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Anxiety, depression and smoking status among adults of Mexican heritage on the Texas-Mexico Border

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Abstract

The goal of the current analysis is to examine relationships between smoking status and anxiety and depression among adults of Mexican heritage to inform the development of culturally relevant smoking cessations efforts. Mexican heritage residents (N=1,791) of the city of Brownsville, TX, aged 18 years or older, enrolled in the Cameron County Hispanic Cohort, were selected through two stage cluster sampling of randomly selected census tracts from the first and third quartile of SES using Census 2000. Among current smokers, anxiety and depression scores were highest among women who had not completed high school ($p<0.05$). Former smoking women, but not men, with at least a high school education and former smoking women born in the United States reported higher levels of anxiety and depression than never smoking women. Negative affective states may represent a greater barrier to smoking cessation among women than men.

Keywords

Smoking behavior; depression; anxiety; Mexican heritage adults

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Authors' contribution

AVW led the writing and conceived the analysis. KPV completed the statistical analyses and contributed to the writing. JBM conceived the study and provided critical revisions throughout. BMR provided critical revisions throughout. AP provided statistical support and provided critical revisions throughout. SPFH conceived the study, contributed to the writing, and provided critical revisions throughout.

DECLARATION OF INTERESTS

None

INTRODUCTION

Negative affective states, such as anxiety and depression, are associated with increased smoking (Fond et al., 2013; Gonzalez, Zvolensky, Vujanovic, Leyro, & Marshall, 2008; Lawrence, Mitrou, & Zubrick, 2009; Moylan, Jacka, Pasco, & Berk, 2012; Weinberger, Mazure, Morlett, & McKee, 2013). In the US, while roughly 20% of the general population meets ICD-10 criteria for having a mental disorder in the previous year, almost 32% of smokers meet the same criteria (Lawrence et al., 2009). Anxiety is related to daily smoking and nicotine dependence (Moylan et al., 2012), while anxiety sensitivity is significantly related to habitual smoking motives (Gonzalez et al., 2008). Similarly, both major depression and dysthymia are associated with increased nicotine dependence, and smokers experience higher rates of suicide than non-smokers (Weinberger et al., 2013). Of importance, many smokers believe that smoking reduces negative affect (Fond et al., 2013) and anxious and depressed smokers perceive more barriers to quitting than other smokers (Gonzalez et al., 2008), which hinders cessation efforts.

Contemporaneously, there is an inverse relationship between socio-economic status (SES) and smoking, such that individuals of low SES smoke at higher rates than their high SES peers (Cokkinides et al., 2009) and low SES is a strong risk factor for both anxiety- and depression-related disorders (Kessler, Ruscio, Shear, & Wittchen, 2010; Lorant et al., 2003). Mexican heritage adults tend to be of low SES, potentially placing them at increased risk for smoking; yet smoking rates among Hispanics are lower than among non-Hispanics (Cokkinides et al., 2009). However, among Mexicans, immigration to the US is associated with increased risk for anxiety and depression (Breslau, Borges, & Tancredi, 2011) and with increased risk for smoking among women, but not among men (Wilkinson et al., 2005). Furthermore, although Hispanics report lower levels of major and current depression compared to non-Hispanic whites (Substance Abuse and Mental Health Services Administration, 2012), research examining the relationship between negative affective states and smoking cessation efforts among Hispanics provides mixed results (e.g., Munoz, Marin, Posner, & Perez-Stable, 1997). Finally, in a recent review of the relationship between depression and smoking cessation, Weinberger et al. (2013; p. 1014) concluded that “few studies report gender and racial differences in the relationship of depression and smoking cessation outcomes, thus suggesting major areas for targeted research”.

Thus, the goal of the current analysis is to characterize the relationship between current smoking status (never, current, or quitter), and both depression and anxiety among Mexican heritage participants in the Cameron Country Hispanic Cohort (CCHC), a population-based cohort of predominantly Mexican Americans along the south Texas border (Fisher-Hoch et al., 2010). Attention is paid to gender, country of birth, and educational attainment as a marker of SES as potential effect modifiers. The results will help inform the development of culturally relevant smoking cessations efforts for Hispanics of Mexican heritage.

