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Association of secondhand smoke exposure with nicotine dependence among Black smokers

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Abstract

Introduction—Exposure to secondhand smoke (SHS) is influenced by norms and regulations, socioeconomic status and immediate personal interactions. SHS exposure may occur in various settings, including the living space, workplace, and other social environments. This study examines the association between exposure to SHS and nicotine dependence among smokers.

Methods—A cross-sectional sample of 246 Black (60% male and 40% female) current smokers age 40 and older, from Baltimore, Maryland and Washington, D.C, responded to an interviewer-administered questionnaire. We examined nicotine dependence using clinical guidelines based on the Diagnostic and Statistical Manual of Mental Disorders, Text Revision (2000). We performed multivariate logistic regression to assess the association between SHS and nicotine dependence.

Results—SHS exposure in the current home environment and exposure in settings outside the home as well as difficulty to quit smoking and heaviness of smoking were associated with nicotine dependence. After adjustment for age, gender, education, income, employment status, current alcohol consumption, history of marijuana use, and number of cigarettes smoked per day; exposure to SHS at home only, and in both current home environments and other settings,

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Contributors

Drs. Jean G. Ford, Carla D. Williams, and Mary A. Garza developed the CRAB study instrument. Drs. Shondelle M. Wilson, Carla D. Williams, and Ana Navas-Acien developed the research question and Dr. Saifuddin Ahmed, and Mr. Mark Emerson assisted with the statistical analysis. Dr. Wilson performed the statistical analysis and wrote the first draft of the manuscript with the assistance of Drs. Ford, Garza and Navas-Acien, and Williams. All authors have contributed and approved the final manuscript.

Competing Interest

None of the authors have conflict of interests

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continued to be associated with clinically-defined levels nicotine dependence (OR = 2.25; 95% CI 1.05, 4.86 vs. OR = 2.31; 95% CI 1.03, 5.18), respectively.

Discussion—These findings highlight the relative importance of examining SHS exposure in personal (residential and automobile) and public (workplace and outdoor) settings by current smokers. Promotion of smoke-free environments may reduce the prevalence of nicotine dependence among current smokers.

Keywords

Tobacco-related disparities; clinical nicotine dependence; secondhand smoke (SHS); smoking ban

1. Introduction

According to the 1999–2004 National Health and Nutrition Examination Survey (NHANES), Blacks are twice as likely as Whites to have increased levels of serum cotinine, a metabolite of nicotine, and more likely to report residential secondhand smoke (SHS) exposure (Schober, Zhang, Brody, & Marano, 2008). Okoli et al. (2008) demonstrated that, in a predominantly White population (89%), improved smoking cessation outcomes and intentions to quit smoking were associated with fewer SHS exposure sources; whereas, greater SHS exposure sources contributed to an increased risk for nicotine dependence as measured by the Fagerström Tolerance Questionnaire (Okoli, Browning, Rayens, & Hahn, 2008). In any given year, Blacks are more likely to attempt cessation, with a lower rate of success compared to Whites (Okuyemi et al., 2007). Potentially, lower cessation rates among Blacks could be explained by a higher prevalence of nicotine dependence or greater exposure to SHS in personal and public environments.

Regardless of smoking status, SHS can increase disease risk (Pell et al., 2008). Given the public health impact of SHS exposure and greater tobacco-related morbidity and mortality experienced by Black smokers, research is needed that explores the association between SHS exposure and nicotine dependence in this population. Thus, contextually-directed interventions focused on SHS exposure may considerably reduce the prevalence of nicotine dependence in current smokers. The objective of this study was to evaluate the association of SHS in personal and public environments with nicotine dependence, in a cohort of Black smokers. We hypothesized that SHS exposure is associated with nicotine dependence in this study population.

2. Materials and methods

2.1. Procedures

Data for this analysis were obtained from a cross-sectional study conducted in 2005, to characterize cancer risk behaviors among Blacks in two cities. Residents of Baltimore City age 40 and older were recruited to the Cancer Risk Assessment in Baltimore (CRAB). Individuals age 18 and older were recruited to the Cancer Risk Evaluation Screening Tool (CREST) study in Washington, D.C. Shared data elements were collected across the two studies and data were merged for this analysis. The study was approved by the Institutional Review Boards of Johns Hopkins Bloomberg School of Public Health and Howard University.

