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Current Research on Cigarette Smoking Among People with HIV

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Abstract A large percentage of people with HIV are current cigarette smokers. Most smokers with HIV are interested in quitting; however, smoking cessation interventions are only moderately effective in this population. Also, most HIV care providers are not trained in tobacco dependence treatment and most smokers with HIV are not getting the smoking cessation support that they need. Although advances in HIV treatment have provided the opportunity for prolonged life, many HIV-positive individuals are not benefitting from these advances because they are suffering from the health consequences of tobacco dependence. Barriers to smoking cessation among smokers with HIV need more research, and new interventions that address the unique issues of smokers with HIV need to be developed and evaluated. HIV care providers need education on tobacco dependence treatment so that smokers with HIV have access to the education and support that they need to successfully quit smoking.

Keywords Smoking · Cigarette · Tobacco · HIV

Introduction

Although advances in HIV treatment have improved health and prolonged life for people with HIV, many HIV-positive individuals are not benefitting from these advances because

they are suffering from the consequences of tobacco dependence. A high proportion of people with HIV are current cigarette smokers, and smokers with HIV are less likely to quit than smokers in the general population [1•, 2–6]. In fact, smokers with HIV, who have access to adequate HIV care, are more likely to die from smoking-related causes than HIV-related causes [7–9]. HIV-positive smokers are more likely to be depressed, have worse quality of life, and have lower anti-retroviral adherence as compared to HIV-positive individuals who do not smoke [6, 10]. Some smoking cessation interventions are promising for helping smokers with HIV to quit smoking; however, research in this area is limited, with variable results. Given the potential for people with HIV to live prolonged and productive lives and the consequences of high tobacco dependence in this population, smoking among HIV-positive individuals needs greater attention.

Smoking Prevalence and Behavior

Recent studies report between 40 and 84 % of people with HIV are current cigarette smokers, two to four times the percentage of smokers in the general US population [1•, 2–4]. Further, although the percentage of smokers in the general population has been steadily declining, the percentage of smokers among people with HIV has remained constant since the first studies of smoking in this population in the 1990s [11–13]. One recent study of 4217 adults who received HIV medical care found that 42, 20, and 37 % were current smokers, former smokers, and never smokers, respectively [1•]. Another study of 349 HIV-positive individuals from the National Survey on Drug Use and Health found that 40 % were current smokers [2]; however, a study of 296 indigent adults with HIV found that 74 % were current smokers [3]. Studies of HIV-positive current and former drug users found that 75–84 % were current smokers and 10 % former smokers [4]. Finally, studies of smokers with HIV have

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found that they, on average, smoke 15–19 cigarettes per day, most are moderately or highly dependent (67 %), and many (15–22 %) also use other forms of tobacco such as cigars, pipes, or chewing tobacco [5, 6]. In sum, public health initiatives that have impacted the smoking prevalence in the general population have had little impact among those with HIV, and alternative solutions need to be explored to decrease smoking among these individuals.
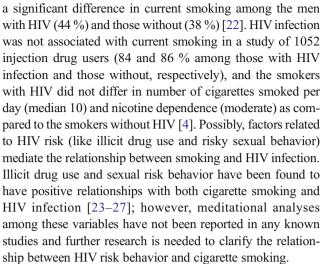
Morbidity and Mortality

Many studies have investigated the impact of smoking on the health of individuals with HIV, and smoking increases both HIV-related and non-HIV-related illness. Among people with HIV, smoking increases risk for bacterial pneumonia, chronic obstructive pulmonary disease (COPD), cardiovascular disease, and decreased bone mineral density [8, 14–17]. One study found that the incidence rate ratio of smoking-related cancers (i.e., lung, head and neck, esophageal, and bladder cancer) among HIV-positive smokers is more than five times the ratio among general population smokers [18]. While smoking does not seem to increase the risk of virological cancers (i.e., lymphoma, Kaposi sarcoma, liver cell carcinoma, anal cancer, cervical cancer, vulva cancer, penile cancer) among people with HIV [18], as compared to HIV-positive non-smokers, HIV-positive smokers are more likely to get esophageal and oral candidiasis [8, 19].

