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The Relation Between Smoking Status and Medical Conditions Among Incarcerated Adults

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Abstract

Objectives—The rate of smoking among incarcerated adults is over three times that of the general population. Negative health consequences of smoking have prompted many correctional facilities to become tobacco-free. This presents a unique opportunity to examine health conditions associated with motivation to remain tobacco-free following release from prison. We examined this association among individuals who participated in the WISE randomized clinical trial.

Methods—247 participants completed a baseline questionnaire asking about illnesses (both smoking-related and non-smoking related), family history of smoking-related illnesses, demographics and smoking history. Smoking status was assessed 3 weeks post release.

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Results—38.1% of participants reported having an illness caused by or worsened by smoking and 53.0% reported having “moderate” to “a lot” of concern about their health due to smoking. 22.9% reported having asthma and 26.8% reported hypertension. The adjusted odds of remaining tobacco-free at 3 weeks post-release from a tobacco-free prison was significant only for individuals with a family history of smoking-related illnesses (OR=0.28;95% CI: 0.12–0.68). For individuals with smoking-related conditions, the adjusted odds of remaining tobacco-free was non-significant (OR=1.91;95% CI: 0.85–4.27). Similarly, the adjusted odds of remaining tobacco-free for participants with non-smoking related medical conditions was non-significant (OR=0.27;95% CI: 0.06–1.22)

Conclusions—These results offer a first look at understanding health conditions as a motivator to remain tobacco-free following release from prison. While these findings require additional investigation, these results suggest that providing treatment to prisoners with chronic disease and specifically targeting smoking related illnesses might be beneficial with regard to smoking cessation success.

Keywords

Smoking; Medical Conditions; Prisoners

Introduction

Tobacco use is the leading cause of preventable morbidity and mortality and is responsible for approximately 443,000 deaths in the U.S. annually (CDC 2008; USDHHS, 2004). Moreover, the economic burden of tobacco use is estimated at \$193 billion per year (MMWR, 2008). As of 2010, 45.3 million Americans were active smokers (CDC, 2011) and this major public health problem contributes to a multitude of smoking related respiratory illnesses, cancer, heart disease and chronic medical conditions (Ockene, 1997;USDHHS, 2004).

Among incarcerated individuals, the rate of cigarette smoking is much higher compared to the general population. The prevalence rates of smoking have been reported to be 70–83% among the two million individuals within correctional institutions, which is over three times that of the general population (CDC, 2006).

Members of the prison population often come from underserved communities, with limited access to health care and poor health status. In fact, while this group encompasses only about 3% of the U.S. adult population, this population has a higher burden of most chronic medical conditions than the general population (Bingswanger, 2009;US Dept. Justice, 2011). An estimated 800,000 incarcerated individuals in the United States report having one or more chronic medical conditions, many of which are smoking related or worsened by smoking (Bingswanger, 2009). Moreover, current and former inmates are more likely to suffer from chronic conditions such as asthma, diabetes, hypertension, and heart disease compared to the general population (Davis, 2004; Bloch, 2009;Wang, 2010). These smoking related conditions account for the most cases of death among prisoners following release, apart from drug overdoses (Davis, 2004).

While smoking was once an integral part of prison culture, overwhelming evidence of the negative health consequences of tobacco use and secondhand smoke has prompted many correctional facilities to become tobacco-free (Lincoln, 2009). All facilities and grounds at the Rhode Island Department of Corrections (RIDOC) have been tobacco-free since establishing a smoking ban for staff and inmates in February of 2003 (Clarke, 2011). This mandated behavior change presents a unique opportunity to examine health conditions associated with motivation to remain tobacco-free following release from a tobacco-free environment.

To date no research has sought to study the relationship between the overall health of individuals and motivation to quit smoking in a setting where tobacco use is prohibited and enforced such as prison. A limited amount of data assessing the health status of incarcerated and released individuals is available from state prisons in the U.S, resulting in a poor understanding of chronic disease in this population and its influence on tobacco use and motivation to quit among its members. While medical comorbidities have been shown to increase willingness to quit smoking within the general population (Noel et al, 2007; Patel et al., 2009), little is known about the influence of health on smokers required to quit during incarceration. Using data from interviews conducted at the Rhode Island Adult Correctional Institution (ACI), it was possible to determine the prevalence of self-reported chronic medical conditions among smokers in the Rhode Island prison population. The association between overall health and plans to either stay quit or resume smoking post-release was assessed. It was our hypothesis that: 1) inmates with more medical conditions associated with tobacco use will have a higher motivation to quit than those without medical conditions and 2) those individuals with a family history of smoking related medical conditions would be more motivated to quit smoking following release from prison than individuals with other self-reported chronic medical conditions given that individuals with a family history of smoking-related illness may be motivated to remain smoke free due to witnessing the negative impact of smoking among family members.

