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A review of epidemiologic research on smoking behavior among persons with alcohol and illicit substance use disorders☆

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ABSTRACT

Persons with alcohol use disorders (AUDs) and substance use disorders (SUDs) appear to be heavily affected by cigarette smoking. In order to address the consequences of smoking in this population, an understanding of the current state of knowledge is needed. Epidemiologic research provides the opportunity to obtain detailed information on smoking behaviors in large community samples. The aim of this paper was to synthesize the epidemiologic evidence on smoking among persons with AUDs/SUDs and suggest directions for future research. Literature searches of Medline and PubMed were used to identify articles and additional articles were elicited from publication reference lists. To be included in the review, papers had to be published in English, analyze epidemiologic data, and examine an aspect of smoking behavior in persons with AUDs/SUDs. Twenty-nine studies met inclusion criteria and were included in the review. In summary, epidemiologic evidence to date suggests greater lifetime and current smoking, nicotine dependence, and non-cigarette tobacco use; lower quitting; and differences in quit attempts and withdrawal symptoms for persons with AUDs/SUDs compared to other people. Most studies examined nationally representative data and were conducted on persons in the United States and Australia. Few publications examined outcomes by demographics (e.g., gender, age) but these studies suggested that specific patterns differ by demographic subgroups. More research is needed on persons with AUDs/SUDs in order to develop the most effective public health and clinical interventions to reduce smoking behaviors, improve cessation outcomes, and reduce the harmful consequences of smoking for those with AUDs/SUDs.

1. Introduction

The harmful consequences of tobacco use to individuals and societies are well known. Tobacco use leads to more than 480,000 deaths every year in the United States (U.S.) (USDHHS, 2014; Carter et al., 2015) and more than 5 million annual deaths around the world (WHO, 2012). Smoking is causally linked to a wide range of illnesses (USDHHS, 2014) and the relative risk of death due to smoking-related causes has increased over the past fifty years (USDHHS, 2014; Mehta and Preston, 2012). While the majority of smokers report that they wish to quit and many smokers attempt to quit (CDC, 2011), only a minority are able to maintain long-term abstinence (CDC, 2011; Fiore et al., 2008; Shiffman et al., 2008). It is important to understand the smoking behavior of subgroups of the population who appear to be disproportionally vulnerable to smoking such as adults with alcohol use disorders (AUDs; alcohol abuse and dependence) and substance use disorders (SUDs; substance abuse and dependence).

Nearly one in ten (8.5%) of U.S. adults meet criteria for a past-year AUD while nearly one-third (30%) of U.S. adults meet criteria for a lifetime AUD (Hasin and Grant, 2015). While fewer U.S. adults use illicit substances, 2.0% of U.S. adults meet criteria for a past-year SUD and approximately one in ten (10.3%) of U.S. adults meet criteria for a lifetime SUD (Hasin and Grant, 2015). More than forty-six million adults in the U.S. report using both alcohol and tobacco (Falk et al., 2006) and the use of tobacco together with alcohol and/or other substances, compared to the use of any one substance alone, increases the risk of smoking-related diseases (Hurt et al., 1996; Hser et al., 1994; National Center for Health Statistics, 2013; McKee and Weinberger, 2013; Kalman et al., 2010). For example, the concurrent use of tobacco and alcohol is associated with greater risk of head cancer, neck cancer, cirrhosis, and pancreatitis than use of alcohol alone (Marrero et al., 2005; Pelucchi et al., 2006). Persons using both tobacco and alcohol/illicit substances have greater mortality mainly due to smoking-related health consequences

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than those using just alcohol/illicit substances (Hurt et al., 1996; Hser et al., 1994).

AUDs/SUDs affect millions of Americans and persons with AUDs and SUDs are greatly impacted by tobacco through higher smoking rates, lower quit rates, and health consequences (Hurt et al., 1996; Hser et al., 1994; National Center for Health Statistics, 2013; McKee and Weinberger, 2013; Kalman et al., 2010; Guydish et al., 2016; Sullivan and Covey, 2002; Lasser et al., 2000). In order to begin to address and counteract the specific consequences of smoking in this population, a clearer understanding of the current state of knowledge about the smoking behavior of adults with AUDs/SUDs is needed. The examination of epidemiologic research provides the opportunity to obtain detailed information on smoking behaviors of large community samples that have greater generalizability at the population level. Recent reviews of smoking and AUDs/SUDs have focused on specific smoking behaviors (e.g., smoking prevalence (Guydish et al., 2016), smoking cessation (Sullivan and Covey, 2002)), clinical samples (e.g., persons in treatment for AUDs/SUDs (Guydish et al., 2016), adolescents (Ramo et al., 2012)), and specific substances (e.g., marijuana (Ramo et al., 2012)). The purpose of this paper is to conduct the first systematic review of epidemiologic studies of smoking behavior and AUDs/SUDs. In addition, this review presents more comprehensive information on the relationship between smoking and AUDs/SUDs by including data on a range of smoking behaviors, age groups (e.g., adults, adolescents), and AUDs/SUDs. The specific aims of this paper are to review and synthesize the epidemiologic evidence on smoking behavior among persons with AUDs/ SUDs and to identify areas needing additional work.