Given the health consequences of smoking, smoking is associated with increased mortality among HIV-positive smokers as compared to HIV-positive non-smokers [7–9]. Studies evaluating the relationship between cigarette smoking and life expectancy among HIV-positive individuals have found that the adjusted hazard ratio and mortality rate ratio of HIV-positive smokers as compared to HIV-positive non-smokers is 1.8–1.9 [9, 20]. Another study found that, among people with HIV, non-HIV-related mortality was more than five times higher among smokers than among never smokers, and the risk of all-cause mortality was almost four times higher [7]. Among people with HIV, the average life expectancy for 35-year-old smokers, former smokers, and never smokers is 62.6, 69.1, and 78.4 years, respectively [7].

Factors Associated with Smoking

Studies investigating the relationship between cigarette smoking and HIV infection among populations known to be at risk for HIV have had mixed results. One study found that among 505 men who have sex with men (MSM), the odds of current cigarette smoking was 2.92 times greater among those with HIV as compared to those without HIV [21]. Alternatively, another study including 6972 MSM did not find

a significant difference in current smoking among the men with HIV (44 %) and those without (38 %) [22]. HIV infection was not associated with current smoking in a study of 1052 injection drug users (84 and 86 % among those with HIV infection and those without, respectively), and the smokers with HIV did not differ in number of cigarettes smoked per day (median 10) and nicotine dependence (moderate) as compared to the smokers without HIV [4]. Possibly, factors related to HIV risk (like illicit drug use and risky sexual behavior) mediate the relationship between smoking and HIV infection. Illicit drug use and sexual risk behavior have been found to have positive relationships with both cigarette smoking and HIV infection [23–27]; however, meditational analyses among these variables have not been reported in any known studies and further research is needed to clarify the relationship between HIV risk behavior and cigarette smoking.

Among people with HIV, various demographic, behavioral, social, and HIV-related factors are related to current smoking, and these factors could help to identify individuals and issues to target for intervention. In a sample of 4217 HIV-positive individuals, older age, non-Hispanic White and Black race, less education, low socioeconomic status, homelessness, and incarceration were positively associated with current cigarette smoking [1•]. Several studies among people with HIV have found that current cigarette smoking is positively related to drug and alcohol use and treatment [1•, 2, 28]. Further, among former and current drug users with HIV, current smoking is associated with current drug use, participation in a 12-step program, and having a primary supporter who is a smoker [29]. Depression and anxiety also have positive associations with cigarette smoking among people with HIV [1•, 6], and, among HIV-positive smokers, loneliness is associated with greater cigarette consumption [30]. In a sample of 60 HIV-positive smokers, most reported that they smoke to manage anxiety and depression, and 75 % reported that they smoke to manage stress [6]. Participants ($n = 29$) in a qualitative study of smokers with HIV described social networks that consisted primarily of other smokers [28]. Finally, studies have found that cigarette smoking has a negative association with antiretroviral adherence and positive association with viral load among people with HIV [1•, 31]. In sum, for all people with HIV to truly benefit from HIV treatment, HIV-positive individuals who (1) lack financial resources, (2) have low education, (3) use drugs and alcohol, (4) have anxiety and depression, (5) have difficulty coping with stress, boredom, and loneliness, and (6) have social networks of smokers need to be targeted for tobacco dependence treatment.

Motivation to Quit, Cessation Attempts, and Related Factors

The majority of smokers with HIV are interested in quitting smoking and many have made quit attempts. Pacek et al. [32]

found that among 267 smokers with HIV, 74 % were interested in quitting and 59 % had used smoking cessation pharmacotherapy during their lifetime. Further, among those who never used pharmacotherapy, 32 % were interested in trying it. One study of 29 smokers with HIV found that 45 % were interested in quitting in the next 30 days, and 79 % attempted to quit smoking in the past [28]. Another study of 60 smokers with HIV found that 66 % were in the "preparation" or "action" stage of change, 82 % made at least one quit attempt, and 32 % had quit for at least 1 year [6]. Most quit "cold turkey" (65 %), 40 % used nicotine replacement therapy, and 5 % used acupuncture. A longitudinal study of 296 HIV-positive indigent adults, of whom 74 % were current smokers, found that 21 % made at least one quit attempt during the 2-year study period, and 5 % successfully quit [3]. Schafer et al. [33] conducted a prospective cohort study of 4833 smokers with HIV over 12 years and found that although 26 % had a period of non-smoking, almost half of the 26 % returned to smoking. These studies suggest that although most smokers with HIV are interested in quitting and many have tried to quit, few are able to remain abstinent long term.

