

# Tobacco-Induced Diseases: An Emphasis on Mental Health Conditions that May Result from Cigarette Use

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Besides the widely known risks to physical health, smoking cigarettes appears to pose mental health risks as well. However, research and public awareness campaigns typically focus on the relationship between smoking and physical health issues. Research has also paid significant attention to smoking as a self-medicating behavior. However, little attention has been given to research focused on cigarette smoking as a risk factor for the onset of psychological disorders. In this literature review, cigarette smoking is examined in its role as a catalyst for psychiatric illnesses. Increased awareness in this area may be particularly beneficial for mental health providers, healthcare practitioners, smokers, and individuals contemplating whether to smoke.

Keywords: cigarette smoking, mental health, psychiatric disorders, smoking cessation

The majority of research examining the mental health and smoking relationship focuses on psychiatric populations that tend to be at greater risk for smoking cigarettes, with specific attention given to smoking as a self-medicating behavior (Kassel, Stroud, & Paronis, 2003; Khantzian, 1997; Lyon, 1999; Upadhyaya, Brady, Wharton, & Liao, 2003). Investigating biological and psychological factors related to smoking is important for understanding why certain psychiatric populations show high levels of cigarette use. However, an important area in need of further study is cigarette smoking as a possible precipitating factor for the onset of certain mental health conditions. The diathesis-stress model outlines that a genetic predisposition compounded by an environmental stressor may result in the development of a psychological disorder (Raulin & Lilienfeld, 1999). Cigarette smoking may be an example of an environmental stressor that can trigger the onset of certain mental health conditions. The aim of this paper is to provide a review of research studies that have examined cigarette smoking as a risk factor for the possible onset of depression, substance abuse and dependence, and specific anxiety disorders.

## Depression

### Neurological changes

A relationship between cigarette smoking and depression has been demonstrated in numerous studies (Aubin, Ti-

likete, & Barrucand, 1996; Brelau, Peterson, Schultz, Chilcoat, & Andreski, 1998; Covey, Glassman, & Stetner, 1998; Glassman, 1993). More specifically, a relationship between cigarette smoking and changes in brain chemistry that may lead to depression has been researched (Dagher et al., 2001; Guer et al., 2006; Schild, Block, Traber, & Maier, 2006). Guer and colleagues (2006) used proton magnetic resonance spectroscopy (H-MRS) to compare the brain chemistry of 43 smokers to 35 non-smokers. Participants were matched according to age and gender. All smokers participated in a smoking cessation program and underwent H-MRS assessment two weeks and six months after quitting. The two week post-cessation H-MRS scan found non-smokers compared to smokers had significantly lower concentrations of the amino acid N-acetylaspartate (NAA) in the anterior cingulate cortex (ACC). The six month follow-up H-MRS scan found the decreased metabolite concentrations returned to normal levels for the 25 participants from the smoking group who remained abstinent. The ACC is an area of the brain involved in pleasure and pain processes (Schild, Block, Traber, & Maier, 2006). The decreased levels of NAA in the ACC of smokers suggest that cigarettes caused chemical imbalances in the brain which affected the pleasure and pain pathways. While evidence to support the following claim was outside of the scope of the study, these chemical changes may have led to the onset of depressive symptoms. An association between NAA levels and schizophrenia, dementia, bipolar disorder, substance abuse, and alcohol dependence has also been found (Auer et al., 2001; DelBello, 2010; Haselhorst et al., 2002; Kantarci, 2007; Saloab et al., 2007; Sassi et al., 2005; Schild, Block, Traber, & Maier, 2006; Stanlev et al., 2007; Szulc et al., 2007). Further imaging research to examine these associations are needed.

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### **Suicidal ideation: A depressive symptom**

Cigarette smoking may elevate suicide risk (Hughes, 2008; Iwaskai, Akechi, Uchitomi, & Tsugane, 2005; Miller, Hemenway, Bell, Yore, & Amoroso, 2000a; Miller, Hemenway, & Rimm, 2000b; Paffenbarger, Lee, & Leung, 1994; Schneider et al., 2005; Tanskanen et al., 2000). Miller and colleagues' (2000a) prospective study collected data on 314,402 male, active-duty U.S. Army members. One hundred thirteen individuals from the sample committed suicide. After controlling for age, race, alcohol intake, marital status, education and military rank, a strong, positive, dose-related correlation between smoking and suicide was found. Suicide rates were 1.2 to 2.3 times higher (dependent on number of cigarettes smoked/day) for smokers compared to non-smokers.