Methods

Procedure and Sample

The details on the full study design and methods have been described previously (Clarke, 2011). Briefly, Project WISE (*Working Inside for Smoking Elimination*) was a randomized clinical trial to investigate an intervention aimed at increasing smoking abstinence rates among individuals following release from a tobacco-free prison. To be eligible, participants were required to be released within the next eight weeks, were 18 years or older, smoked 10 or more cigarettes per day prior to incarceration, and spoke English. Outcome assessments took place in-person three weeks after release. Self-reported smoking status was confirmed by urine cotinine with current smoking defined as ≥ 200 ng/ml cotinine. The study was approved by the Memorial Hospital of Rhode Island Institutional Review Board, the Office for Human Research Protections (OHRP) and the Medical Research Advisory Group at the RIDOC. To further protect study participants a Certificate of Confidentiality was obtained from the Department of Health and Human Services.

Measurements

Participant demographics collected at baseline included age, race, gender, and education level. Conditions examined included (1) smoking-related medical conditions: asthma, diabetes, hypertension, stroke, heart disease; (2) non-smoking related conditions: hepatitis C or liver disease; and (3) a family history of lung cancer, emphysema, COPD, or chronic bronchitis. The three groups were conceptualized this way because they were likely receiving different levels of advice on smoking cessation from medical providers, friends, and family. A self-reported rating of general health (poor/fair vs. good/very good/excellent) was also assessed. Individual smoking history assessed years since smoked daily, age started smoking daily, and number of cigarettes smoked per day (smoking rate) prior to incarceration. "Plans for smoking after release" was evaluated using a single item with responses of: 1) planning not to smoke, 2) thinking about not smoking, or 3) not planning to stay quit. The association between medical conditions (smoking related, non-smoking related, and smoking related family history) and plans for smoking upon release (planning to smoke or planning to stay quit) with smoking plans as the dependent variable was also assessed.

Data Analysis

We examined the association between medical condition categories (smoking related, non-smoking related, and family history of smoking-related illnesses) and verified smoking status three weeks post-release using univariate and then multiple variable logistic regression with smoking status as the dependent variable. A priori, we considered the following baseline characteristics to be potentially associated with smoking status at three weeks: (age, gender, education, race/ethnicity, smoking rate, number of smokers in the household, spouse/partner smokes, age first smoked regularly, total number of years smoked, confidence in remaining quit post-release, depression, participation in prison drug treatment, plans for smoking upon release from prison). The association of these variables and smoking status was evaluated using Chi-square tests, t-tests or non-parametric tests where applicable and those found to have significant associations with smoking status were used as covariates in the regression model. Multiple variable logistic regression models were used to estimate the probability of remaining tobacco-free upon release from prison by medical condition after adjusting for Hispanic ethnicity, number of smokers in the household, number of cigarettes smoked per day, and intervention status. We next examined the association between medical condition categories (smoking-related, non-smoking related, and smoking-related family history) and plans for smoking (planning to smoke vs. planning to stay quit) after adjusting for the covariates described above. All analyses were conducted using IBM SPSS Statistics Version 20 (International Business Machines Corp., 2011).

Results

Of the 312 people screened for the study, 273 met eligibility criteria and 262 (95.9%) agreed to participate and completed the consent procedure. Of the 262 enrolled at baseline, 9 were excluded from the analyses due to a technical error resulting in missing baseline data, and 6 participants were excluded because they were never released or were re-incarcerated by the

3-week follow-up. The final sample included 247 participants of whom 228 (92.3%) completed the three-week post release follow-up assessment.

The sample (N=247) was 65.2% male, and averaged 35.5 years of age (standard deviation (SD)=9.2 years). Approximately half (52.0%) were Caucasian, 20.1% were Hispanic and 17.6% were Black. More than half of the participants had graduated high school or had a GED (65.2%), and most had been in prison prior to the current incarceration (85.4%). On average, participants reported starting smoking at the age of 16 (SD=4.5), reported smoking an average of 22 (SD=11.7) cigarettes per day prior to incarceration, and averaged 19 years (SD=10.0) as a daily smoker.