2.2. Participants

Participants were identified via local community events such as health fairs and through ongoing collaborations with community partners in Baltimore, M.D. and Washington, D.C. This analysis includes Black smokers aged 40 and over. Current smokers were defined as

those who smoked at least 100 cigarettes in their lifetime and smoked in the last month. We excluded participants lacking data on demographics (n=27), smoking status (n=6), secondhand smoke exposure status (n=28) and clinical nicotine dependence (n=7), resulting in 246 participants eligible for this analysis. Following receipt of informed consent from all participants, research assistants administered face-to-face interviews in English in private settings.

2.3. Nicotine dependence

Nicotine dependence, was measured in accordance with the Diagnostic and Statistical Manual of Mental Disorders IV, Text Revision (DSM-IV-TR) (American Psychiatric Association). Items were selected from the tobacco module of the Semi Structured Assessment for the Genetics of Alcoholism (SSAGA)-II to assess seven established symptoms associated with clinical nicotine dependence: (1) heaviness of smoking or chain smoking, (2) participation in activities that prohibited smoking, (3) smoking more than expected/often running out cigarettes sooner than intended, (4) quit attempts, (5) withdrawal symptoms, (6) emotional, psychological and other smoking-related health conditions, and (7) tolerance. Subjects that experienced at least three clinical symptoms of nicotine dependence within a single 12 month time period were considered dependent. We also report three items from the Fagerström Test for Nicotine Dependence (FTND) in this analysis: (1) time to first cigarette, (2) heaviness of smoking, and (3) difficulty in refraining from smoking for comparison by clinical nicotine dependence.

2.4. Secondhand smoke exposure

Secondhand smoke (SHS) exposure was defined as smoking by someone other than the study participant. SHS exposure was classified by time frame and location of occurrence: (1) past childhood exposure at home, (2) past adult exposure at home, (3) current exposure at home and, (4) non-home exposure (work, vehicle, and public places). Past home exposures (childhood and adulthood) and current home exposure were reported as binary variables (yes or no) by responding to the following questions: (1) "In the home where you grew up, did anyone smoke cigarettes?", (2) "In your adult years, did you ever live with anyone who smoked cigarettes?", and (3) "Do you now live with anyone who smokes?" SHS exposure at work, public places and in a vehicle were reported as hours and/or days by responding to the following questions: (1) "At work, how many hours per day are you close enough to people who smoke so that you can smell the smoke?" or (2) "On average, over the past year, how many days per week have you been exposed to other people's cigarette smoke in a car?" or (3) "On average, over the past year, how many days per week have you been exposed to other people's cigarette smoking in a public building (or other places)?" Due to differences in units of measure for non-home settings (hours per day vs. days per week), a cumulative exposure variable was created. Individuals who reported any length of exposure in at least one non-home setting were classified as being exposed. Unexposed participants reported no exposure in both residential and non-home settings. These measures on environmental tobacco exposure have been validated in a previous report (Eisner, Katz, Yelin, Hammond, & Blanc, 2001).

2.5. Covariates

The following covariates were included in our model of nicotine dependence: age, gender, educational attainment (< 12 years or ≥ 12 years), income (< \$12,000 or ≥ \$12,000), employment status (unemployed or employed), ever-marijuana use (Ford, Vu, & Anthony, 2002). Number of cigarettes smoked per day was reported as a categorical variable (10 or less, 11–20, 21–30, and 31 or more) and collapsed into two categories (< 10 cigarettes or ≥ 11 cigarettes). Current beverage-specific (wine, beer, and liquor) alcohol consumption was reported as number of drinks consumed per week and/or month. An algorithm was derived

to compute the median number of (6 drinks) drinks consumed per month. Participants who did not consume any alcoholic beverage were coded as “none”; those who consumed less than the median number of drinks were coded as “casual drinkers” and those who consumed greater than the median number of drinks were coded as “regular drinkers”.

2.6. Analysis

Student’s t-test for continuous variables and chi-square test for categorical variables were used to assess differences in participants’ characteristics by nicotine dependence. Multivariate logistic regression was used to assess the association between SHS and nicotine dependence, controlling for: age, gender, income, employment status, education, current alcohol consumption, ever-marijuana use, and number of cigarettes smoked per day. Significance testing was performed at a p-value < 0.05. Statistical analysis was performed using STATA 11 (©Stata Corp, College Station, Texas, USA).

