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**Patterns and predictors of antiretroviral therapy use among alcohol drinkers at HIV clinics in Tshwane, South Africa**

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Alcohol use is associated with compromised antiretroviral therapy (ART) adherence. We aimed to identify patterns and predictors of ART use among alcohol drinkers. Using purposive sampling, we recruited 304 male and female patients from two ART clinics in Tshwane, South Africa. Interviews were conducted using a structured questionnaire comprising measures of demographic factors, psychosocial factors (i.e., ART adherence, self-efficacy beliefs, alcohol and ART interactions beliefs, ART-alcohol outcome expectancy, attitude towards drinking alcohol and taking ART and HIV stigma) and alcohol use (AUDIT). Data were analysed using descriptive statistics and three multivariate linear regressions. Forty percent of the sample reported drinking alcohol. Half of the drinkers endorsed one of three unique patterns of ART use: (1) dosing ART earlier than required (2) taking ART while drinking alcohol and (3) skipping ART doses. The other half endorsed combinations of ART use on drinking days, for example, earlier ART dosing and taking ART while drinking alcohol was the most common combination. High adherence perseverance (a self-efficacy subscale) and a non-favourable attitude towards drinking alcohol and taking ART predicted the unique pattern of taking ART early when planning to drink alcohol. The unique pattern of taking ART despite drinking alcohol was predicted by higher levels of education (marginal significance) and experiencing low HIV stigma. A high score on the AUDIT and experience of high stigma predicted the unique pattern of skipping ART doses when drinking alcohol. Patterns of ART taking in alcohol drinkers in this sample are varied, and not always mutually exclusive. This apparent complexity of medication taking patterns among alcohol drinkers warrants further exploration. Furthermore, the finding that different psychosocial factors predict different ART-taking patterns suggests a need for programmes to improve alcohol-related non-adherence to ART to be multifaceted.

**Keywords:** alcohol; antiretroviral therapy; adherence; patterns of ART taking; South Africa

## Background

Alcohol use is a key modifiable psychosocial factor which hampers antiretroviral therapy (ART/ARV) adherence (e.g., Hendershot, Stoner, Pantalone, & Simoni, 2009). ART non-adherence related to alcohol use can entail missing some ART doses or completely interrupting one's ART schedule (Kalichman et al., 2013; Kenya et al., 2013; Marcellin et al., 2008). Three patterns of ART use among alcohol drinkers have been studied quantitatively: (1) "weekending" (drinking more on the weekend than weekdays and intentionally skipping one or two days of ART due to planned alcohol use), (2) skipping ART when drinking alcohol and (3) not skipping ART when drinking alcohol (Kalichman et al., 2009, 2012; Kenya et al., 2013). In our formative qualitative research (unpublished), we identified three patterns of ART use among alcohol drinkers: earlier ART dosing when planning to drink alcohol, taking ART concurrent with/after drinking alcohol and skipping ART doses when drinking alcohol. This study extends this line of research by examining (quantitatively):

(1) patterns of ART use and (2) predictors of patterns of ART use among alcohol drinkers.

## Methods

### Procedure

We purposively sampled 304 male and female patients from two ART clinics in Tshwane, South Africa. Eligibility criteria were: (a) 18 years or older; (b) HIV positive; (c) on ART for at least 4 months; (d) speakers of English or seTswana/seSotho or isiZulu and (e) cognitively intact.

The research was approved by the Ethics Committee of the University of Pretoria, the Gauteng Provincial Department of Health and the Centres for Disease Control and Prevention (CDC).

### Measures

Interviews were conducted using a broad-structured questionnaire which assessed: (i) demographics, (ii) household/structural factors, (iii) health care facility factors, (iv) ART

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adherence, (v) alcohol use, (vi) depression and (vii) psychosocial factors: social support, HIV disclosure and stigma, beliefs about alcohol and ART interactions, ART-alcohol outcome expectancy, attitudes towards drinking alcohol and taking ART, patterns of ART use when drinking alcohol and ART adherence self-efficacy. Only variables relevant to this paper are discussed further.

#### Demographic factors

Demographic factors included age, gender, education and assets (a proxy for material wealth based on eight household indicators: electricity, a radio, a television, a telephone, a fridge, a computer, a washing machine and a mobile phone).

#### Psychosocial factors

**HIV stigma.** The overall HIV stigma score was the sum of scores across two enacted stigma and two anticipated stigma items. Response options ranged from “strongly disagree” (1) to “strongly agree” (4).

**Adherence self-efficacy.** We used the two sub-scales of the 12-item HIV Treatment Adherence Self-efficacy Scale (Johnson et al., 2007): (a) adherence perseverance (three items) – perseverance in adhering to one’s treatment regimen(s) despite HIV-related adversity, and (b) adherence integration (nine items) – integration of the treatment regimen(s) into one’s life. Response options ranged from 1 (“cannot do it at all”) to 10 (“certain can do it”).