Table 1 presents participants' future smoking plans, smoking related and non-smoking related medical conditions, and family history of smoking-related illnesses. Approximately 38% of participants reported having an illness that they believed to be caused by or worsened by smoking and more than half of participants (53.0%) reported having "moderate" to "a lot" of concerns about their health due to their smoking habit. About one-third of participants reported their health status as poor or fair as opposed to good, very good, or excellent. Additionally, 48.8% were not planning to smoke after release from incarceration while 51.2% reported that they had no plans to stay quit.

Of the self-reported smoking related medical condition categories, hypertension had the highest prevalence among the population (26.8%), followed by asthma (22.9%). Least common was a history of heart attack (0.7%). Hepatitis C presented as the most common non-smoking related illness, reported by 27.5% of participants. Additionally, 68% of participants reported smoking other substances during the 30 days immediately prior to incarceration.

We next examined whether there was overlap between the medical condition categories. There was overlap of medical condition categories for 26% of the participants. Eleven participants (4.5%) had all three medical conditions; 21.5% (n=53) had 2 medical conditions (2.3% had smoking and non-smoking conditions; 13.4% had smoking conditions and family history of smoking-related illnesses; and 5.7% had non-smoking conditions and family history of smoking-related illnesses); and 42.9% (n=106) had one medical condition. Approximately 31% (n=77) did not report having any medical conditions. Spearman correlations were low between medical condition categories and were only significant between family history of smoking-related illness and non-smoking related medical conditions ($r=0.15$; $p=.02$).

The baseline characteristics by medical condition categories are presented in Table 2. The proportion of participants making plans not to smoke were highest among those with no medical condition (59.2%) followed by those with a smoking and/or non-smoking-related conditions (50.0%). Individuals with any family history of smoking-related conditions were less likely to make plans to remain tobacco-free after release (46.6%). When we compared the self-reported health status on the basis of medical condition categories, more participants (36.5%) with smoking and/or non-smoking-related conditions reported poor or fair health

than individuals with any family history of smoking-related conditions (33.9%) or those with no medical conditions (21.6%).

The association between remaining tobacco-free at 3-week follow up and having a medical condition was examined using univariate and multiple variable logistic regression models that are presented in Table 3. After adjusting for covariates (Hispanic ethnicity, number of smokers in the household, number of cigarettes smoked per day, intervention status, and age), participants with smoking-related medical conditions had an odds ratio (OR) of 1.91; 95% confidence interval: 0.85–4.27 of remaining tobacco-free three weeks post-release compared to those without any smoking-related illnesses. Participants with non-smoking-related conditions had an OR of 0.27; 95% CI: 0.06–1.22 compared to those without any non-smoking related conditions. Results were significant only for individuals with a family history of smoking-related illnesses (OR=0.28; 95% confidence interval: 0.12–0.68) suggesting that they were less likely to remain tobacco-free 3 weeks post release. A model was also run including all three medical conditions to adjust for overlap of conditions (data not presented). Although the odds ratios were similar in magnitude to the individual models for the medical condition categories, only the OR for family history of smoking-related illnesses remained significant (OR=0.32; 95% confidence interval 0.13–0.78).

We also assessed whether plans to quit moderated the effect of medical conditions on cessation and found that plans to quit did not appear to moderate the association.

Discussion

The proportion of participants making plans not to smoke were highest among those with no medical conditions (59.2%) followed by those with a smoking and/or non-smoking-related conditions (50.0%). Individuals with any family history of smoking-related conditions were less likely to make plans to remain tobacco-free after release (46.6%). After adjusting for covariates (Hispanic ethnicity, number of smokers in the household, number of cigarettes smoked per day, age and intervention status), our results suggested that individuals with a family history of smoking-related medical conditions were found to be significantly less likely to remain tobacco-free compared to those with smoking and non-smoking-related medical conditions. Although we did hypothesize that individuals with a family history of smoking-related illness, who have already experienced forced abstinence, may be motivated to remain smoke free due to witnessing the negative impact of smoking, we found that these individuals were least likely to quit possibly due to the results of genetics with higher levels of addiction which requires additional investigation.

