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Smoking is a predictor of depression onset among National Guard soldiers

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Abstract

This paper aimed to investigate the relationship between smoking and depression in a sample of American soldiers. Persistent, active smoking is associated with increased risk of incident depression at follow up. History of smoking in the absence of current smoking at baseline was not associated with depression at follow-up.

Keywords

smoking; depression; military

1. Introduction

Major depression is increasingly recognized as a serious health problem among military personnel in the US (Tanielian et al., 2008). The National Guard is a subgroup of the US military among whom rates of depression are even higher than among active military personnel (Thomas et al., 2010). Several reports suggest that smoking is also disproportionately common among military service personnel (Schei et al., 1994; Bray et al., 2010), although this varies to some degree by age and unit of service. Cigarette smoking has a long history of being tolerated and even encouraged in American military culture (Conway, 1998; Smith et al., 2009). Trend data show that over the past 28 years cigarette smoking in the US military has decreased. However, the prevalence of cigarette smoking remains high among military personnel with some estimates reporting that up to 31% of active duty military personnel are current smokers (Department of Health and Human Services, 2011).

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Recently several general population studies have documented a link between smoking and increased risk of depression (Breslau et al., 1991; Fergusson et al., 2003; Boden et al., 2010; dos Santos et al., 2010; Kang et al., 2010). Several studies have documented relationships between depressive symptoms, suicide behavior, stress and high levels of tobacco use among military populations (Miller et al., 2000; Gulec et al., 2005; Bray et al., 2010). With the exception of one previous study of Turkish medical military undergraduates that found a relationship between smoking and depression (Gulec et al., 2005), studies among military populations have not directly examined the relationship between depression and smoking. Against this background, this study assessed the relationship between depression and smoking in a sample of National Guard members. We hypothesized that this relationship would be significant, and even stronger than in the general population, given the disproportionate burden of stress and cigarette smoking among military populations.

2. Methods

2.1. Study population and survey

Data were drawn from the Ohio Army National Guard Health Initiative (OHARNG MHI). The OHARNG MHI is a longitudinal cohort of Ohio Army National Guard Soldiers who are interviewed annually to assess mental health, substance use and life experiences. All enlisted soldiers between June 2008 and February 2009 (N=12,570) were notified that they may be contacted to participate in a telephone interview; 1013 opted to be non contacted further (8%). Of the remaining 11,557 soldiers, 58.1% had contact information and thus were possible participants (n=6,514). This group was further reduced to a final baseline sample of 2,616 after eligibility, language proficiency, and desire to participate were taken into account; the overall survey response rate was 43.2%. This was calculated as those who consented to an interview (N=187 retired+2616 completed) over all possible participants (N=6514 – 31 ineligible as heard of hearing or non-English speaking). Participants were contacted for follow-up interviews in November of 2009, within 12 months of their original interview, and given 12 months to respond. 67.7% of the original 2,616 soldiers responded to follow-up surveys (n=1,770). This study included the 1,770 soldiers who participated in both baseline and follow-up surveys. After giving written, informed consent, soldiers participated in computer -assisted telephone interviews that obtained information on mental health, substance use, military experiences, and life events history. The investigation was carried out in accordance with the latest version of the Declaration of Helsinki. The study design was reviewed by University of Michigan and Case Western IRB and informed consent of the participants was obtained after the nature of the procedures had been fully explained.

2.2. Measures

The main independent variable of interest was whether or not an individual reported smoking at baseline. The main dependent variable of interest was depression status at time 2. The Patient Health Questionnaire-9 (PHQ-9) was used to evaluate depression (Kroenke et al., 2001). Incident depression at time 2 was defined as having at least two out of 9 symptoms at follow-up and they must have occurred between the baseline survey and follow-up survey among participants with no history of depression at baseline (individuals had to have had at least 2 co-occurring symptoms at some point in the past to be considered to have a history of depression at baseline) (Kroenke et al., 2001). A concurrent clinical reappraisal was conducted with the OHARNG MHI baseline survey and found the PHQ-9 to be highly specific (98%) with moderate sensitivity (58%) as compared to clinician-administered interviews (Calabrese et al., 2011). With high specificity and moderate sensitivity, the CATI administered PHQ-9 removes virtually all false positive depressed

participants. Other covariates included smoking status at follow-up, age and gender. Age was included as an indicator variable (18-24 (reference group), 25-34, 35-44, 45+).