Several recent studies have evaluated factors that are associated with motivation and attempts to quit. Pacek et al. [32] found that older age and lifetime pharmacotherapy use were positively related to interest in quitting smoking, and older age, White race, and having a supporter who used smoking cessation pharmacotherapy were positively related to lifetime pharmacotherapy use. Shuter et al. [6] evaluated beliefs among smokers with HIV that could impact their motivation to quit smoking and found that while 80 % were concerned "somewhat" or "a lot" about the effects of smoking on their health, 27 % erroneously believed that smoking increases their T cell count and improves their immune functioning. In a qualitative study of HIV-positive smokers, participants who made a quit attempt in the past reported that they quit smoking due to factors such as incarceration, protecting children, fear of health consequences, and pregnancy [28]. Hessol et al. [34] conducted a longitudinal study of 1622 smokers with HIV and found that among the 19 % who achieved sustained smoking abstinence over the 17 years of the study, shorter time to smoking abstinence was positively associated with pregnancy, and longer time to smoking abstinence was positively associated with lower household income and drug use. Further, CD4 count <200 and use of highly active antiretroviral therapy were also positively associated with longer time to smoking abstinence. Possibly, those who were more ill were less motivated to quit smoking due to the stress of their physical symptoms or the belief that they already had a terminal disease; however, the meaning of this finding is unclear and needs further research. Based on these findings, interventions that (1) address drug use and other stressors, (2) provide support from others who used smoking cessation pharmacotherapy, (3) educate about the health risks of smoking, and (4) enable

discussion of the impact of smoking on children and other loved ones could enhance motivation to quit among smokers with HIV.

Treatment Studies

In recent years, four large randomized controlled trials and several pilot and non-randomized tobacco dependence treatment studies among smokers with HIV have been published (Table 1). However, the smoking abstinence rates achieved in most of these studies are similar to the rates achieved in earlier studies of tobacco dependence treatment in this population [49•]. Three of the large randomized trials had post-treatment smoking abstinence rates of 3–19 % and evaluated nicotine replacement therapy (NRT) or guidance on how to get NRT and (1) brief advice or education, (2) self-help materials, (3) group therapy (with educational content tailored to HIV), or (5) CBT delivered by phone (with content minimally tailored for HIV) [36•, 45•, 46•, 47]. Another randomized controlled trial, comparing NRT and face-to-face cognitive-behavioral treatment (CBT), internet CBT, or educational materials among 209 smokers with HIV had greater post-treatment abstinence (24–29 %) as compared to the other recent studies; however, individuals with greater mood disturbance were less likely to achieve abstinence in all conditions [42•]. A few pilot studies of varenicline have had promising quit rates among smokers with HIV (25–42 %); however, in these studies, most participants experienced adverse events (78–83 %), medication adherence was low, and individuals with psychiatric symptoms or taking psychiatric medications were excluded [41, 48, 50]. In sum, although varenicline seems promising for helping more smokers with HIV to quit smoking than other interventions, further research is needed to determine its efficacy and effectiveness among HIV-positive smokers. Also, additional research is needed to develop or tailor behavioral interventions to better help smokers with HIV quit smoking since most behavioral interventions studied to date are only moderately effective among people with HIV.

A few researchers have investigated factors that are associated with smoking abstinence and treatment adherence in their recent treatment studies among smokers with HIV. For example, a study evaluating smoking abstinence among participants in an infectious disease clinic-based brief smoking cessation intervention found that smoking abstinence at 6-months post-treatment was negatively related to a history of cocaine or heroin use [37]. Moadel et al. [45•] found that, among 145 smokers in a randomized controlled trial, in addition to intervention condition assignment, Latino ethnicity and less loneliness had a positive relationship with smoking abstinence post-treatment. Further, the relationship between treatment condition and smoking abstinence was at least partially mediated by self-efficacy for resisting smoking during

Table 1 Tobacco dependence treatment studies among smokers with HIV published between 2012 and 2015