3. Results

Table 1 describes participants’ demographics and smoking characteristics by nicotine dependence. Eighty-six percent of study participants met the criteria for nicotine dependence. Dependent and non-dependent participants did not differ significantly by demographic characteristics, drinking status, ever-marijuana use, time to first cigarette and difficulty in refraining from smoking. Nearly 80% of nicotine dependent study participants reported difficulty in quitting smoking compared to 47% in non-nicotine dependent participants (p-value <0.001). Participants with nicotine dependence were more likely to be currently exposed to SHS in the home environment (67.0% vs. 47.1%, p=0.024) compared to non-nicotine dependent participants. Nicotine dependent and non- dependent participants reported similar histories for past childhood and past adult exposure to SHS.

Table 2 shows results from logistic regression models to examine the association between current SHS exposure and nicotine dependence. After adjustment for age, gender, education, income, employment status, current alcohol use, ever-marijuana consumption, and number of cigarettes smoked per day, participants exposed to SHS at home and participants exposed to SHS both at home and in other settings were more likely to be classified as nicotine dependent with ORs 2.25 (95% CI 1.05, 4.86) and 2.31 (1.03, 5.18), respectively. There was little difference between the crude and adjusted models.

4. Discussion

We examined the association between secondhand smoke (SHS) exposure and nicotine dependence. To our knowledge, this is the first study to assess the association of SHS with nicotine dependence using the DSM-IV criteria in an urban low-income Black study population. Current residential SHS exposure and cumulative exposure to SHS in other settings were each associated with nicotine dependence in this sample. The association between SHS exposure and nicotine dependence remained after adjustment for demographic characteristics, alcohol consumption, marijuana use, and cigarettes smoked per day. Adjustment for number of cigarettes smoked per day permitted examination of nicotine dependence beyond active smoking. Further, our data indicate that the residential exposures exert the largest portion of influence on dependence compared to other sources of SHS exposure (automobile, work, other public places). Education about SHS and promotion of 100% smoke-free residential environments may be an unexplored strategy toward reducing tobacco-related health disparities among current smokers, decreasing non-smokers’ and children’s SHS exposure, and reducing the prevalence of nicotine dependence in low-income and urban Black communities.

Our results are consistent with previous reports that associate SHS exposure and nicotine dependence, using the FTND instrument (Okoli, et al., 2008; U.S. Department of Health and Human Services, 1988). However, Royce et al. (1993) used a single FTND item, time to first cigarette, and found that Blacks consumed their first cigarette shortly after waking, therefore experience greater nicotine dependence (Royce, Hymowitz, Corbett, Hartwell, & Orlandi, 1993). We did not find this association in our study. Moreover, subjects who met criteria for clinically-defined nicotine dependence were less likely to consume their first cigarette shortly after waking. Our data suggest that time to first cigarette may not consistently capture key attributes of nicotine dependence (i.e. withdrawal symptoms and repeated cessation attempts) in populations with a high prevalence of smoking.

Currently, only 16 states, along with Puerto Rico and Washington, D.C., have enacted 100% smoke-free legislation that prohibits smoking in workplaces, restaurants, and bars (Americans for Nonsmokers' Rights Foundation). However, our study was conducted in 2005 in two major cities prior to the enactment of such legislation. The enactment of smoke-free policies has effectively reduced tobacco use and SHS exposure by current smokers (Chapman et al., 1999; Pell, et al., 2008) (Fichtenberg & Glantz, 2002). Our data suggest that contextually-directed interventions are needed to protect current smokers from the harm associated with smoking in residential settings. Furthermore, Bauer et al. (2005) suggest that a 100% smoke-free policy is more effective than a partial ban because it will enhance cessation among current smokers and better protect non-smokers (Bauer, Hyland, Li, Steger, & Cummings, 2005).

A strength of the study is the documentation of multiple sources of SHS exposures in a predominantly low-income urban Black sample of current smokers. To understand the association between SHS exposure and nicotine dependence in Blacks, we used the gold standard, DSM-IV criteria to measure nicotine dependence. Finally, we report a consistent association between both current home and non-home SHS exposures, and nicotine dependence in an urban Black population.