**Alcohol use.** We assessed alcohol consumption via the 10-item Alcohol Use Disorders Identification Test (AUDIT; Saunders, Aasland, Babor, de la Fuente, & Grant, 1993). Scores range from 0 to 40. Problem drinking is indicated by a score of 8 or above.

**Beliefs about alcohol and ART interactions.** The following 1-item Likert scale assessed beliefs regarding alcohol and ART interactions: “Please indicate how strongly you agree with the following statement: Drinking alcohol makes ARVs too strong/toxic”. Response options ranged from “strongly agree” (1) to “strongly disagree” (5).

**ART-alcohol outcome expectancy.** Five Likert scale items assessed negative ART and alcohol outcome expectancies; response options ranged from “strongly agree” (1) to “strongly disagree” (5). An illustrative item is “Please indicate how strongly you agree... (that)... Drinking alcohol and taking ARVs makes me feel sick or vomit”.

**Attitudes towards drinking alcohol and taking ART.** This 8-item Likert scale comprised three items which assessed a general attitude towards alcohol and ART and five which assessed the attitude towards taking ART relative to various alcoholic beverages. Response options ranged from “strongly agree” (1) to “strongly disagree” (5). An illustrative item (general attitude scale) is “How strongly

do you agree or disagree... (that) ... It is never OK to drink alcohol with ARVs”.

**Patterns of ART use when drinking alcohol [The outcome variables].** The three patterns of ART use measures were created from four Likert scale items: (1) Early ART taking was based on the item: “How often do you take your ART early if you know that you will be drinking?” (2) Simultaneous ART taking was based on the item: “How often do you take your ART even if you have been drinking or are drunk?” (3) Skipping ART taking was based on the summed score of two items: “How often do you skip doses of your ART if you have been drinking?” and “How often do you not take your ART if you have been drinking?” ( $r = 0.87$ ;  $p = 0.01$ ). Response options for these items ranged from “rarely (1)” to “always (4)”.

#### Data analysis

Data analysis involved descriptive statistics, Pearson correlations and three multivariate linear regressions. For the multivariate regressions, we entered independent variables that were significant at least at  $p < 0.05$  in the correlational analyses.

#### Results

The sample ( $N = 304$ ) was mostly female (68%), aged 30–34 and 35–39 years, single, unemployed and with low education (Table 1). Less than half (40.46%) of the sample reported drinking alcohol. The mean AUDIT score for drinkers was 9.84 (SD = 6.96). All participants’ average duration on ART was 24.87 months (SD = 18.69).

Half (49.59%) of those who drank alcohol endorsed one of the single patterns of ART use: (1) “early ART taking” (11.38%); (2) “simultaneous ART taking” (28.46%) and (3) “Skipping ART taking” (9.76%). The other half (50.41%) endorsed combinations of two or three of the ART use patterns. Early ART taking along with simultaneous ART taking was the most common combination of ART use patterns (21.49%). The least common combination (6.61%) was endorsement of all the three ART use patterns.

Table 2 shows correlations between each of the ART use patterns and demographic and psychosocial factors among those who consumed alcohol. Different sets of variables were significantly associated with each ART use pattern, with the exception of HIV stigma, which was associated with both simultaneous ART taking and skipping ART taking.

As shown in Table 3, high adherence perseverance and a non-favourable attitude towards drinking alcohol while taking ART predicted “early ART taking” [ $F(2, 116) = 5.42$ ;  $p = 0.006$ ;  $R^2 = 0.09$ ]. A high level of education (marginally significant) and low experience of HIV stigma predicted “simultaneous ART taking” [ $F(3,$

Table 1. Demographic characteristics of participants ( $N = 304^a$ ).

Variable	Males ( $N = 98$ )		Females ( $N = 205$ )	
	$n$ (%)	$M$ (SD)	$n$ (%)	$M$ (SD)
Age (years)		37.3 (7.8)		35.2 (8.1)
Marital status				
Married	20 (20.4)		42 (20.5)	
Cohabiting	6 (6.1)		10 (4.9)	
Single	63 (64.3)		127 (62.0)	
Other	9 (9.2)		26 (12.7)	
Employment				
Employed <sup>b</sup>	26 (26.5)		60 (29.3)	
Unemployed	72 (73.5)		145 (70.7)	
Education				
<Grade 8	19 (19.4)		34 (16.6)	
Grade 8–12	71 (73.5)		157 (76.6)	
>Grade 12	7 (7.1)		14 (6.8)	
Assets <sup>c</sup> ( $\geq 5/8$ household amenities)	17 (17.3)		45 (22.1)	
ART duration (months)		23.7 (15.7)		25.5 (20.0)

<sup>a</sup>One participant's gender could not be discerned; % based on  $N$  excluding this one participant.