Source	Sample	Design	Intervention	Results
Cropsey et al. [35]	N = 100 men and women at an HIV clinic	Pilot randomized controlled trial	Intervention (I): 12-week pharmacotherapy-based algorithm treatment (AT) and one session of brief counseling. Control (C): treatment as usual (TAU, i.e., smoking cessation assistance from their medical provider when the patient was ready to quit)	Individuals who received AT reduced the number of cigarettes per day across time relative to the individuals who received TAU. Quit attempts: $I = 50$ %, $C = 38$ %, $p = .006$
Stanton et al. [36•]	N = 302 Latino men and women at immunology clinics	Randomized controlled trial	I: 4 in-person tailored sessions plus 8 weeks of nicotine replacement therapy (NRT). C: 2 sessions of brief advice plus 8 weeks of NRT	Biochemically confirmed 7-day point prevalence abstinence at 6 months: $I = 8$ %, $C = 11$ %, $p > .485$ and 12 months: $I = 6$ %, $C = 7$ %, $p = .927$
Chew et al. [37]	N = 123 men and women at an infectious disease practice	Program evaluation	I: single individualized face-to-face counseling session and offer of pharmacotherapy. C: no control group	Self-reported 7-day point prevalence abstinence at 6 months: $I = 16$ %
Shuter et al. [38]	N = 138 men and women at an HIV care center	Pilot randomized controlled trial	I: web based, 8-session, 7-week targeted tobacco program plus nicotine patch. C: brief advice and self-help brochure plus nicotine patch	Biochemically confirmed 7-day point prevalence abstinence at 3-months: $I = 10.1$ %, $C = 4.3$ %, $p = .33$
Healey et al. [39]	N = 41 men enrolled in smoking cessation program at a sexual health clinic	Program evaluation	I: counseling (mean = 4 sessions, range 1–15 sessions) and NRT	Five of 18 who completed follow-up had quit at 6 months post-treatment and 4 of 16 who completed follow-up had quit at 12 months post-treatment
Cropsey et al. [40]	N = 40 men and women at an HIV clinic	Pilot randomized controlled trial	I: 8 weeks of combination NRT plus brief counseling. C: usual care	At week 8, the intervention group smoked fewer cigarettes per day ($p = .13$), had lower physical nicotine dependence ($p = .01$), and lower smoking urge ($p = .01$) compared to the control group
Ferketich et al. [41]	N = 228 men and women recruited from infectious disease clinics and community agencies	Non-randomized safety trial	I: 12 weeks of varenicline plus 1 face-to-face session and 11 telephone counseling sessions. C: 12 weeks of NRT plus one face-to-face session and 11 telephone counseling sessions	Biochemically confirmed as abstinent at 3-month post-treatment initiation: Adjusted OR: $I = 12$ %, $C = 12$ %, OR = 2.72; 95 % CI = 1.50–4.94
Humfleet et al. [42•]	N = 209 men and women at HIV clinics	Three arm randomized controlled trial	I1: 6 individual counseling sessions over 12 weeks plus 10 weeks of NRT. I2: computer-based treatment plus 10 weeks of NRT. I3: self-help plus 10 weeks of NRT	Biochemically confirmed 7-day point prevalence abstinence at 12, 24, 36, and 52 weeks: I1 = 26, 15, 21, and 20 %, I2 = 29, 27, 21, and 26 %, I3 = 24, 15, 19, and 20 %. Differences between groups were not statistically significant
Matthews et al. [43]	N = 31 African American (mostly homosexual and bisexual) males	Non-randomized pilot study	I: 7-session tailored group treatment plus 4 weeks of nicotine patch. C: no control group	Biochemically confirmed 7-day point prevalence abstinence at 1 month and 3 months post-treatment:

Table 1 (continued)

Source	Sample	Design	Intervention	Results
Manuel et al. [44]	$N = 30$ women at HIV clinic	Pilot randomized controlled trial	I: single session of motivational interviewing and referral for NRT C: prescribed advice and referral for NRT	$I = 16$ and 6 %, respectively Biochemically confirmed 7-day point prevalence abstinence at 1 month: $I = 7$ % $C = 0$ % p not significant Cigarettes per day (m[sd]) at baseline: $I = 15.53$ (11.10) $C = 16.73$ (8.71) p not significant and 1 month: $I = 7.00$ (8.62) $C = 15.79$ (14.02) $p < .05$
Moadel et al. [45•]	$N = 145$ men and women at HIV care center	Randomized controlled trial	I: intensive group therapy (8 sessions based on Clinical Practice Guidelines with educational content tailored to HIV) plus NRT C: standard care	Biochemically confirmed 7-day point prevalence abstinence at 3 months: $I = 19.2$ % $C = 9.7$ % $p = .11$
Vidrine et al. [46•] Gritz et al. [47]	$N = 474$ men and women at HIV health center	Randomized controlled trial	I: cognitive-behavioral intervention provided by cell phone (11 calls over 3 months) plus brief advice to quit, self-help written materials, and instructions on how to obtain NRT C: brief advice to quit, self-help written materials, and instructions on how to obtain NRT	Biochemically confirmed 7-day point prevalence abstinence at 3, 6, and 12 months: Participants in the intervention group were 2.41 times ($p = .049$) more likely to demonstrate abstinence compared to the control group. The treatment effect was strongest at the 3-month follow-up (odds ratio = 4.3, $p < .001$) but diminished at 6 and 12 months ($p > .05$)
Cui et al. [48]	$N = 35$ men and 1 woman at HIV clinics	Pilot open label study	I: 12 weeks of varenicline C: no control group	Biochemically confirmed 4-week continuous abstinence from weeks 9–12: $I = 42$ %