With the cross-sectional study design, it is not possible to infer causality between SHS exposure and nicotine dependence. Nevertheless, our study contributes to literature on nicotine dependence among urban Black current smokers. While our data are based on self-report, we used validated measures; and biomarkers of nicotine exposure cannot distinguish between SHS exposure and active smoking in current smokers.

In summary we report that in a low-income urban community, residential and non-home SHS exposure was associated with nicotine dependence in smokers. Expansion of clean air policies in public environments could reduce the prevalence of SHS exposure and nicotine dependence in this population. Public health education campaigns directed to private environments may be useful. Health care providers should inquire about exposure to SHS and recommend eliminating SHS exposure if present. Due to the increasing prevalence of nicotine dependence among current smokers in the U.S., research is needed to develop strategies to reduce nicotine dependence, thereby reducing tobacco-related morbidity and mortality.

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References

- American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders. 42000. Text Revision (DSM-IV-TR) Retrieved 5 August, 2008, from www.psychiatryOnline.com
- Americans for Nonsmokers' Rights Foundation. How many smokefree laws?. Retrieved 27 April, 2009, from <http://www.no-smoke.org/goingsmokefree.php?id=519>
- Bauer JE, Hyland A, Li Q, Steger C, Cummings KM. A longitudinal assessment of the impact of smoke-free worksite policies on tobacco use. *American Journal of Public Health*. 2005; 95(6):1024–1029.10.2105/ajph.2004.048678 [PubMed: 15914828]
- Chapman S, Borland R, Scollo M, Brownson RC, Dominello A, Woodward S. The impact of smoke-free workplaces on declining cigarette consumption in Australia and the United States. *American Journal of Public Health*. 1999; 89(7):1018–1023. from <http://ajph.aphapublications.org/cgi/reprint/1089/1017/1018?view=long&pmid=10394309>. [PubMed: 10394309]
- Eisner MD, Katz PP, Yelin EH, Hammond SK, Blanc PD. Measurement of environmental tobacco smoke exposure among adults with asthma. *Environmental Health Perspectives*. 2001; 109(8):809–814.10.2307/3454823 [PubMed: 11564616]
- Fichtenberg CM, Glantz SA. Effect of smoke-free workplaces on smoking behaviour: systematic review. *British Medical Journal*. 2002; 325(7357):188–195.10.1136/bmj.325.7357.188 [PubMed: 12142305]
- Ford DE, Vu HT, Anthony JC. Marijuana use and cessation of tobacco smoking in adults from a community sample. *Drug and Alcohol Dependence*. 2002; 67(3):243–248.10.1016/S0376-8716(02)00066-2 [PubMed: 12127195]
- Okoli CT, Browning S, Rayens MK, Hahn EJ. Secondhand tobacco smoke exposure, nicotine dependence, and smoking cessation. *Public Health Nursing*. 2008; 25(1):46–56. doi: 0.1111/j.1525-1446.2008.00679.x. [PubMed: 18173585]
- Okuyemi KS, Pulvers KM, Cox LS, Thomas JL, Kaur H, Mayo MS, Ahluwalia JS. Nicotine dependence among African American light smokers: A comparison of three scales. *Addictive Behaviors*. 2007; 32(10):1989–2002.10.1016/j.addbeh.2007.01.002 [PubMed: 17307303]
- Pell JP, Haw S, Cobbe S, Newby DE, Pell ACH, Fischbacher C, Borland W. Smoke-free Legislation and Hospitalizations for Acute Coronary Syndrome. *New England Journal of Medicine*. 2008; 359(5):482–491.10.1056/NEJMs0706740 [PubMed: 18669427]
- Royce JM, Hymowitz N, Corbett K, Hartwell TD, Orlandi MA. Smoking cessation factors among African Americans and whites. COMMIT Research Group. *American Journal of Public Health*. 1993; 83(2):220–226.10.2105/ajph.83.2.220 [PubMed: 8427327]
- Schober S, Zhang C, Brody D, Marano C. Disparities in Secondhand Smoke Exposure--United States, 1988–1994 and 1999–2004. *Morbidity Mortality Weekly Report*. 2008; 57(27):744–747. from <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5727a5723.htm>.
- U.S. Department of Health and Human Services. The Health Consequences of Smoking: Nicotine Addiction: A Report of the Surgeon General. 1988. Retrieved 5 November, 2008, from http://profiles.nlm.nih.gov/NN/B/B/Z/D/_/nnbbzd.pdf