Schneider and colleagues (2005) reported similar results, finding a positive correlation between cigarette smoking and elevated suicide risk. Two hundred and sixty three completed suicides occurred in the Frankfurt/Main area of Germany during the years 1999 and 2000. Relatives of the individuals were contacted and 163 relatives participated in the study. Three hundred and ninety six controls matched according to the residential area, age and gender of the suicide completers participated. All participants were assessed based on the Structured Clinical Interview for the Diagnostic and Statistical Manual of Mental Disorders Axis I Disorders (SCID I), Structured Clinical Interview for the Diagnostic and Statistical Manual of Mental Disorders Axis II Personality Disorders (SCID II), and a modified version of the semi-structured interview used in the National Suicide Prevention Project in Finland. For both genders, current smoking and current heavy smoking (defined as 20 or more cigarettes/day) were significantly more common in individuals who committed suicide compared to controls. Most notably, heavy cigarette smoking was found to be an independent risk factor for male suicides.

Tanskanen and colleagues (2000) found support for a direct relationship between cigarette smoking and suicide risk among both males and females. The study analyzed data from 36,527 participants who participated in five independent population surveys between the years 1972-1992. Information on suicide related deaths were obtained from the National Mortality Registrar. Suicide rates for males and females were 134/17,798 and 31/18,729 respectively. The results, after controlling for gender, age, marital status, education, employment, alcohol and coffee consumption, physical activity, body mass index, cholesterol level, subjective overall health, depression, stress and anxiety symptoms, psychiatric medication, and heart disease found an independent dose-response association between frequency of smoking and completed suicide. The adjusted relative risk of suicide was 1.77 times higher for male smokers and 2.17

times higher for female smokers compared to nonsmokers. The findings from the existing literature on the relationship between cigarette smoking and suicide risk warrant the need for further research in this area.

### **Successful smoking cessation leading to the onset of depression**

While this paper focuses on cigarette use as a risk factor for depression, a relationship between smoking cessation and the onset of depression (Bock, Goldstein, & Marcucs, 1996; Covey, Glassman, & Stetner, 1997; Stage, Glassman, 1996; Tsoh et al., 2000) may exist. Continued smoking in attempt to avoid a depressive episode is not recommended. However, awareness surrounding depression as a potential byproduct of smoking cessation is important for smokers and individuals involved in the cessation process. Covey and colleagues (1997) assessed depression rates for 126 individuals who completed a ten week treatment program and successfully quit smoking. Individuals who met criteria for a major depressive episode within the past six months or were prescribed antidepressant medications were excluded from the study. Depression levels were assessed three months after treatment ended. Two percent of individuals with no history of major depression, 17% of individuals with a past single-episode of major depression and 30% of individuals with a history of recurrent major depression met the criteria for major depression at three month follow-up. The study suggests that individuals with a history of depression may be at risk for developing depression upon successful smoking cessation. Understanding that smoking cessation may be followed by a period of depressive symptoms may be instrumental in helping to reduce relapse rates.

### **Substance Abuse & Substance Dependence**

Research has shown that in adolescent and youth populations smoking cigarettes may act as a gateway drug to alcohol and illicit drug use (Fleming, Leventhal, Glynn, & Ershler, 1989; Gray, 1993; Schorling, Gutgesell, Klas, Smith, & Keller, 1994; Torabi, Bailey, & Majd-Jabbari, 1993). Torabi and colleagues (1993) analyzed drug-based questionnaires from 20,629 students in grades 5-12. The results found a strong, dose-related relationship between cigarette smoking and alcohol and drug use. Reported cigarette use was a more powerful predictor of substance use than other predictive factors (i.e., perceived risk of harm, perceived peer approval/disapproval of use). Individuals who smoked one or more packs of cigarettes per day compared to nonsmokers were three times more likely to drink alcohol, seven times more likely to use smokeless tobacco, and ten to thirty times more likely to use illicit drugs. The increased prevalence of legal and illegal drug use among cigarette smokers suggests that smoking may be a risk factor for the onset of substance abuse or dependence.