2. Materials and methods

Papers for this review were identified though literature searches of Medline and PubMed using search terms related to epidemiologic research (e.g., "epidemiology", "nationally representative"), smoking ("smoking", "cigarettes", "tobacco", "nicotine"), and alcohol/substance use disorder (e.g., "alcohol use disorders", "substance use disorders", "drug use disorders"). Abstracts from these literature searchers were individually examined to determine whether they met the inclusion criteria. To be included in the review, the paper had to: (1) be published in English, (2) have a full text available, (3) analyze epidemiologic data (defined by the use of sampling procedures aimed at generating a representative sample from the geographic area of the study), and (4) examine smoking behavior in persons with AUDs/SUDs (defined as abuse and/or dependence). No limits were set related to publication date. Studies that examined alcohol or substance use or problematic use rather than an AUD or SUD (e.g., heavy use, binge drinking) and studies that examined alcohol or substance outcomes rather than smoking behavior outcomes (e.g., rates of AUDs or SUDs among persons who smoke) were excluded from the review. Information gathered from publications included the country, the area of sampling if the study did not recruit respondents from the entire country, sample size, and smoking behavior. Smoking behaviors included prevalences of current or lifetime smoking, nicotine dependence, quitting smoking outcomes, smoking initiation, quit attempts, and withdrawal symptoms. Data on the use of non-cigarette tobacco products was also gathered.

Medline and PubMed searches of the terms above yielded 2,312 results (617 abstracts from Medline and 1,695 abstracts from PubMed). These abstracts were individually reviewed by the authors. The major reasons for excluding studies were that they did not include samples of persons with AUDs and SUDs and they did not examine smoking behavior as an outcome. Additional publications were elicited from the reference lists of papers included in the review and supplementary searches conducted with terms for specific drugs of abuse (e.g., "alcohol", "cocaine", "stimulants", "heroin", "opiates"). In the end, 29 publications met all of the criteria to be included in the review. See Tables 1 and 2 for a summary of the study characteristics (Table 1) and assessed outcomes (Table 2). More than one study that used the same dataset could be included and datasets are listed in the tables along with the sample size for the analyses from each unique article. While most analyses of SUDs combined multiple substances, results from analyses conducted for a specific substance (e.g., cannabis use disorders) are also included when reported in the publications.

3. Results

3.1. Current and lifetime smoking among persons with AUDs/SUDs (Table 3)

3.1.1. Current and lifetime smoking

Fourteen studies were identified that examined current or lifetime smoking by AUD and/or SUD diagnosis (see Table 3): twelve studies of adults (Lasser et al., 2000; Degenhardt et al., 2001; Degenhardt and Hall, 2003; Agosti and Levin, 2009; Hickman et al., 2010; Lopez-Quintero et al., 2011a; Goodwin et al., 2013a; Peters et al., 2014; Smith et al., 2014a; Lawrence et al., 2009; Higgins et al., 2016; Redner et al., 2014) and two studies of adolescents (Fergusson et al., 1994; Goodwin et al., 2013b). The majority of studies ($n = 8$) were conducted in the U.S. with five of those studies using the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) dataset. For adults, current and lifetime smoking was consistently reported to be higher among adults with lifetime, past-year, and past-month AUDs, SUDs, and cannabis use disorders compared with other adults. While few studies examined smoking among adolescents with AUDs/SUDs, the results were similar to adult studies: SUDs were significantly associated with increased nicotine use among adolescents in Germany (Goodwin et al., 2013b) and alcohol abuse was significantly associated with higher levels daily cigarette smoking among adolescents, compared with those without alcohol abuse, in New Zealand (Fergusson et al., 1994).

3.1.2. Gender and age differences

Few studies examined the relationship between smoking and AUDs/SUDs by demographics. Smith et al. (2014a) and Higgins et al. (2016) were the only two studies that were identified as reporting analyses of smoking and AUDs/SUDs by demographics. Higgins et al. (2016) found no significant two-way interactions of AUD or SUD and smoking by gender, age, or race/ethnicity. Conversely, Smith et al.'s (2014a) analyses revealed a number of significant gender and age differences in the relationship between AUDs/SUDs and smoking. Overall, lifetime smoking was 2 to 3 times more common for women and men with current and lifetime AUDs/SUDs (63.1%–77.0%) compared to women and men with no AUD/SUD diagnosis (28.3%–37.5%). Men with past-year and lifetime AUDs were more likely to report lifetime smoking (65.1% and 65.3%) than women with past-year and lifetime AUDs (63.1% and 63.9%; $ps < 0.001$); these differences were statistically significant but not substantial in terms of percentages. Conversely, women with past-year and lifetime SUDs were more likely to report lifetime smoking (77.0% and 76.7%) than men with lifetime SUDs (74.9% and 74.6%, $ps < 0.001$), though the differences were again fairly small. Prevalences of current smoking were 2 to 4 times higher for women and men with current and lifetime AUDs/SUDs (38.1%–55.1%) compared to women and men with no diagnosis (13.8%–17.8%). With regard to current smoking, women with past-year AUDs (53.9%), lifetime AUDs (41.3%), and lifetime SUDs (55.1%) were more likely to report current smoking compared to men with past-year AUDs, lifetime AUDs, and lifetime SUDs (49.87%, 38.1%, and 52.8%; $ps < 0.001$). Conversely, no difference in current smoking was found among men and women with past-year SUDs (66.3% and 67.0%). Smoking was more common among women than men among those with current AUD/SUDs but there were no gender differences in lifetime smoking rates.

In Smith and colleagues' (Smith et al., 2014a) analyses of age-related differences, adults with past-year and lifetime AUDs and SUDs of all ages