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Psychiatry Res. Author manuscript; available in PMC 2015 May 29.

Published in final edited form as:

Psychiatry Res. 2015 March 30; 226(1): 73–77. doi:10.1016/j.psychres.2014.11.064.

Major depressive disorder and smoking relapse among adults in the United States: A 10-year, prospective investigation

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Abstract

This study investigated the relation between major depressive disorder (MDD) and smoking relapse in the U.S. over a 10-year period. Data were drawn from the Midlife Development in the United States (MIDUS) Survey Waves I & II. Logistic regression analyses were used to explore the associations between past-year MDD in 1994, past-year MDD in 2005 and persistent depression (1994 and 2005) and risk of smoking relapse in 2005 among former smokers, adjusting for demographics, anxiety disorders, and substance use problems and smoking characteristics. Among former smokers, MDD in 1994, compared to without MDD in 1994, was associated with significantly increased odds of smoking relapse by 2005. Current MDD in 2005 was associated with an even stronger risk of relapse in 2005 and persistent depression even more strongly predicted relapse by 2005. These associations remained significant and were not substantially attenuated by the covariates. In conclusion, MDD appears to confer long-term vulnerability to smoking relapse among adults in the general population. These results suggest interventions for smoking cessation should include screening and treatment for MDD if programs are to be optimally effective at achieving initial quit success as well as enduring abstinence.

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Conflict of interest The authors have no conflict of interest to declare.

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Keywords

Tobacco; Longitudinal; Mood disorder; Epidemiology

1. Introduction

Cigarette smoking is the leading preventable cause of death and remains common in the US with approximately one in five (18%) of adults reporting that they currently smoke regularly (Centers for Disease Control and Prevention, 2012). Most smokers say they would like to quit (70%) and at least half report having made at least one quit attempt within the past year (Centers for Disease Control and Prevention, 2011). Yet, the prevalence has remained relatively steady for the past decade and the quit rate remains low at approximately 3% (Benowitz, 2010). Therefore, while most smokers want to quit, a majority is unable to do so. As such, the identification of modifiable risk factors for poor smoking cessation outcomes, or smoking relapse, seems imperative both in order to groups most vulnerable to persistent smoking and to develop and disseminate interventions which will lead to more successful outcomes with these groups.

Epidemiologic studies have suggested that current (past year) major depression is common among 6.7% of smokers in the US and 16.5% have a lifetime history of depression (Kessler et al., 2003, 2005a, 2005b). A large number of clinical trials have examined whether a history of depression is associated with poorer outcomes in clinical smoking cessation trials and this issue has been debated for years with evidence confirming and contradicting this possibility (Brown et al., 2001a, 2001b; Hitsman et al., 2003; Japuntich et al., 2007; McClave et al., 2009; Zvolensky et al., 2009). Current depression, however, is a malleable yet understudied condition in smoking cessation studies (Gierisch et al., 2012; van der Meer et al., 2013). At present, evidence appears to suggest that either current depression or history of depression confers a moderate and significant detrimental impact on smoking cessation outcomes, which encourages smoking cessation services to provide behavioral mood management for their depressed clients (Hitsman et al., 2003). However, there are several methodological features of the majority of prior studies to date that limit the degree to which studies to date is informative about smokers in the community. First, with few exceptions (Biener and Abrams, 1991) studies to date have included clinical samples of smokers seeking smoking cessation treatment. Therefore, the generalizability to adults in the community is questionable. For example, those who participate in clinical trials tend to be of higher SES than those in the community (Hanson and Chen, 2007). Lower SES is a risk factor for smoking, for persistent and is a barrier to access to smoking cessation treatment (Kiefe et al., 1998; Roddy et al., 2006; Schaap and Kunst, 2009; Weinberger et al., 2008). Additionally, clinical trials for smoking cessation generally exclude potential participants with current depression, as well as those with anxiety and substance use disorders, which are highly comorbid with both depression and smoking (Cox et al., 2008; Gierisch et al., 2012). Physical health problems are also commonly excluded, and therefore, clinical trials may be more apt to include “super healthy” smokers who are unlikely to be representative of the general population of smokers in the population. Moreover, clinical trial participants all receive treatment and/or it is clear what kind of treatment they do or do not receive. Smokers

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in the population do not all receive treatment and/or any routine type of treatment when they attempt to quit smoking (Fiore et al., 1990). Finally, most clinical trials follow people for 1 month–2 years. Smoking is often a lifelong struggle and the depression can be recurrent. Therefore, the degree to which depression affects risk of relapse over the long term, and the potential role of the proximity and persistence of depression on risk of relapse remain unclear.

