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Effects of cigarette smoking and nicotine dependence on adherence to antiretroviral therapy among HIV-positive patients in Vietnam

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Abstract

Cigarette smoking is increasingly recognized as an indicator for inferior adherence to antiretroviral therapy (ART) among HIV-positive patients. Given the limited body of work on this issue, we aimed to explore the relations between cigarette smoking, nicotine dependence, and ART adherence in Vietnam. A cross-sectional study of 1050 HIV-positive people was conducted from January to September 2013 in Hanoi (the capital) and Nam Dinh (a rural city). Adherence to ART during the last 30 days was measured by the 100-point visual analog scale (VAS). Smoking history and nicotine dependence (Fagerstrom Test of Nicotine Dependence) were self-reported by participants. Multiple logistic regression was performed to examine the association of current smoking and nicotine dependence with ART nonadherence. Using the established VAS cut point of 95 to indicate adequate adherence, the prevalence of ART nonadherence was 30.9%. Approximately 35.5% of the sample reported current smoking. No association between smoking status and ART nonadherence was found. However, participants with greater nicotine dependence (OR=1.1, 95%CI=1.0–1.2 per unit increase) were more likely to be nonadherent. Also, individuals who were female (OR=1.70, 95%CI=1.19–2.42), receiving ART in Nam Dinh (OR=1.6, 95%CI=1.1–2.4), and currently feeling anxiety (OR=1.6, 95% CI=1.2–2.1) had a higher likelihood of ART nonadherence. Additionally, current smokers reporting current pain (OR=1.9, 95%CI=1.2–3.1) were more likely to be nonadherent. Conversely, protective factors included living with a spouse/partner (OR=0.5, 95%CI=0.3–0.7) and having more than a high school

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education (OR=0.4, 95%CI=0.1–1.0). Given the high prevalence of suboptimal adherence and current smoking among HIV-positive patients, screening for smoking status and nicotine dependence during ART treatment may help to improve patients' adherence to medication. More efforts should be targeted to women, patients with mental health problems, and ART clinics in rural areas.

Keywords

cigarette; smoking; ART adherence; HIV; Vietnam

Introduction

Emerging research indicates high rates of cigarette smoking among people living with HIV/AIDS (PLWHA), ranging from 40% to 74% (Burkhalter, Springer et al. 2005, Duval, Baron et al. 2008, Reynolds 2009, Tesoriero, Gieryic et al. 2010). Furthermore, smoking is increasingly recognized as a predictor for inferior adherence to antiretroviral therapy (ART), which may contribute to poor ART response (Shuter and Bernstein 2008, Webb, Vanable et al. 2009, O'Connor, Gardner et al. 2013, O'Cleirigh, Valentine et al. 2015). HIV-positive smokers (vs. nonsmoking counterparts) demonstrated lower ART adherence rates (O'Connor, Gardner et al. 2013, O'Cleirigh, Valentine et al. 2015). Moreover, a higher level of nicotine dependence was associated with a higher likelihood of ART nonadherence (King, Vidrine et al. 2012). Therefore, exploring the effects of smoking on ART adherence is critical to identify patients at risk for suboptimal adherence and to design adherence improvement interventions.

To date, there have been no data on this issue in Vietnam. The HIV prevalence among adults age 15–49 years is 0.45% in the country (VAAC 2014). Free ART services have been scaled up since 2006, and cover 53% of patients in need of treatment. Furthermore, high rates of suboptimal ART adherence among Vietnamese patients have been observed, with a range of 25–29% (Do and Pham 2011, Tran, Nguyen et al. 2013). However, the effects of smoking and nicotine dependence on adherence have not been examined. Thus, this study aimed to explore the associations between cigarette smoking, nicotine dependence, and ART adherence in this developing country. We hypothesized that PLWHA who were current smokers or had greater nicotine dependence would be less likely to be adherent to their medications.

Methods

Participants and procedures

The survey was conducted in Hanoi – the capital, and Nam Dinh – a rural area from January to September 2013. Participants were recruited from eight clinics through a convenience sampling technique. Eligible patients must have been 18 years or older, currently taking ART, and willing to provide informed consent. Individuals having any health problems that could interfere with participating in an interview were excluded. The study was approved by the Vietnam Authority of HIV/AIDS Control and The University of Texas Health Science

Center at Houston. Further details about the study procedures have been previously published. (Nguyen, Tran et al. 2015, Nguyen, Tran et al. 2015)

Measures

ART adherence—Adherence during the last 30 days was measured by the 100-point visual analog scale (VAS), where 0 indicates complete nonadherence and 100 indicates complete adherence (Giordano, Guzman et al. 2004). The established cut point of 95 or above was used to indicate adequate adherence.