Smoking cessation studies conducted with the general population suggest that the diagnosis of a chronic disease increases the likelihood of successful smoking cessation (Noel, 2007; Rodondi, 2007; Patel et al., 2009). Patel and colleagues examined several chronic illnesses (i.e., diabetes, hypertension, or high cholesterol) and smoking behavior (Patel et al., 2009). They reported that only individuals with diabetes reported being former smokers after adjusting for sociodemographic characteristics. A limitation of that study was that the survey was based on self-report, smoking status was not verified, and the data were cross-sectional. Another study that examined the relationship between medical comorbidities and motivation

to quit smoking was conducted among veterans within a psychiatric facility in Michigan (Haller, 1996). Researchers found a history of diabetes, lung disease, and stroke increased motivation to quit smoking, while high blood pressure, heart disease, and cancer had no association with motivation to quit (Haller, 1996). To date, there is limited research that has examined the relationship between the overall health of individuals and motivation to quit smoking in institutionalized settings where tobacco use is prohibited and enforced.

One study of 200 prisoners with chronic health conditions reentering the community was conducted by Lincoln and colleagues (Lincoln, 2009). They reported that 165 (83%) were self-reported cigarette smokers and of these, 129 were interviewed at 1 and/or 6 months post release. Self-reported sustained abstinence rates were 37.3% at day 1, 17.7% at the end of week 1, 13.7% at month 1 and 3.1% at 6 months. Smoking resumption rates reported by Lincoln et al (2009) were similar to rates following inpatient psychiatric and addiction programs (El-Guebaly, 2002; Prochaska, 2006), and were higher than those following military basic training and medical hospitalization (Rigotti, 2007). They did not, however, examine cessation in relation to motivation or desire to quit (Lincoln, 2009). In our study, we found that a majority of inmates with any type of illness did report making plans to quit smoking after release.

A limited amount of data assessing the health status of incarcerated and released individuals is available from state prisons in the U.S, resulting in a poor understanding of chronic disease in this population and its influence on tobacco use and motivation to quit among its members. In our study, participants reported higher rates of hypertension (26.8%), asthma (22.9%) and hepatitis (27.5%) compared to the study conducted by Bingswanger et al. (2010) who reported prevalence rates of 24.7%, 13.9%, and 12.9% for hypertension, asthma and hepatitis respectively. Given these high prevalence rates, tobacco use among these individuals with chronic diseases provides additional challenges.

While medical comorbidities have been shown to increase willingness to quit smoking within the general population (Patel, 2009), little is known about the influence of health on smokers required to quit during incarceration. To our knowledge, this is the only study that has examined the effects of health-related factors on smoking cessation using verified smoking status among an underserved and high-risk incarcerated population.

There are several strengths and limitations that need to be mentioned. A strength of the study is that there was a very high participation rate (96.0%) of those screened, providing a representative group of inmates who smoke in prison. Furthermore there was also a high follow-up rate (92.3%) of those who completed the three-week post release follow-up assessment. The major drawback in this study is that all data of medical conditions and illnesses is self-reported and respondents may have been unwilling or may not have had accurate knowledge about their health status. Additionally, analyses were limited to three weeks following release from the prison. However, the study was designed with a brief follow-up period which was felt to be appropriate given the high relapse rates typically observed immediately following release from prison (Lincoln, 2009). Also, this study was a randomized clinical trial powered to investigate an intervention aimed at increasing smoking abstinence rates among individuals following release from a tobacco-free prison and were

not powered for medical conditions. While there was limited power for smoking-related and non-smoking related conditions, there was sufficient power for a family history of smoking-related conditions. Finally, we did not obtain information on criminal history as part of the study design which may limit the ability to assess representativeness of the population. However, we did assess time since last cigarette as a proxy and found that the median time since last cigarette was 0.58 years

Conclusions

In summary, these results offer a first look at understanding health conditions as a motivator to quit smoking among incarcerated adults. Our findings suggest that individuals with a family history of smoking-related medical conditions were significantly less likely to remain tobacco-free compared to those with smoking and non-smoking-related medical conditions. Further research is needed on how this information may be used to assist in effective smoking cessation programs for incarcerated adults with medical conditions given the higher burden of most chronic medical conditions, particularly those that related to a family history of smoking-related conditions compared to the general population (Maruschak, 2001; Binswanger, 2009).