Against this background, the goal of the current study was to examine the relationship between a history of major depressive disorder (MDD) in 1994 and risk of relapse among former smokers 10 years later in 2005 among adults in the general US population. We also explored the relationship between current depression (past year) in 2005 and risk of smoking relapse by 2005 among formers smokers as well as the association between persistent depression and risk of relapse by 2005 among former smokers compared with those without depression.

2. Methods

2.1. Participants

Data were drawn from the two waves of the Midlife Development in the United States Survey (MIDUS) (Brim et al.; Ryff et al., 2006). The MacArthur Midlife Research Network collected Wave 1 data from 1994 to 1995; a national survey of over 7000 Americans in adulthood that investigated behavioral, psychological, and social factors related to physical and mental health. Wave 1 consisted of a nationally representative multistage probability sample (main sample) of community-dwelling English speakers in the continental United States (n=3032). Participants completed a 30-min telephone interview and a self-administered questionnaire was mailed to them. Approximately 70% of Wave 1 participants took part in the Wave 2 survey collected by the Institute on Aging at the University of Wisconsin–Madison supported by the National Institute on Aging between 2004 and 2006.

Respondents who participated in the telephone interview were mailed a self-administered questionnaire. The response rate from the mailed questionnaire was 86.6%, yielding an overall response rate of 61% (0.70*0.87=0.61) and an overall sample size of 3302 (n) for the Wave 1 main sample. Of the 3032 respondents from Wave 1, 2101 completed the Wave 2 telephone surveys (response rate of 69.5%). For the present study, Wave 1 data were drawn from respondents who completed both the telephone and mail surveys, and Wave 2 data were drawn from respondents who completed the telephone interviews only. Post-stratification weights were applied to the samples, which made it representative according to age, gender, race, and education.

2.2. Measures

2.2.1. Smoking—At each Wave, all participants were asked whether they had ever smoked at least one cigarette. Participants who reported ever smoking at least one cigarette were asked whether they had ever smoked daily (“regularly—meaning at least a few cigarettes every day”), whether they currently smoke daily (“Do you smoke cigarettes regularly now?”), and the age they were when they last smoked regularly. For the purposes

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of these analyses, former smokers at Wave 1 were those who endorsed having ever been a daily smoker and that the last age at which they were a regular smoker was at least 1 year prior to their age at Wave 1 and that they responded in the negative to whether they were currently a regular smoker at Wave 1. We used this subgroup to examine the relationship between depression and smoking relapse by 2005. Respondents who reported at Wave 2 that the last age at which they smoked daily was greater than their age at Wave 1 and/or that they currently smoked daily at Wave 2 (among those who had reported at Wave 1 that they last smoked daily at least 1 year prior to Wave 1) were considered to have "relapsed" by 2005. Those who reported that they last smoked daily at least 1 year prior to Wave 1 (and that they did not smoke daily at Wave 1 or 2) were considered to have remained abstinent (not relapsed). The amount of smoking (while a daily smoker) was reported as average number of cigarettes per day during the period when the individual was a regular smoker prior to Wave 1. Duration of abstinence was defined as the age at last smoked regularly at Wave 1 subtracted from age at Wave 1. Duration of smoking was defined as the age at which they first smoked daily prior to Wave 1 subtracted from the age at which they last smoked daily.

2.2.2. Major depression and anxiety disorders—Major depression, generalized anxiety disorder (GAD), and panic attacks in the MIDUS were based on the Composite International Diagnostic Interview-Short Form (CIDI-SF) scales, a diagnostic-specific scale that was developed from item level analyses of the Composite International Diagnostic Interview (CIDI) questions used in the National Comorbidity Survey (Kessler et al., 1998). The CIDI-SF scales were designed to reproduce the full CIDI diagnoses as exactly as possible, with only a small subset of the original questions. Validity data suggest a strong relationship between diagnoses based on the CIDI-SF and the full CIDI (Hedden et al., 2012). Past 12-month major depression, GAD and panic attacks were assessed using the CIDI-SF depression scale in Waves 1 and 2.

2.2.3. Substance use problems—All participants were asked whether they had received treatment for problems with alcohol or illicit drug use at Wave 1.

2.2.4. Demographic characteristics—At Wave 1, all participants reported on basic demographic characteristics including age, gender, race, marital status and level of formal education obtained.

2.3. Statistical analyses

Logistic regression analyses were used to examine the relationships between depression in 1994, compared with those without depression in 1994, and odds of smoking relapse by 2005 among former smokers. The same procedure was used to examine the relationship between depression in 2005, compared to without, and relapse by 2005 as well as the relationship between persistent depression (1994 and 2005) and relapse by 2005. Analyses were then adjusted for demographic characteristics, anxiety disorders, substance use problems and smoking characteristics. Estimates of the strength of these relationships are reported by adjusted odds ratios with 95% confidence intervals.

