0240796

WHO. (2016). *Consolidated guidelines on the use of antiretroviral drugs for treating and preventing HIV infection Recommendations for a public health approach* (2nd ed). World Health Organization.

WHO. (2018). *Global status report on alcohol and health* - 2018. https://www.who.int/publications/i/item/9789241565639