<sup>b</sup>Part-time, full-time and self-employed.

<sup>c</sup>A proxy for material wealth.

115) = 4.01;  $p = 0.009$ ;  $R^2 = 0.10$ ]. Finally, a high score on the AUDIT and experience of high stigma predicted “skipping ART taking” [ $F(2, 115) = 7.33$ ;  $p = 0.001$ ;  $R^2 = 0.11$ ].

## Discussion

It emerged that patterns of ART use in alcohol drinkers are varied and not mutually exclusive. About half of those who drank alcohol endorsed a single ART use pattern; the other half reported a combination of ART use patterns. Additionally, different sets of psychosocial factors predict each unique pattern of ART use. First, those who perceive themselves as being more able to persevere with ART despite obstacles and have a negative attitude towards drinking alcohol and taking ART are most inclined to take their ART earlier. Although taking ART earlier than prescribed constitutes non-adherence, such a deviation from prescribed dosing times reflects individuals' attempt to problem solve regarding incorporation of ART into their drinking lifestyle.

Second, those with higher education and lower levels of HIV stigma are more likely to take ART despite drinking alcohol. More educated individuals may rely less on “folk beliefs” regarding alcohol and medicines, and more on objective information, such as the evidence that there are no antiretroviral agents with which alcohol consumption is specifically contraindicated (Kalichman et al., 2009; Lyimo et al., 2012).

Third, experiences of high stigma and high proneness to problem drinking (the AUDIT score) were positively

associated with “skipping ART taking” when drinking alcohol. Our findings contradict previous research (e.g., Sankar, Wunderlich, Neufeld, & Luborsky, 2007) that heavy drinkers are less likely than light and moderate

Table 2. Correlations between predictors and ART-taking patterns.

	Early ART taking	Simultaneous ART taking	Skipping ART taking
Gender	-.033	-.020	-.042
Age	.014	-.028	-.059
Education	-.128	.239**	-.052
Assets <sup>a</sup>	-.027	.181*	-.118
Beliefs about alcohol and ART interactions	.148	.016	.162
ART-alcohol outcome expectancy	.155	-.048	-.030
Self-efficacy			
Adherence perseverance	.193*	.070	.087
Adherence integration	.162	.026	.015
HIV stigma	.109	-.235**	.237**
AUDIT score	.073	-.050	.296***
Attitudes towards drinking alcohol and taking ART	-.220*	.083	.019

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

<sup>a</sup>A proxy for material wealth.

Table 3. Results of multivariate regression analyses for variables predicting early ART taking, simultaneous ART taking and skipping ART taking ( $N = 119$ ).

Dependent Variable	Predictor	SE		$\beta$	$p$	$R^2$ model	$F$
		$B$	$B$				
Early ART taking	Self-efficacy: adherence perseverance	0.15	0.07	0.19	0.032*	0.09	5.42**
	Attitudes towards drinking alcohol and taking ART	-0.05	0.02	-0.21	0.018*		
Simultaneous ART taking	Education	0.10	0.05	0.19	0.058	0.10	4.01**
	Assets <sup>a</sup>	0.03	0.09	0.03	0.789		
	HIV stigma	-0.14	0.07	-0.20	0.038*		
Skipping ART taking	AUDIT score	0.08	0.03	0.25	0.008**	0.11	7.33**
	HIV stigma	0.18	0.09	0.18	0.050*		

\* $p < .05$ ; \*\* $p < .01$ .<sup>a</sup>A proxy for material wealth.

drinkers to skip ART when drinking, but concur with the observation that stigma impedes ART adherence in sub-Saharan Africa (e.g., Dlamini et al., 2009).

Our findings suggest the importance of educating ART patients and their health care providers about alcohol and ART in order to prevent intentional ART non-adherence on drinking days among some patients. Moreover, given that different psychosocial factors predict different ART-taking patterns, programmes to improve alcohol-related non-adherence to ART ought to be multifaceted.

### Limitations

Since self-report measures for alcohol consumption and ART adherence are susceptible to social desirability bias, their use is a limitation. Furthermore, we did not inquire whether participants take some medications in their regimen and skip others on drinking days and reasons guiding such behaviour. The study's cross-sectional design precludes causal inferences, and the generalisability of its findings is limited.

### Future direction

Qualitative research is needed to explore people's reasons for engaging in the various ART-taking patterns. Additionally, qualitative studies could shed light on the mechanisms through which varied psychosocial factors predict different ART-taking patterns.

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