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3. Results

Adults who had MDD in 1994 were more likely to be younger, female, less likely to be married, and were more likely to be separated, divorced, or never married compared with those who quit successfully (see Table 1). In the MIDUS overall sample, the prevalence of past year MDD, 9.4%, is consistent with other studies, although slightly higher than studies that have used a full diagnostic instrument (e.g., 6.6% past 12-month (Ryff et al., 2004)) due to the use of a screening instrument. There were no statistically significant differences in race, education, substance abuse disorder, amount of smoking and duration of quit attempt among those with MDD at 1994 compared to those who had not.

Participants with MDD in 1994 compared to those without MDD in 1994 (mutually exclusive) remained at a significantly increased risk of smoking relapse by 2005 (see Table 2). These associations were significant after adjusting for the covariates in 1994. Participants with MDD in 2005 compared to those without this disorder in 2005 (mutually exclusive) were at a significantly increased risk of smoking relapse by 2005 (see Table 3). These associations also remained significant after adjusting for the covariates in 1994. Participants with MDD in 1994 and 2005 compared to those without MDD at either 1994 or 2005 (mutually exclusive) were at a significantly increased risk of smoking relapse by 2005 (see Table 4), even after adjusting for the covariates in 1994.

4. Discussion

In this study, we examined whether MDD in 1994 was associated with increased risk of relapse 10 years later. Results indicated that MDD in 1994 was associated with higher risk of smoking relapse by 2005. Moreover, persistence of MDD at both waves (compared to no history of MDD) and current MDD at Wave 2 (compared to no current MDD at Wave 2) were associated with higher risks of relapse among former smokers. Importantly, adjusting for a diverse range of sociodemographic characteristics and measures of smoking behavior (e.g., duration of quit) did not changed the pattern of the outcomes. These data provide novel and consistent evidence that MDD is a potentially significant and long lasting predictor of smoking persistence. There is a pressing need to identify the mechanisms underlying these MDD-smoking cessation effects, including psychological (e.g., dysfunctional thinking styles such as rumination), neurological (e.g., low sensitivity to intrinsic rewards), and social (e.g., financial strain) processes.

There are a number of interpretive caveats to the present study. First, while this study employed longitudinal methodology, it is not possible to identify the exact chronology of some theoretically and clinically relevant events (e.g., quitting dates, dates of remission from past psychiatric diagnoses). Therefore, a useful next step in this line of work could be use of a research design that isolates the temporal trajectories of such events in relation to cessation success. Second, the age range of the MIDUS pertains to 25–74. Accordingly, it is not known whether the findings apply to those outside this age range. Future research would benefit from examining the role of MDD among younger smoking samples. Third, it is not clear whether the present study results are applicable to the non-U.S. populations. Future studies could examine this issue in other developed and developing countries. Third, the

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study data did not include information on methods of cessation used by each quitter (e. g., self-quit or pharmacotherapy). Since cessation methods could have important effects on smoking relapse (Yeomans et al., 2011), future work would benefit from including such variables in the methodological approach. Fourth, we did not have data on other factors relevant to MDD, including treatment history, time since treatment, time since diagnosis, and number of episodes. Future work could benefit by documenting such treatment history and illness course variables in a more comprehensive fashion. Finally, we could not take into account the broader range of anxiety and mood disorders due to the lack of measurement of these factors and statistical power. Thus, it is unclear whether MDD is a relative risk factor when accounting for other anxiety and mood disorders. Future research could usefully examine the role of MSS on smoking relapse when adjusting for all other anxiety and mood disorders.

Overall, the present findings uniquely extend previous work and suggest that MDD is prospectively associated with increased risk of smoking relapse over time. Yet, such MDD effects are attenuated when considering the duration of past quit attempts. The present data add to a growing empirical literature suggesting greater clinical attention be focused on MDD in smoking cessation from a treatment development and policy standpoint (Hitsman et al., 2003). Clinically, such findings point to the potential importance of continuing to develop and more broadly disseminate specialized smoking cessation intervention(s) for the MDD segment of the smoking population whom may benefit through psychosocial or pharmacological interventions targeting reductions in depressive symptoms (e.g., Brown et al., 2001b; Hitsman et al., 2003).

Acknowledgments

Funding The MIDUS study was funded by the United States Department of Health and Human Services, the National Institutes of Health and the National Institute on Aging.

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Table 1

Adult demographic characteristics among adults with and without MDD among former smokers by 1994.