Listed in order from most to least recent

positive or social situations. The importance of self-efficacy in smoking cessation is supported by earlier treatment studies [51] and another recent randomized controlled trial among 350 smokers with HIV that found increased self-efficacy mediated the effect of a cell phone-based smoking cessation intervention [52]. Finally, a study of pharmacotherapy (i.e., varenicline or NRT) plus telephone counseling found that (1) younger age and non-White race had a negative relationship with pharmacotherapy adherence, (2) younger age, non-White race, and binge drinking were negatively associated with telephone counseling adherence, and (3) greater adherence to pharmacotherapy and telephone counseling had a positive association with post-treatment smoking abstinence [50]. In sum, although the meaning of the relationships between race and ethnicity and treatment adherence and outcomes are unclear and need further research, interventions that (1) target treatment adherence, (2) address drug and alcohol use, (3) increase social support, and (4) foster self-efficacy may have greater success among smokers with HIV.

Smoking Cessation Services

Cigarette smoking clearly needs addressing among people with HIV; however, most HIV care providers are not trained in tobacco dependence treatment and most HIV-positive individuals are not getting the smoking cessation support that they need in their healthcare settings. Shuter et al. [53•] surveyed 363 medical professionals who care for individuals with HIV and found that, although 79 % somewhat or strongly agreed that cigarette smoking is a major health issue among people with HIV, only 22 % ever received tobacco dependence treatment training, and only 8 % provide clinical practice guideline-based brief treatment for their patients with HIV. Further, less than half "somewhat" or "strongly" agree that they frequently give smoking cessation brochures (30 %), advise Quitline use (44 %), prescribe nicotine replacement (46 %), prescribe buproprion (37 %), or prescribe varenicline (42 %) to their HIV-positive patients who smoke. Another study found that while 55 % of 92 HIV healthcare providers felt confident in their ability to provide smoking cessation resources and services, only 38 % reported that they have adequate time to address tobacco use among their patients [54]. Yet, some HIV care providers are interested in becoming more educated about tobacco dependence treatment [53•, 54], and training HIV care providers does seem to increase smoking cessation among people with HIV [55]. For example, in the Swiss HIV Cohort Study, physicians at a HIV clinic in Zurich participated in a half-day smoking cessation treatment training and were provided with a smoking cessation treatment checklist to complete for their patients over a 2-year period. Patients seen at the Zurich clinic during this time period were more likely to stop smoking and had fewer lapses as

compared to patients in other Swiss HIV Cohort Study clinics where providers did not receive the training or checklist [55]. Given these findings, training HIV care providers on tobacco dependence treatment could motivate more HIV clinicians to provide smoking cessation treatment to their patients and enable more smokers with HIV to access treatment for their tobacco dependence and quit smoking.

Conclusion

Although a body of research has described the high prevalence and dire consequences of cigarette smoking among people with HIV, tobacco use has not been adequately addressed in this population. To date, smoking cessation interventions studied among smokers with HIV are only moderately effective in this population and most who quit return to smoking. Barriers to smoking cessation among smokers with HIV need more research, and new interventions that address the unique issues of smokers with HIV need to be developed and evaluated. HIV care providers need education on tobacco dependence treatment so that smokers with HIV have access to the education and support that they need to become motivated to make a quit attempt and successfully quit smoking. If tobacco use can be significantly reduced or eliminated among people with HIV, many of those who would suffer with the health consequences of smoking or die prematurely will be able to live the healthy and productive lives that advances in HIV treatment now allow them and that they deserve.

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