METHODS

CCHC participants are residents of the city of Brownsville, on the US/Mexico border in one of the two poorest counties by size in the US (Federal Reserve Bank of Dallas, 2001). CCHC participants were aged 18 years or older at enrollment and were selected through a two stage cluster sampling of randomly selected census tracts from the first and third quartile of SES using Census 2000 (Fisher-Hoch et al., 2010; Fisher-Hoch et al., 2012).

All households in the randomly selected census tracts were invited to participate in CCHC. Participants visited our Clinical Research Unit (CRU), provided written informed consent, and responded to questionnaires, in either Spanish or English, assessing socio-demographic characteristics, smoking status, and affective states (anxiety and depression), with the assistance of a trained staff member, following previously described procedures (Fisher-Hoch et al., 2010). The measures of anxiety and depression were introduced in February 2006; thus, data presented in the current analysis are provided by participants in the CCHC who were enrolled between February 2006 and October 2011. The current analysis is limited to participants in the CCHC of Mexican heritage (i.e. participant self-reported as born in Mexico, or reported that a parent or grandparent was born in Mexico) who completed the anxiety and depression measures.

Measures

Smoking status was grouped into three categories: current, former, and never. Current and former (i.e., ever) smokers responded “yes” to the question “Have you smoked more than 100 cigarettes in your life?” while never smokers responded “no”. Former smokers stated that they had quit smoking before enrolling in the cohort.

Anxiety was assessed using Zung’s self-rating anxiety scale (SAS), a 20-item self-report assessment designed to assess anxiety-related symptoms in four domains: cognitive, autonomic, motor, and central nervous system (Zung, 1971). Responses are made on a 4-point scale; response options include: “a little of the time”, “some of the time”, “good part of the time”, and “most of the time”. Items are summed, following the SAS scoring protocol, to create a total anxiety score, which we examined as a continuous measure in the current study. The measure demonstrates very good reliability based on our participants (Cronbach’s alpha=0.83).

Depression was assessed using the Epidemiological Studies Depression Scale (CESD) (Radloff, 1977), a 20-item self-report measure designed to screen for depression and depressive disorders. Responses are made on a four point scale; response options include: “rarely or none of the time”, “some or a little of the time”, “occasionally or a moderate amount of the time”, and “most or all of the time”. Items are summed, following the CESD scoring protocol, to create a total depression score, which we examined as a continuous measure in the current study. The measure demonstrates very good reliability based on our participants (Cronbach’s alpha=0.90).

Demographic characteristics included gender, coded as “male” or “female”, country of birth, coded as “Mexico” or “US”, educational attainment, coded as “less than high school”, “high

school", or "more than high school", and age, which was used in its continuous format to calculate age-adjusted means.

Statistical methods

First, using bivariate analysis of categorical data, we evaluated if there were differences in demographic characteristics, as well as smoking status, between participants recruited to the CCHC prior to the inclusion of the depression and anxiety measures (i.e., in 2004i.e., in 2005, and January 2006) and those recruited between February 2006 and October 2011, and therefore eligible for inclusion in the current analysis.

All analyses were performed using age- and gender-adjusted sampling weights to correct the imbalance of the sampling ratios of genders and age groups, and to scale the sample to the population. In addition, we took into account the potential clustering among participants from the same household and census block and tract. We used weighted linear regression models incorporating the complex sample design of this study to examine associations and least square mean differences in anxiety and depression scores for each of the demographic indicators of interest (gender, country of birth, and educational attainment) and smoking status, adjusting for age.

We completed additional weighted linear regression models to examine mean age-adjusted differences in anxiety and depression scores by smoking status (Tables 1 and 2). In these analyses we stratified by a) gender, b) country of birth and gender, and c) educational attainment and gender. We completed post-hoc pairwise comparisons of the age-adjusted means to determine whether mean depression and anxiety scores varied by smoking status within gender, country of birth and gender, and educational attainment and gender; significance was assessed using a Tukey-Kramer adjustment to correct for the multiple comparisons. All statistical tests were two-sided with a type I error level of 0.05. All analyses were performed using SAS version 9.1.