Cigarette smoking—Smoking items were devised based on previous studies (Vidrine, Fletcher et al. 2012, Vidrine, Marks et al. 2012). Current smokers were those who had smoked at least 100 cigarettes during their lifetime and had smoked in the last 30 days. Former smokers were those who reported smoking at least 100 cigarettes but had not smoked in the last 30 days. Never smokers were those who had smoked less than 100 cigarettes during their lifetime. Additionally, the Fagerstrom Test for Nicotine Dependence (FTND) was employed to evaluate nicotine dependence (Heatherton, Kozlowski et al. 1991). It included six items yielding a total score of 0–10 with higher scores indicating higher nicotine dependence. Nonsmoking participants (former and never smokers) were assigned a FTND score of 0.

Other covariates—Sociodemographic characteristics (i.e., age, gender, educational attainment, marital status, and employment status) were obtained. Alcohol consumption was measured by the brief version of the Alcohol Use Disorders Identification Test-Consumption (AUDIT-C) (Bush, Kivlahan et al. 1998). History of illicit drug use was examined. Health-related characteristics (i.e., HIV-infection duration, HIV stage, and ART treatment duration) were self-reported. Pain and anxiety were assessed by items from the EQ-5D-5L (EQOL 2011).

Statistical analyses

Two multiple logistic regression models with the same set of covariates were performed to identify factors associated with nonadherence among all participants and among only current smokers. Variables whose univariable test had a p-value <0.25 were candidates for the multivariable models along with all variables of known clinical importance (e.g., alcohol and drug use). We applied a stepwise backward model approach based on the log-likelihood ratio test including variables with a p-value <0.1. Smoking status and FTND score were kept in the final models regardless of statistical significance. Collinearity and potential interactions were examined. Statistical analyses were performed with STATA version 12.0 (StataCorp LP, College Station, Texas, USA).

Results

Participants' characteristics

Overall, 1050 participants were included in this analysis. The mean age was 35.6 years (SD=6.9). The majority was male (58.4%), had less than a high school education (58.1%), lived with a spouse/partner (61.6%), and was currently working (80.0%). The prevalence of

current-, former-, and never smoking in the sample was 35.5%, 9.5%, and 55.0%, respectively. Approximately 35% of the sample reported ever using illicit drugs and 17% reported hazardous drinking. The mean duration of HIV infection and ART treatment was 6.2 years (SD=3.4) and 4.4 years (SD=2.2), respectively. Pain (37.3%) and anxiety (43.8%) were prevalent in the sample. (Table 1)

Suboptimal ART adherence

The prevalence of nonadherence was 30.9%, slightly higher among current smokers (31.6%) than among nonsmokers (30.6%) ($p=0.72$). Adherent participants (vs. nonadherent counterparts) were more likely to be living with a spouse/partner, have higher educational attainment, receive ART in Hanoi, report no pain or anxiety, and had lower FTND scores (1.4 vs. 1.6, $p=0.09$). (Table 1)

Associated factors with ART nonadherence

We did not find a significant association between current smoking status and ART adherence (data not shown). However, after controlling for other covariates, a significant relationship between FTND score and adherence was observed although the initial zero order relationship (with no covariates) was not significant. Accordingly, every unit increase in FTND score was associated with greater odds of nonadherence (OR=1.1, 95% CI=1.0–1.2). Additionally, female patients (OR=1.7, 95% CI=1.2–2.4), participants receiving ART in Nam Dinh (OR=1.6, 95% CI=1.1–2.4), and individuals currently feeling anxiety (OR=1.6, 95% CI=1.2–2.1) were more likely to be nonadherent. (Table 2)

Multiple logistic regression analysis conducted only with the current smokers also indicated the negative association between nicotine dependence and adherence (OR=1.1, 95% CI=1.0–1.2). Additionally, current smokers who were feeling pain had a higher likelihood of nonadherence (OR=1.9, 95% CI=1.2–3.1). Conversely, protective factors were living with a spouse/partner (OR=0.5, 95% CI=0.3–0.7) and having more than a high school education (OR=0.4, 95% CI=0.1–1.0). (Table 2)

Discussion

Our study is among the first to address the role of smoking on ART adherence in Vietnam. We observed high prevalence rates of ART nonadherence (30.9%) and current smoking status (35.5%). We did not find a significant association between smoking status and ART adherence. It could be due to variations in assessments of adherence across studies. Our study used the VAS instrument, while other studies used the Medication Event Monitoring System (Shuter and Bernstein 2008) or a 5-Likert point item (O'Connor, Gardner et al. 2013) to assess adherence. Interestingly, our study is among the limited body of work indicating a role of nicotine dependence on ART adherence. In line with previous studies (Peretti-Watel, Spire et al. 2006, King, Vidrine et al. 2012), we found that HIV-positive persons with greater nicotine dependence were more likely to report suboptimal adherence.

Additionally, mental health problems may interfere with ART adherence. In a systematic review, depression was consistently associated with a lower likelihood of ART adherence across the country's income group, study design, and adherence rates (Uthman, Magidson et

al. 2014). While our study did not include data on depression, we did observe a relationship between anxiety and poor ART adherence, providing further evidence of the deleterious effects of negative affect. Nevertheless, there is debate as to whether this association is related to smoking or not. One study found that depression mediated the effect of smoking on adherence (Webb, Venable et al. 2009). However, this effect was diminished in combination with nicotine dependence (King, Vidrine et al. 2012). More research is warranted to examine the underlying mechanisms of this association.