### Anxiety Disorders

Cigarette smoking may increase the likelihood for the onset of certain anxiety disorders (Amering et al., 1999; Breslau & Klein, 1999; Breslau, Novak, & Kessler, 2004; Isensee, Wittchen, Stein, Hofler, & Lieb, 2003; Johnson et al., 2000; Pohl, Yeragani, Balon, Lycaki, & McBride, 1992; Zvolensky, Feldner, Leen-Feldner, & McLeish, 2005). Johnson and colleagues' (2000) longitudinal study of 688 individuals examined the relationship between cigarette smoking and anxiety disorders. Participants were assessed at 16 and 22 years of age. Analyses found the presence of an anxiety disorder during adolescence was not a significant predictor of heavy smoking (20 or more cigarettes/day) during early adulthood. Fourteen percent of the adolescents with an anxiety disorder compared to 15% of the adolescents without an anxiety disorder were heavy smokers during early adulthood. After controlling for age; sex; difficult childhood temperament; alcohol and drug use; anxiety and depressive disorders of the participant; and smoking status, psychopathology and education level of the participant's parent, adolescent heavy smokers compared to adolescent non-smokers were at greater risk for developing agoraphobia, generalized anxiety disorder (GAD) or panic disorder during early adulthood. Thirty-one percent of adolescent heavy smokers compared to nine percent of adolescent non-smokers developed an anxiety disorder during adulthood. Adolescent non-heavy smokers were not at an elevated risk for anxiety disorders during adulthood. No significant relationship was found among smoking and obsessive-compulsive disorder (OCD) or social anxiety disorder. This study suggests that the quantity and frequency of adolescent smoking may predispose certain individuals to develop agoraphobia, GAD or panic disorder. Previous research has found an association between impaired respiration and agoraphobia (Biber & Alkin, 1999; Klein, 1994), GAD (Pine, 2000) and panic disorder (Klein, 1994) and no association between impaired respiration and OCD (Perna, Bertani, Arancio, Ronchi, & Bellodi, 1995) or social anxiety disorder (Pine, 2000). These findings suggest that impaired respiration may be misinterpreted as panic-like symptoms which then may trigger an anxiety driven response. Knowledge of this cycle may be clinically useful in helping to treat the subset of individuals with impaired respiration induced anxiety.

Breslau and Klein's (1999) longitudinal study found support for cigarette smoking as a risk factor for the onset of panic disorder among young adults. A random sample of 1,200 participants was recruited from a large health maintenance organization in southeast Michigan. Individuals ranged from 21 to 30 years of age. Baseline assessments were conducted in 1989 with follow-up assessments in 1990, 1992 and 1994. Information on panic attack and smoking

histories, according to the DSM-II-R and NCS Tobacco Supplement, respectively, were obtained during the assessments. Complete data was obtained for 974 individuals. After controlling for depression and substance use a relationship between daily smoking and increased risk for the initial panic attack was found. Furthermore, smoking was found to be a risk factor for the onset of panic disorder. However, panic disorder was not found to be a risk factor for the onset of smoking.

The link between smoking and anxiety is particularly interesting given that many individuals smoke cigarettes to reduce stress and anxiety (Parrott, 1999; Zvolensky, Schmidt, & Antony, 2005; Zvolensky, Schmidt, & McCreary, 2003; Zvolensky, Schmidt, & Steward, 2003). When individuals smoke cigarettes to decrease anxiety, the very action may have the opposite long term effect, resulting in an increase in anxiety. Individuals who do not understand that smoking may actually increase their overall anxiety may continue to engage in this counterproductive cycle. Awareness that cigarettes may increase anxiety may dissuade some individuals from deciding to smoke.

### Future Directions

While the physical side-effects of cigarette use have received the most attention in scientific research, the studies reviewed here provide support for a relationship between cigarette use and psychiatric disorders. Specifically, there is evidence that cigarette use is a risk factor in the development of depression, anxiety, and substance abuse. However, further research is needed to strengthen a causal, rather than a correlational, relationship between smoking and mental health disorders.

Further research in this area will be beneficial for both smokers and non-smokers. Understanding the relationship between cigarette smoking and mental health will allow for more informative public awareness campaigns and innovative smoking cessation interventions. Furthermore, research examining the role of cigarette use as precipitating and exacerbating factors for mental health conditions will help mental health specialists provide better treatment for clients who smoke cigarettes.

Future directions should also examine whether cigarette smoking may be a maintaining factor for certain mental health conditions. If this relationship could be demonstrated, interventions could make use of this finding and greater emphasis could be placed on quitting smoking during therapy sessions. Given the continued prevalence of cigarette use, the relationship between smoking and psychological disorders represents a critically important area of public health research. It is imperative that we understand the effects of smoking on minds as well as bodies.



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