RESULTS

No differences in smoking status were noted between the 598 participants recruited to the CCHC prior to the inclusion of the depression and anxiety measures (i.e., in 2004i.e., in 2005, and January 2006) and the N=1,985 recruited between February 2006 and October 2011. Among the 1,985, a total of 1,852 participants were of Mexican heritage, and of these, 1,791 participants completed the anxiety measure and 1,784 participants completed the depression measure, and therefore, were eligible for inclusion in the current analysis. No differences in smoking status were noted between participants included in the current analysis who completed the anxiety and depression measures and those who declined to complete the anxiety and depression measures. However the participants who did not complete the anxiety and depression measures were significantly older than those who did.

Overall the majority (67.3%) of the participants were female, born in Mexico (67.7%), completed the assessments in Spanish (74.5%), and 45.8% had completed high school or more education. On average women were older than men (46.2 years old (SE=1.14) vs. 43.4 years old (SE=1.4) $p<0.05$). Significantly more men reported ever smoking than women

(p<0.0001). Almost half (46.4%) of the men were never smokers, 25.2% were former smokers, and 29.4% were current smokers. Among women, most (79.5%) were never smokers, 12.0% were former smokers, and 8.5% were current smokers. In addition, women reported higher mean anxiety and depression scores compared to men (p<0.0001 for both). Although mean scores on both scales were higher among respondents who answered in Spanish compared to English the difference was significant for anxiety only (p<0.05).

Table 1 presents age-adjusted mean anxiety scores for current, former, and never smoking status stratified by gender, country of birth by gender, and educational attainment by gender. In the results, we focus on the associations obtained from the post-hoc comparisons as they are not reported in the table. Women who have never smoked and those who currently smoke reported higher anxiety scores than their male counterparts (p<0.001 and p=0.018, respectively). Post-hoc comparisons revealed that among both men and women, never smokers reported lower anxiety scores than former (p=0.027 and p=0.047, respectively).

Post-hoc comparisons further indicated that among women with less than a high school education, current smokers reported higher anxiety scores than never smokers (p=0.009), whereas among women who were high school graduates, former smokers reported higher anxiety scores than never smokers (p=0.011). And finally, among both men and women born in the US, mean anxiety scores were higher among former smokers than never smokers (p<0.034 and p<0.043, respectively).

Table 2 presents age-adjusted mean depression scores for current, former, and never smoking status stratified by gender, country of birth by gender, and educational attainment by gender. Again, in the presentation of results in table 2, we focus on the post-hoc comparison p-values because they are not reported in the table. At all levels of smoking status, women reported higher depression scores than men (p<0.001 for all) and depression scores varied by smoking status among women (p=0.045), but not among men (p= 0.510). Never smoking women reported lower depression scores than former smokers (p=0.053).

There were no significant differences in depression scores for smoking status by either educational attainment or country of birth reported by men. However, among women with less than a high school education, post-hoc tests revealed that depression scores were significantly higher among current smokers compared to never smokers (p<0.007), and among women who completed high school, higher depression scores were found among former and current smokers compared to never smokers (p=0.046 and p=0.036, respectively). Among women born in the US, former smokers reported significantly higher depression scores than never smokers (p=0.005)

DISCUSSION

Our goal was to examine the relationship between smoking status and both anxiety and depression, as both conditions are associated with current smoking (Buckner & Vinci, 2013; Lyvers, Carlopio, Bothma, & Edwards, 2013) and increased barriers to quitting smoking (Gonzalez et al., 2008). Overall, and across the lifespan, women report greater levels of

anxiety (Kessler et al., 2010) and depression (Ferrari et al., 2013) than men, which was also the case in our study.

In our study we found both anxiety and depression were associated with smoking status among women, whereas only anxiety was associated with smoking status among men. Among women who had completed high school, former smokers reported higher levels of anxiety and depression than never smokers. Also, former women smokers born in the US reported higher levels of both anxiety and depression than never smokers, but not current smokers. When women abstain from tobacco, they experience more negative affect compared to men (Pang & Leventhal, 2013). Thus, consistent with previous findings (Weinberger et al., 2013), our results suggest that it is important to tailor smoking cessation programs by gender. Compared to men, women who smoke, including women of Mexican heritage, experience more anxiety and depression than women who do not smoke, which may hinder their cessation efforts.