We also found females were more likely to be nonadherent to their HIV medication. One explanation is that females had traditional gender roles (e.g., housework and taking care of children), which impaired taking their medications. Additionally, living in Nam Dinh was found to be negatively associated with ART adherence. It could be due to fewer resources for HIV treatment management at ART clinics in rural areas, or differences in HIV populations between urban and rural areas.

Several limitations should be acknowledged. First, due to the cross-sectional design, we cannot establish temporal or causal relationships between the independent variables and ART adherence. Second, self-reported data may be compromised by some degree of recall error and socially desirable responding. Third, the generalization of our results is limited by the convenience sampling strategy.

Conclusions

The high prevalence of both nonadherence and smoking combined with the negative association between nicotine dependence and adherence highlight the necessity of screening for smoking and nicotine dependence during ART treatment. Additionally, more efforts should be targeted on females, patients with mental health problems, and ART clinics in rural areas.

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Table 1:
Characteristics of study participants by ART adherence (N=1050)

	Adherence	Nonadherence	Total	p-value
N (%)	725 (69.1)	325 (30.9)	1050 (100.0)	
Sociodemographics, n (%)				
Age in years, mean (sd)	35.8 (6.8)	35.2 (7.0)	35.6 (6.9)	0.17
Gender				
Female	290 (40.0)	147 (45.2)	437 (41.6)	0.11
Male	435 (60.0)	178 (54.8)	613 (58.4)	
Annual income				
Poorest (<1.20 million VND)	236 (32.6)	108 (33.2)	344 (32.8)	0.32
Moderate (1.21–3.00 million VND)	272 (37.5)	131 (40.3)	403 (38.4)	
Richest (>3.00 million VND)	208 (28.7)	78 (24.0)	386 (27.2)	
Marital status				
Live with spouse/partner	466 (64.3)	181 (55.7)	647 (61.6)	<0.01
Education				
Less than high school	401 (55.3)	209 (64.3)	610 (58.1)	0.01
High school	236 (32.6)	91 (28.0)	327 (31.1)	
More than high school	88 (12.1)	25 (7.7)	113 (10.8)	
Location				
Hanoi	660 (91.0)	273 (84.0)	933 (88.9)	<0.01
Nam Dinh	65 (9.0)	52 (16.0)	117 (11.1)	
Employment status				
Currently working	586 (80.8)	254 (78.2)	840 (80.0)	0.32
Substance use, n (%)				
Cigarette smoking				
Never smokers	400 (55.2)	177 (54.5)	577 (55.0)	0.93
Former smokers	70 (9.7)	30 (9.2)	100 (9.5)	
Current smokers	255 (35.2)	118 (36.3)	373 (35.5)	
FTND score, mean (sd)	1.4 (2.1)	1.6 (2.3)	1.5 (2.2)	0.09
Alcohol consumption				
Hazard drinking	119 (16.4)	59 (18.2)	178 (17.0)	0.49
Illicit drug use				
Ever using illicit drugs	248 (34.2)	119 (36.6)	367 (35.0)	0.45
Ever injecting drugs	220 (30.3)	111 (34.2)	331 (31.5)	0.22
Health-related characteristics, n (%)				
HIV stage				
Without symptoms	285 (39.3)	131 (40.3)	416 (39.6)	0.49
With symptoms	117 (16.1)	63 (19.4)	180 (17.1)	
AIDS	71 (9.8)	28 (8.6)	99 (9.4)	
HIV duration (years), mean (sd)	6.2 (3.4)	6.2 (3.3)	6.2 (3.4)	0.90
ART duration (years), mean (sd)	4.4 (2.2)	4.3 (2.1)	4.4 (2.2)	0.48

	Adherence	Nonadherence	Total	p-value
Currently feeling pain	247 (34.1)	145 (44.6)	392 (37.3)	<0.01
Currently feeling anxiety	287 (39.6)	173 (53.2)	460 (43.8)	<0.01

Table 2:

Associated factors of ART nonadherence among all participants and current smokers

	All participants (N=1050)		Current smokers (N=373)	
	Adjusted OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
Sociodemographics				
Sex (Female vs. Male)	1.70 (1.19–2.42)	<0.01		
Marital status				
Live with spouse/partner			0.45 (0.28–0.74)	<0.01
Education				
Less than high school			1.00	
High school			0.70 (0.42–1.17)	0.17
More than high school			0.36 (0.14–0.97)	0.04
Location				
Nam Dinh vs. Hanoi	1.62 (1.08–2.44)	0.02		
Employment status				
Currently working			0.63 (0.37–1.07)	0.09
Substance use				
FTND score	1.08 (1.00–1.16)	0.047	1.12 (1.00–1.24)	0.049
Ever injecting drugs	1.42 (0.98–2.05)	0.06		
Health-related characteristics				
Currently feeling pain			1.92 (1.18–3.13)	<0.01
Currently feeling anxiety	1.60 (1.22–2.11)	<0.01		