	No depression 1994 (*n* = 608)	Depression 1994 (*n* = 91)	*p*-value
Age (M, S.D.)	50.9 (12.6)	47.7 (10.3)	0.02
Gender			0.002
Male	324 (56.3%)	36 (39.6%)	
Female	266 (43.8%)	55 (60.4%)	
Race			0.2
White	510 (91.2%)	77 (95.1%)	
Black/African American	30 (5.3%)	0 (0%)	
Asian	4 (0.7%)	3 (3.7%)	
Native American/Alaskan	8 (1.4%)	1 (1.2%)	
Native Hawaiian/Pacific Islander	5 (0.9%)	0 (0%)	
Marital status			0.02
Married	435 (71.7%)	54 (59.3%)	
Divorced/Separated	87 (14.3%)	26 (28.3%)	
Widowed	52 (8.6%)	8 (8.8%)	
Never married	33 (5.4%)	3 (3.3%)	
Education			0.07
Grade school up to GED	62 (10.2%)	9 (9.9%)	
High school graduate	170 (28.0%)	23 (25.3%)	
Some college	172 (28.3%)	37 (40.7%)	
Bachelor's degree	130 (21.4%)	10 (11.0%)	
Any graduate school	74 (12.2%)	12 (13.2%)	

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Table 2

Depression in 1994 and risk of smoking relapse by 2005 among former smokers.

	No depression 1994 (*n* = 608)	**Depression 1994 (*n* = 91)**	**OR (95% CI)**	**AOR[a] (95% CI)**	**AOR[b] (95% CI)**	**AOR[c] (95% CI)**	**AOR[d] (95% CI)**	**AOR[e] (95% CI)**	**AOR[f] (95% CI)**
Relapse by 2005	12.1% (63)	24.4% (19)	**2.3 (1.3, 4.2)**	**2.2 (1.2, 3.9)**	**2.5 (1.3, 4.6)**	**2.0 (1.1, 3.8)**	**2.2 (1.2, 4.1)**	**2.1 (1.02, 4.2)**	**2.4 (1.3, 4.2)**

AOR[a]=Adjusted for gender and age.

AOR[b]=Adjusted for alcohol/drug use problems at Wave 1.

AOR[C]=Adjusted for GAD and panic attacks at Wave 1.

AOR[d]=Adjusted for amount of smoking.

AOR[e]=Adjusted for duration of quit.

AOR[f]= Adjusted for length of smoking.

Bold=$p < 0.05$.

Relapse = Currently a regular/daily smoker in 2005 among those who were former daily smokers in 1994 ($n = 699$).

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Table 3

Depression in 2005 and smoking relapse by 2005 among former smokers.

	No depression 2005 (*n* = 622)	**Depression 2005 (*n* = 77)**	**OR (95% CI)**	**AOR[a] (95% CI)**	**AOR[b] (95% CI)**	**AOR[c] (95% CI)**	**AOR[d] (95% CI)**	**AOR[e] (95% CI)**	**AOR[f] (95% CI)**
Relapse by 2005	11.6% (62)	30.3% (20)	**3.2 (1.9, 5.4)**	**3.0 (1.6, 5.4)**	**3.4 (1.8, 6.4)**	**3.0 (1.6, 5.5)**	**3.1 (1.7, 5.7)**	**3.2 (1.5, 6.7)**	**3.3 (1.8, 6.0)**

AOR[a]=Adjusted for gender and age.

AOR[b]=Adjusted for alcohol/drug use problems at Wave 1.

AOR[c]=Adjusted for GAD and panic attacks at Wave 1.

AOR[d]=Adjusted for amount of smoking (number of cigarettes per day when smoking).

AOR[e]=Adjusted for duration of quit.

AOR[f]=Adjusted for length of smoking.

Bold=$p < 0.05$.

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Table 4

Depression in 1994 and 2005 and smoking relapse by 2005 among former smokers.

	No depression 1994 or 2005 (*n* = 556)	**Depression 1994 and 2005 (*n* = 25)**	**OR (95% CI)**	**AOR[a] (95% CI)**	**AOR[b] (95% CI)**	**AOR[c] (95% CI)**	**AOR[d] (95% CI)**	**AOR[e] (95% CI)**	**AOR[f] (95% CI)**
Relapse by 2005	10.3% (49)	27.8% (6)	**4.0 (1.9, 8.8)**	**3.0 (1.1, 8.1)**	**3.4 (1.1, 9.8)**	**2.9 (1.0, 8.5)**	**22.7 (0.9, 7.7)**	**3.2 (1.5, 6.7)**	**3.5 (1.3, 9.4)**

AOR[a]=Adjusted for gender and age.

AOR[b]=Adjusted for alcohol/drug use problems at Wave 1.

AOR[c]=Adjusted for GAD and panic attacks at Wave 1.

AOR[d]=Adjusted for amount of smoking.

AOR[e]=Adjusted for duration of quit.

AOR[f]=Adjusted for length of smoking.

Bold=$p < 0.05$.