In our study both anxiety and depression scores were higher among Mexican heritage women who currently smoke and who have not completed high school compared to their more educated peers. Consistent with this finding, smoking rates, successful quit rates, and the prevalence of depression and anxiety are inversely related to SES (Cokkinides et al., 2009; Kessler et al., 2010; Lorant et al., 2003), underscoring the need to tailor primary prevention efforts and cessation interventions to Mexican heritage girls from families with limited educational attainment, as well as to those at risk for dropping out of school.

Of note, anxiety scores were significantly higher among respondents who answered in Spanish compared to English. Yet gender-specific, age-adjusted anxiety score means for never, former, and current smokers did not vary by language of interview (data not shown). In other words, in our study, the relationship between anxiety and smoking status does not vary by language of interview.

Like all, our study has some limitations. Due to the cross-sectional nature of the data we are unable to address issues of causality, and therefore, present associations between self-reported smoking status and two affective states. Smoking status was not validated biochemically, and therefore may be underreported. However, the smoking prevalence rates reported in the current study, while different from prevalence rates based on national data for Hispanics (CDC, 2013; Cokkinides et al., 2009), are similar to those observed among Mexican heritage adults residing in Houston, TX (Wilkinson et al., 2005), suggesting participants accurately reported their behavior. Finally, while we did not conduct clinical diagnosis of depression and anxiety, the instruments we used to assess these negative affective states are well established (Radloff, 1977; Zung, 1971) and validated for use in both English and Spanish (e.g. Ruiz-Grosso et al., 2012). Strengths include the complex sampling design, a large sample size and weighted statistical analysis, and as a result, our results generalize to similar populations.

In conclusion, our results add to the body of knowledge that indicate that negative affective states represent a greater barrier to smoking cessation among women than men. Our results also suggest that addressing depression and anxiety as part of smoking cessation programs

that target women of Mexican heritage, particularly for women of low educational attainment, could improve long-term abstinence rates.

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Biographies

Anna V. Wilkinson received her PhD in 1996 from The University of Texas at Austin in Community Psychology. Currently she is an Assistant Professor at The University of Texas School of Public Health, Austin Regional Campus. Her research examines relationships between non-genetic risk factors (including acculturation) and genetic risk factors on health enhancing and health compromising behaviors. She is also interested in the role of culture on health, including acculturation in general, as well as participation in cultural activity.

Kristina P. Vatcheva received her MS in 1996 from Sofia University “St. Kliment Ohridski” in Mathematics. Currently she is a PhD candidate in Epidemiology at The University of Texas School of Public Health, Brownsville Regional Campus. Her research interest is in the application of biostatistical methods to all areas of epidemiology.

Adriana Pérez received her MS and PhD in Biostatistics from Tulane University in 1995. Currently she is an Associate Professor of Biostatistics at The University of Texas Health Science Center at Houston School of Public Health, Austin Regional Campus. Her research interests include statistical methods to handle missing data, sample size and power calculations for health studies, sampling techniques, measurement error models for complex food intake and longitudinal analysis.

Belinda M. Reininger received her DrPH in 1994 from The University of Texas Houston Health Science Center School of Public Health. Currently she is an Associate Professor at The University of Texas School of Public Health, Brownsville Regional Campus, where she designs and examines the effectiveness of interventions based on behavioral theory and the Ecological Model to improve health outcomes associated with obesity and related chronic diseases among Mexican Americans.

Joseph B. McCormick, MD, graduated from Duke University Medical School in 1967 and received his Master of Science from Harvard School of Public Health. He became a leading figure in studies of viral hemorrhagic fevers and AIDS in many countries in Africa and Asia. Currently he is the Dean of the Brownsville Regional Campus at The University of Texas School of Public Health and James H. Steele Professor of Epidemiology. His current

research focuses on the impact of obesity and diabetes on the mental, social and physical health, on the immune system and response to infectious diseases, as well as, intervention studies that could improve the health of the community.

