



Published in final edited form as:

J Adolesc Health. 2021 August ; 69(2): 346–348. doi:10.1016/j.jadohealth.2020.12.134.

Feasibility of Ethyl Glucuronide Nail Testing Biomarker for Alcohol Use among Youth Living with HIV

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Abstract

Purpose: We assessed feasibility of the ethyl glucuronide biomarker (EtG) through nail sampling to measure alcohol use among youth living with HIV in the United States (YLWH, N=183); we also evaluated concordance between this EtG biomarker and self-reported measures of alcohol use, specifically, the Alcohol Timeline Followback (TFLB) and Alcohol, Smoking and Substance Involvement Screening Test (ASSIST).

Methods: EtG, TFLB, and ASSIST were collected at 4-points over 1-year. At baseline and 52-weeks, 78.1% and 70.1% respectively, provided a valid (full or partial) sample.

Results: At 16-weeks, EtG was associated with ASSIST ($r=0.25$, $p<.05$). At 28-weeks and 52-weeks, TFLB and ASSIST were correlated with EtG (at 28-weeks $r=0.23$, $p<.05$ and $r=0.41$, $p<.01$, respectively; at 52-weeks $r=0.34$, $p<.01$ and $r=0.25$, $p<.05$, respectively).

Conclusions: We found that nail-based EtG biomarker was feasible to measure alcohol use among YLWH; we also found concordance between EtG, TFLB, and ASSIST, supporting ongoing use of self-reported alcohol use measures with YLWH.

INTRODUCTION

Although there is a growing body of literature on the use of ethyl glucuronide (EtG) biomarkers to assess alcohol use,[1] many of these protocols utilize hair collection rather than nail specimens, and even fewer studies examine the use of EtG testing via nail samples

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among youth. While EtG hair testing results are valid, it requires collection of 3–6 centimeters of hair that may not be feasible. To our knowledge, there are no EtG nail-based studies with youth living with HIV (YLWH), arguably one of the most underserved and vulnerable youth sub-populations, a group that is more likely than their HIV-negative peers to engage in problematic alcohol use (a behavior that is associated with HIV-disease progression).[2,3] Considering the clinical and scientific benefit of validating the feasibility of biomarkers that provide objective data on risk behaviors among youth and YLWH, we conducted this EtG biomarker study under the auspices of the Adolescent Medicine Trials Network for HIV/AIDS Interventions (ATN, protocol 129). The purpose of this study was twofold: examine acceptability and feasibility of nail-based EtG testing among YLWH, and assess concordance between nail-based EtG biomarker results and self-reported scales of alcohol use among YLWH.

METHODS

We analyzed data from a five-city randomized controlled trial of the Healthy Choices intervention (ATN 129), within which we collected alcohol use biomarkers and self-reported measures. We describe study protocols elsewhere.[4] Participant eligibility included: being 16–24 years, having detectable viral load, prescribed antiretroviral medications, able to speak and understand English, and self-reporting alcohol use in the prior 3-months (N=183). Data collection occurred at study labs and HIV clinics, pre-intervention (baseline), 16-weeks, 28-weeks, and 52-weeks post-baseline. Wayne State University’s Institutional Review Board provided ethics approval (#097013B3E).

Alcohol measures

For EtG assays, participants clipped their own fingernails (or toenails) and collected them in a sterile foil tray, witnessed by a Research Assistant. For testing purposes, nails with polish were acceptable; acrylic, gel, and silk overlaid nails were unacceptable. EtG assay requires 100mg of nails (necessitating clippings be taken from multiple nails). After collection, the Research Assistant weighed the sample using a gem scale, sealed the foil tray inside a specimen envelope, sealed the specimen envelope, and indicated participant ID and collection date and time on the outside of the package. Our samples were analyzed by The United States Drug Testing Laboratories using immunoassay to screen for indication of alcohol use with minimum quantification threshold of 8pg/mg, that is sensitive to detecting weekly alcohol consumption.[1,5] We also collected self-reported alcohol use via the highly reliable Timeline Followback (TLFB) and Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST, test-re-test kappa=0.85).[5–7] The TLFB assessed the number of standard drinks consumed on each of the past 30 days (quantity, frequency, and recency). The ASSIST score included frequency and consequences of alcohol use in the past 3-months.

Analyses

We conducted point bi-serial correlations to assess statistical relationships between dichotomous EtG results and continuous self-reported alcohol use measures.

RESULTS

Mean participant age was 21.4 years (SD=1.9); 79.2% self-identified as male; 82.5% self-identified as Black or African American. Over half self-identified as gay or lesbian; 8.2% reported being perinatally HIV-infected. At baseline, 78.1% provided a valid (full or partial) sample; 70.1% of participants who completed the 52-week follow-up visit provided a valid sample. Among the 21.9% who did not provide baseline samples, 14.8% were unable to provide a sample due to insufficient nail length or artificial nails, while 7.1% refused to provide a sample due to perceptions that cutting nails for research was unacceptable or made the participant uncomfortable. Among the 78.1% who provided a baseline sample, 59.0% provided a complete sample; 19.1% provided a partial sample. Sampling rates, including refusals, varied across time, but these differences were not statistically significant. See Table 1.