2.3. Statistical analysis

For the study sample, those who did not answer the smoking series of questions were eliminated (N=4) and only those who were at risk for incident depression at follow-up were included (N=1391). To be considered at risk, those who ever had a history of depression as reported in the baseline survey were excluded (375). Within this sample, the distribution of incident depression was examined among those who were and were not smoking. The distribution of incident depression among the multiple categories of smoking (never, history but not currently, on and off again, incident smoker, chronic smoker) was then examined. Using unadjusted logistic regression, the crude association between smoking status and incident depression was estimated. Adjusted logistic regression was then used to estimate the crude association between smoking status and incident depression adjusting for age and gender.

3. Results

The distribution (number (%)) and the association (crude odds ratio, 95% CI) of depression at follow-up according to the baseline and follow-up characteristics are listed in Table 1. The majority of the sample was male (86.1%) and below the age of 35 (64.3%). In bivariable cross-sectional associations, smoking status at baseline was associated with depression at baseline. History of smoking (but not current) (AOR=1.2 (0.7, 2.1)), sporadic/inconsistent smoking (AOR=2.2 (0.9, 5.2)) and incident smoking (AOR=2.7 (0.6, 12.4)) at baseline were not associated with increased risk of depression at follow-up but chronic smoking was associated with significantly increased risk of incident depression at follow-up (AOR=2.0 (1.2, 3.4)). This association remained statistically significant after adjusting for demographic differences.

4. Discussion

The first study of the relationship between smoking and depression over time among military personnel found that persistent smoking is associated with incident depression among National Guard soldiers. This finding is consistent with results from several longitudinal studies showing that smoking is associated with increased risk of depression in general population samples (Covey et al., 1998; Boden et al., 2010; dos Santos et al., 2010; Kang et al., 2010).

There are four main explanations for the observations noted here. First, while the military has traditionally experienced higher rates of smoking than the general population, recently there have been targeted efforts to improve smoking cessation in the military (Bondurat, 2009). Therefore, it is conceivable that depression could result from increased exposure to stigma among remaining smokers though this seems less likely in the military than among some other population subgroups. Second, there is a near-perpetual state of withdrawal among chronic smokers, beginning after the effects of the last cigarette wear off. Since soldiers are frequently unable to smoke at will while fulfilling their duties, it is possible that they are more vulnerable to depression via increased exposure to withdrawal symptoms than the civilian population. Third, it is possible that smoking influences the brain through depletion of serotonin due to frequent nicotine use, leading to increased vulnerability to depression via neurobiological pathways (Malone et al., 2003). Fourth, the relationship between smoking and depression among National Guard members could result from uncontrolled confounding. For example, anxiety disorders, substance use disorders (i.e. alcohol and illicit substances) and exposure to traumatic events are all associated with

increased smoking and depression (Vlahov et al., 2002; Kalman et al., 2005; Feldner et al., 2007). It is possible that exposure to one of these factors results in the observed association.

Limitations of this study should be considered. First, while levels of smoking were examined at two time points, there was no measure of nicotine dependence. Future studies that can differentiate between dependent and non-dependent smoking, including an examination of withdrawal symptoms in the relationship between smoking and depression will lead to a better understanding of the relationship between smoking and depression in the military. Second, fairly small cell sizes did not allow adjustment for a number of potential confounders (e.g., exposure to traumatic experiences, substance use disorders, other mental disorders). Yet, numerous previous studies have examined potential confounders and the relationship has remained significant.

The current study provides evidence that smoking is associated with incident depression, and provides the first evidence of a relationship between smoking and depression among National Guard members. As smoking continues to be highly prevalent among military personnel, these data suggest the burden of mental health – as well as physical health – consequences of smoking. As such, the importance of making smoking cessation programs available to soldiers—as prevention of subsequent mental health problems, as well as a means to stop smoking—cannot be overestimated.

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Table 1
Smoking characteristics among those at risk for depression and association between smoking status and depression

Smoking status	Total	Incident occurrence of depression	Crude Odds Ratio (95% CI)	Adjusted ^a Odds Ratio (95% CI)
<i>Smoked at baseline</i>				
No	995 (71.5)	61 (6.1)	1	1
Yes	396 (28.5)	37 (9.3)	1.6 (1.0, 2.4)	1.7 (1.1, 2.5)
<i>Categories of smoking</i>				
Never smoked	586 (42.2)	31 (5.3)	1	1
History of smoking but not currently	366 (26.3)	24 (6.6)	1.3 (0.7, 2.2)	1.2 (0.7, 2.1)
On and off smoker	71 (5.1)	7 (9.9)	2.0 (0.8, 4.6)	2.2 (0.9, 5.2)
Incident smoker	19 (1.4)	2 (10.5)	2.1 (0.5, 9.5)	2.7 (0.6, 12.4)
Chronic smoker	349 (25.1)	34 (9.7)	1.9 (1.2, 3.2)	2.0 (1.2, 3.4)

^aModels were adjusted for age and gender

CI, Confidence Interval