Research highlights

- The present study highlights the importance of examining the association between secondhand smoke exposure and nicotine dependence among African American current smokers
- Nicotine dependence was associated with residential as well as residential and non-home sources of SHS
- Eliminating SHS exposure in personal and non-home settings may have important implications for smoking cessation among African Americans in low income urban settings

Table 1

Participants' demographic and smoking characteristics by nicotine dependence* (N = 246)

Variable	Nicotine Dependence*		p-value
	Not Nicotine Dependent	Nicotine Dependent	
N (%)	34 (14)	212 (86)	
Age in years, Mean (SD)	46.1 (4.8)	47.9 (5.9)	0.097
Location [†]			
Baltimore, MD	32 (94.2)	178 (84.0)	0.188
Washington, DC	2 (5.9)	34 (16.0)	
Female	17 (50.0)	84 (39.6)	0.254
Education, 12 years	27 (79.4)	154 (72.6)	0.406
Income, \$12,000	20 (58.8)	95 (44.8)	0.128
Employed	16 (47.1)	76 (35.9)	0.210
Marital status ^{†‡}			
Single / never married	23 (67.7)	118 (55.9)	0.464
Married/ living as married	1 (2.9)	16 (7.6)	
Divorced, separated / widowed	10 (29.4)	77 (36.5)	
Current alcohol consumption			
None	6 (17.7)	25 (11.8)	0.294
Casual drinker	14 (41.2)	70 (33.0)	
Regular drinker	14 (41.2)	117 (55.2)	
Ever-marijuana use	11 (32.3)	94 (44.3)	0.190
Difficulty to quit smoking			
Easy	18 (52.9)	43 (20.3)	<0.001
Difficult / Impossible	16 (47.1)	169 (79.7)	
Heaviness of smoking ^{†§}			
< 20 cigarettes	29 (85.3)	76 (35.9)	<0.001
20 cigarettes	5 (14.7)	136 (64.2)	
Time to first cigarette ^{†§}			
30 – > 60 minutes	15 (44.1)	80 (37.7)	0.478
5 – 30 minutes	19 (55.9)	132 (62.3)	
Difficulty to refrain from smoking [†]			
No	31 (91.2)	165 (77.8)	0.106
Yes	3 (8.8)	47 (22.2)	
Past childhood SHS exposure [†]	30 (88.2)	178 (84.0)	0.619
Past adult home SHS exposure [†]	29 (85.3)	197 (92.9)	0.168
Current adult home SHS exposure	16 (47.1)	142 (67.0)	0.024
SHS exposure in other settings ^{//}	23 (67.7)	163 (76.9)	0.244

Data represent N (%) or mean (standard deviation)

Column total may not equal 100% due to rounding

* Clinical nicotine dependence measured by DSM IV criteria (based on experiencing 3 or more symptoms)

† Fisher Exact or χ^2 test

‡ Marital status, n=245

§ Fagerström Test for Nicotine Dependence (FTND)

// Exposure at the following settings: work, vehicle, and public places

Table 2
 OR (95% CI) for nicotine dependence* by current adult secondhand smoke exposure

SHS exposure	N (%)	Crude	Model 1	Model 2	Model 3
None	27 (11.0)	1.00 (Ref.)	1.00 (Ref.)	1.00 (Ref.)	1.00 (Ref.)
Home	158 (64.2)	2.28(1.10, 4.74)	2.28 (1.09, 4.78)	2.36 (1.11, 5.03)	2.25 (1.05, 4.86)
Home & other settings [‡]	125 (50.8)	2.09 (0.99, 4.44)	2.20 (1.02, 4.72)	2.49 (1.13, 5.46)	2.31 (1.03, 5.18)

Model 1: Adjusted for gender and age

Model 2: further adjusted for income, employment status, and education

Model 3: further adjusted for current alcohol consumption, ever-marijuana use and number of cigarettes smoked per day (11 or more v. 10 or less)

* Defined according to DSM-IV, TR guidelines

[‡]Exposure at the following settings: work, vehicle, and public places