Susan P. Fisher-Hoch completed her Medical Degree at the Royal Free Hospital School of Medicine in 1975, Membership of the Royal College of Pathologists and Masters' Doctoral Degrees in Epidemiology at London University in 1981. She has made major contributions to the study of viral hemorrhagic fevers and other diseases in developing countries in Africa and Asia. She was responsible for overseeing the design and construction of the Biosafety Level 4 laboratory in Lyon, France. Currently she is a Professor of Epidemiology at The University of Texas School of Public Health, Brownsville Regional Campus where she has been responsible for recruitment of the Cameron County Hispanic Cohort. Her research includes clinical, metabolic, immunological, proteomic and genetic studies, including gene expression, focused on understanding and preventing the complications of diabetes and obesity and in the interactions of these chronic conditions with acute infections such as influenza and tuberculosis.

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Table 1

Weighted Age-adjusted Means (SE) for Anxiety by Demographic Characteristic s and Smoking Status

	Anxiety			
	Never	Former	Current	
	Mean (SE)	Mean (SE)	Mean (SE)	p-value
Gender				
Male	29.18 (0.56)	32.96 (1.24)	31.31 (0.97)	0.0325
Female	33.89 (0.45)	36.69 (1.45)	36.27 (1.27)	0.0412
p-value	<0.0001	0.3508	0.0182	
Males				
Educational Attainment				
< High school	29.53 (0.91)	30.45 (1.60)	31.20 (1.62)	0.5510
High school	29.59 (1.15)	30.78 (1.82)	29.68 (1.81)	0.7461
> High school	29.15 (0.82)	32.82 (1.62)	31.96 (1.40)	0.0634
p-value	0.9549	0.4200	0.5224	
Country of Birth				
Mexico	29.71 (1.07)	32.58 (1.67)	32.27 (1.41)	0.1782
USA	28.76 (1.06)	32.55 (1.67)	30.40 (1.22)	0.0399
p-value	0.4033	0.9677	0.2560	
Females				
Educational Attainment				
< High school	34.15 (0.54)	33.94 (2.29)	41.10 (2.21)	0.0125
High school	32.42 (1.22)	43.56 (3.68)	32.14 (2.66)	0.0156
> High school	34.01 (0.65)	37.34 (1.75)	34.98 (1.51)	0.2352
p-value	0.5421	0.1065	0.0175	
Country of Birth				
Mexico	33.70 (0.55)	34.98 (1.45)	35.93 (1.48)	0.3147
USA	34.35 (0.71)	40.99 (2.68)	36.70 (2.44)	0.0406
p-value	0.4446	0.1594	0.8515	

Table 2

Weighted Age-adjusted Means (SE) for Depression by Demographic Characteristic s and Smoking Status

	Depression			
	Never	Former	Current	
	Mean (SE)	Mean (SE)	Mean (SE)	p-value
Gender				
Male	28.30 (0.73)	29.80 (1.24)	29.52 (1.21)	0.5104
Female	32.92 (0.59)	35.92 (1.37)	35.91 (1.56)	0.0452
p-value	0.0001	0.0004	0.0007	
Males				
Educational Attainment				
< High school	28.12 (1.32)	28.14 (0.96)	29.58 (1.42)	0.6107
High school	27.42 (1.80)	30.16 (3.83)	29.76 (1.71)	0.5924
> High school	28.50 (0.96)	29.40 (1.50)	29.44 (1.76)	0.8550
p-value	0.7329	0.4609	0.9246	
Country of Birth				
Mexico	28.54 (0.98)	29.19 (1.48)	30.42 (1.83)	0.5859
USA	27.97 (1.10)	30.83 (2.18)	28.30 (1.30)	0.1945
p-value	0.5950	0.4745	0.4254	
Females				
Educational Attainment				
< High school	33.84 (0.76)	33.91 (2.42)	43.08 (2.75)	0.0099
High school	31.86 (1.22)	43.57 (4.71)	40.55 (3.34)	0.0039
> High school	32.63 (0.86)	36.03 (1.68)	33.18 (1.97)	0.2859
p-value	0.3498	0.1788	0.0122	
Country of Birth				
Mexico	32.87 (0.73)	34.26 (1.74)	35.42 (1.77)	0.3776
USA	33.02 (0.92)	39.53 (2.72)	36.85 (3.02)	0.0477
p-value	0.9178	0.0214	0.9897	