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Table 1

Baseline Characteristics of Participants

Characteristics (n=247)	N	%
Smoking Plans		
plans not to smoke upon release	120	48.8
plans to smoke upon release	126	51.2
Reported health status		
Poor/Fair	75	30.7
Good/Very Good/Excellent	169	69.3
Health Concerns		
None	25	10.3
A little	89	36.6
Moderate	67	27.5
A lot	62	25.5
Participant's self-report of illness caused by or made worse by smoking		
No	148	61.9
Yes	91	38.1
Smoking-related medical conditions		
Asthma	55	22.9
Diabetes	12	8.7
Hypertension	37	26.8
Stroke	4	2.9
Heart attack	1	0.7
Non-smoking related illnesses		
Hepatitis C	38	27.5
Liver hepatitis/cirrhosis	8	5.8
Family history		
Lung cancer	73	31.1
Emphysema, COPD, or chronic bronchitis	89	37.6

Table 2

Baseline characteristics by medical condition category

Variable	No Medical Condition ^a N=7		Smoking and/or Non- Smoking Related Conditions ^b N=52		Any Family history of Smoking- Related Conditions ^c N=118		p-value
Race/Ethnicity	N	%	N	%	N	%	
White	28	37.8	25	48.0	74	62.7	0.03
Hispanic	20	27.0	12	23.1	17	14.4	
Black, non-Hispanic	18	24.3	7	13.5	18	15.3	
Other	8	10.8	8	15.4	9	7.6	
Gender							
Male	51	66.2	33	63.5	77	65.3	0.95
Female	26	33.8	19	36.5	41	34.7	
Smoking Plans							
plans to smoke	31	40.8	26	50.0	63	53.4	0.23
plans not to smoke	45	59.2	26	50.0	55	46.6	
Education							
Less than high school	46	62.2	40	76.9	71	60.7	0.04
High school	21	28.3	5	9.6	23	19.6	
Beyond High school	7	9.5	7	13.5	23	19.6	
GED	44	59.5	22	42.3	67	56.8	0.13
Self-Reported Health Status							
Poor/Fair	16	21.6	19	36.5	40	33.9	0.12
Good/Very good/Excellent	58	78.4	33	63.5	78	66.1	
Health Concerns							
Yes (moderate/a lot)	31	42.5	24	37.5	74	62.7	0.11
Participant's illness caused or made worse by smoking							
Yes	18	25	17	33.3	56	48.3	<0.01
Other substances smoked in 30 days prior to incarceration							
Pipe, Cigars, Heroin, Pain killers, sedatives, Benzodiazepine, Cocaine, Amphetamines, Marijuana, or Hallucinogens	63	81.8	48	92.3	107	90.7	0.10

Variable	No Medical Condition ^a N=7		Smoking and/or Non- Smoking Related Conditions ^b N=52		Any Family history of Smoking- Related Conditions ^c N=118		p-value
	N	%	N	%	N	%	
Age							
Mean (years) ± standard deviation	33.2 ± 8.5		37.1 ± 9.8		36.5 ± 9.1		0.02

^a and no family history;

^b includes asthma, diabetes, hypertension, stroke, heart attack and/or hepatitis C or liver hepatitis/cirrhosis;

^c includes lung cancer, emphysema, COPD, and bronchitis.

Table 3
Unadjusted and multivariable adjusted odds ratios (ORs) of the association between remaining tobacco-free and medical condition category

Medical Condition Category	Unadjusted			Adjusted		
	OR	95% CI	p-value	OR	95% CI	p-value
Smoking related medical conditions ^a						
No	1.00			1.00		
Yes	1.39	0.70–2.76	0.35	1.91	0.85–4.27	0.12
Non-smoking related conditions ^b						
No	1.00			1.00		
Yes	0.25	0.06–1.08	0.06	0.27	0.06–1.22	0.09
Family history of smoking related illness ^c						
No	1.00			1.00		
Yes	0.41	0.20–0.85	0.02	0.28	0.12–0.68	<0.01

Note : Models were adjusted for: Hispanic ethnicity, number of smokers in the household, number of cigarettes smoked per day, age and intervention status.

^a includes asthma, diabetes, hypertension, stroke or heart attack

^b includes hepatitis C or liver hepatitis/cirrhosis

^c includes lung cancer, emphysema, COPD, bronchitis.