At baseline, 25.2% of those who provided sample had a positive EtG result; by 52-weeks, positive results decreased to 13.3%. This reduction was anticipated since the Healthy Choices intervention aimed to reduce problematic alcohol use among YLWH. At baseline the correlations between the ASSIST and TLFB variables were significant (total drinks [$r=0.30, p<.01$]; heaviest drinking week [$r=0.28, p<.01$]). Baseline EtG was significantly negatively correlated with days since last use (TLFB; $r=-0.21, p<.05$). At 16-weeks, EtG and ASSIST were significantly correlated ($r=0.25, p<.05$). Total drinks consumed (TLFB) and ASSIST score were significantly associated with EtG at 28-weeks ($r=0.23, p<.05$ and $r=0.41, p<.01$, respectively) and at 52-weeks ($r=0.34, p<.01$ and $r=0.25, p<.05$, respectively). See Table 2.

DISCUSSION

Our findings indicate that although EtG nail testing was feasible and acceptable to most YLWH study participants, this biomarker was unacceptable to some. At each time point, over 20% of participants refused or were unable to provide a valid sample, suggesting that an exploratory qualitative study to elucidate barriers to EtG nail testing and ascertain techniques to promote the acceptability among YLWH, particularly YLWH who are sexual and gender minorities of color, may be warranted. Among participants who provided nail samples, we found some statistical concordance between EtG results and self-reported measures of alcohol use via the TLFB and ASSIST. While our effect sizes ($r=0.23$ to 0.41) are considered small to moderate[8], findings suggest that self-report measures, although not equal, may be used as an alternative to assessing alcohol use when it is not possible to collect objective biomarkers. A limitation of this study is that statistical concordance between EtG, TLFB, and ASSIST outcomes may have emerged, because participants were aware that their alcohol use self-reported data could be validated against their EtG biomarker, leading to increased effort given to self-reported recall and honesty in self-reporting.

ACKNOWLEDGEMENTS

Research reported in this publication was supported by the National Institute of Mental Health, National Institute on Drug Abuse, and Eunice Kennedy Shriver National Institute of Child Health and Human Development of the

National Institutes of Health under Award Numbers K01MH116737 (Budhwani), K01AA024500 (Jacques-Tiura), R01AA022891 (Naar), and U19HD089875 (Naar). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health. We thank our youth participants who volunteered their time, and we acknowledge the contributions of the Healthy Choices Project Team, including our staff, recruiters, and interns.

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IMPLICATIONS AND CONTRIBUTION

This study provides evidence for the feasibility and acceptability of using ethyl glucuronide biomarker via nail sampling to assess alcohol use among YLWH; the study also substantiates the validity, and therefore supports the ongoing use, of certain self-report alcohol use scales, indicated by statistical concordance between self-report and biomarker results.

Table 1.

Descriptive alcohol related sample data

	Baseline N=183		16 weeks N=136		28 weeks N=118		52 weeks N=117	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
EiG biomarker alcohol results								
Complete sample	108	(59.0)	79	(58.1)	61	(51.7)	59	(50.4)
Partial sample	35	(19.1)	22	(16.2)	21	(17.8)	23	(19.7)
Refused to provide sample [†]	13	(7.1)	11	(8.1)	9	(7.6)	16	(13.7)
Unable to provide sample	27	(14.8)	24	(17.6)	27	(22.9)	19	(16.2)
EiG sample = negative	104	(74.8)	75	(77.3)	59	(75.6)	65	(86.7)
EiG sample = positive	35	(25.2)	22	(22.7)	19	(24.4)	10	(13.3)
Self-reported alcohol results								
Total drinks in a month (TLFB)	Mean	SD	Mean	SD	Mean	SD	Mean	SD
	14.9	(19.9)	9.0	(13.7)	10.5	(19.5)	8.8	(13.1)
Most drinks in a day (TLFB)	5.3	(6.0)	3.5	(4.2)	4.0	(5.3)	3.1	(3.9)
Drinks in heaviest drinking week (TLFB)	8.1	(9.0)	5.4	(7.7)	6.5	(11.3)	5.4	(7.6)
Number of days since last drank (TLFB)	6.0	(7.3)	5.1	(5.4)	5.2	(5.6)	6.3	(6.8)
ASSIST score	11.7	(8.8)	9.8	(8.7)	10.1	(9.1)	10.3	(8.4)

[†]Unable to provided sample due to lack of nail length or having acrylic or artificial nails

Table 2.Point-biserial correlations between positive EtG result (≥ 8 pg/mg) and self-report alcohol use measures

	Positive EtG Result			
	Baseline	16 weeks	28 weeks	52 weeks
Total drinks in a month (TLFB)	0.14	0.06	0.23*	0.34**
Drinks in heaviest drinking week (TLFB)	0.10	0.06	0.20	0.24*
Days since last drink (TLFB)	-0.21*	-0.06	-0.35**	-0.11
ASSIST score	0.16	0.25*	0.41**	0.25*

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