COPD JOURNAL OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE

informa healthcare

COPD, 9:1–9, 2012
ISSN: 1541-2555 print / 1541-2563 online

DOI: 10.3109/15412555.2012.684414

ORIGINAL RESEARCH

Alcohol Use Predicts ER Visits in Individuals with Alpha-1 Antitrypsin Deficiency (AATD) Associated COPD

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Abstract

Excessive alcohol use in COPD has been associated with increased mortality; however, little is known about alcohol use in AATD-associated COPD. A total of 538 individuals with AATD-associated COPD completed questionnaires at baseline and 330 also completed 2 years of follow-up questionnaires. Demographic and health information was collected, including information about alcohol use, ER visits for COPD, and hospitalizations for COPD. Problem alcohol use was characterized using the CAGE screening questionnaire and recent alcohol consumption. Demographic and clinical characteristics associated with problem drinking were identified using logistic regression. Problem drinking at baseline was examined as a predictor of ER visits and hospital admissions for COPD in the subsequent two years using logistic regression adjusting for demographic variables and baseline health status. 14% of the sample reported a history of problem drinking per the CAGE and 8% reported problem drinking in the past week. Problem drinking was associated with higher education and greater lifetime tobacco exposure. Recent alcohol consumption was a significant predictor of having an ER visit for COPD in the subsequent two years. Compared to individuals who reported problem drinking in the past week, individuals with no consumption (OR = 0.32, 95% CI = 0.10 to 0.97, p = .043) and individuals with low-to-moderate consumption (OR = 0.25, 95% CI = 0.08 to 0.77, p = .016) had significantly lower odds of an ER visit. Neither measure of problem drinking predicted hospital admission. Screening for recent excessive alcohol use in this population may identify individuals at risk for use of costly emergency health services.

Introduction

COPD is the third-leading cause of death in the United States (1). The annual direct cost of COPD in the United States ranges from approximately 20 to 26 billion dollars (2), with visits to the emergency room making up a significant portion of this cost. It is important to identify potentially modifiable behaviors that place patients at a higher risk for emergency treatment so that practitioners can intervene during routine visits and reduce the need for emergency care.

Problem alcohol use is known to have negative consequences across a range of chronic medical illnesses (3). Several studies have examined the association between alcohol use and medical outcomes in COPD with mixed results. Consistent with the broader epidemiological literature, there is some

We thank Rebecca McClure, MLIS for her help recruiting participants for this study and Kimberly Meschede, BS for administrative assistance during the preparation of the manuscript.

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evidence that light to moderate alcohol use may be beneficial, while heavy alcohol consumption is harmful (4, 5). In one European study alcohol consumption was shown to have a U-shaped association with COPD-related mortality over a 20-year period (6, 7), suggesting protective effects of moderate drinking. Another study observed that heavy drinkers with COPD did have an increased risk of COPD exacerbation over the following 3½ years, although this effect was not independent of tobacco use (8).

Although there has been some attention paid to problem drinking (PD) and outcomes in COPD, little is known about PD in AATD-associated COPD. AATD is an autosomal co-dominant disorder that affects production of alpha-1 antitrypsin, a plasma protein with a range of biological actions including antiprotease activity (9). Individuals with AATD are at increased risk of lung and liver injury, with COPD being the most common health problem resulting from AATD (10). Understanding the impact of PD in AATD-associated COPD may be particularly important given the unique characteristics of this population, including elevated risk of liver disease. To date no published studies have focused on the risks of PD in AATD-associated COPD.

This study had three objectives: 1) document the prevalence of PD among individuals with AATD-associated COPD, 2) identify demographic and health-related characteristics associated with PD, and 3) determine whether PD increases risk of an ER visit and/or hospital admission for COPD in the subsequent two years. We utilized questionnaire data collected through the Alpha-1 Foundation Research Registry, which provided a unique opportunity to gather data in a large sample of patients. PD was characterized using the CAGE, a brief screening tool used to detect any personal history of harmful alcohol use.

Self-reported information about the number of alcoholic drinks that participants consumed in the past week was also available and we examined this information as a secondary measure. We hypothesized that PD would be associated with depression, anxiety, and lifetime tobacco exposure (11–13). We also hypothesized that individuals who reported PD at baseline would be at higher risk of having an ER visit and being admitted to the hospital for COPD in the subsequent two years than those without PD.

Methods

Sample and procedures

The protocol was approved by the IRBs at National Jewish Health (#2464) and the Medical University of South Carolina (#17831). All data were collected via de-identified questionnaires mailed to adult members of the Alpha-1 Foundation Research Registry who had physician-diagnosed COPD and resided in the United States or Canada. Data were collected as part of a larger study with the aim of examining behavioral and social factors that affect adjustment in AATD-associated COPD. Measures of alcohol use and health care utilization were included, but were not the primary focus of the initial study.

Baseline questionnaires were mailed to 1727 people and were returned by 621. To be included in the baseline analyses, respondents had to report having COPD and provide data for all correlates and at least one of the measures of alcohol use. First, 538 people qualified for baseline analyses. Follow-up data were collected each year for the subsequent two years by mailing questionnaires to all 621 individuals who had returned the baseline questionnaire. Then, 330 individuals returned both follow-up questionnaires and had complete data for all variables used in follow-up analyses. Figure 1 depicts recruitment flow.

Measures

Collected demographic information included age, sex, education, income, race, and ethnicity. Lifetime tobacco exposure in pack-years was calculated as average number of cigarette packs smoked per day times number of years smoked. Genotype was categorized as severely deficient (ZZ, SZ, FZ, P-Null, Z-Null, ZPlowell, ZMmalton, and ZMheerlen), not severely deficient (MZ, MS, M-Null, and SS), or unknown. Participants also reported whether they were current smokers, were currently using oxygen for COPD, and whether they had ever undergone augmentation therapy. Mental health was assessed via the Hospital Anxiety and Depression Scale (HADS), which was designed to measure depression and anxiety in medical outpatients (14) and has been used in COPD (15–18). Subscales for depression and anxiety range from 0 to 21, with higher scores indicating more symptoms.

Problem Drinking (PD)

The CAGE screening questionnaire was the primary measure of problem drinking. The CAGE consists of four questions designed to screen adults for any lifetime history of harmful or dependent alcohol use (19). Respondents indicate whether: 1) they have ever felt they ought to *C*ut down on drinking, 2) whether people have ever *A*nnoyed them by criticizing their drinking, 3) whether they have ever felt bad or *G*uilty about their drinking, and 4) whether they have ever had a drink first thing in the morning (i.e., *E*ye-opener) to steady their nerves or to get rid of a hangover. Each positive response was scored as a 1, and a score of 2 or higher on the CAGE was used as the cutoff for PD.

The number of drinks of alcohol that each respondent reported consuming in the past week was also available. We used the number of drinks in the past week compared to current guidelines as a secondary measure of problematic alcohol use. The measure was conceptualized as supplementary because the number of drinks in the past week represents a relatively brief observation period and is not a validated measure of problem

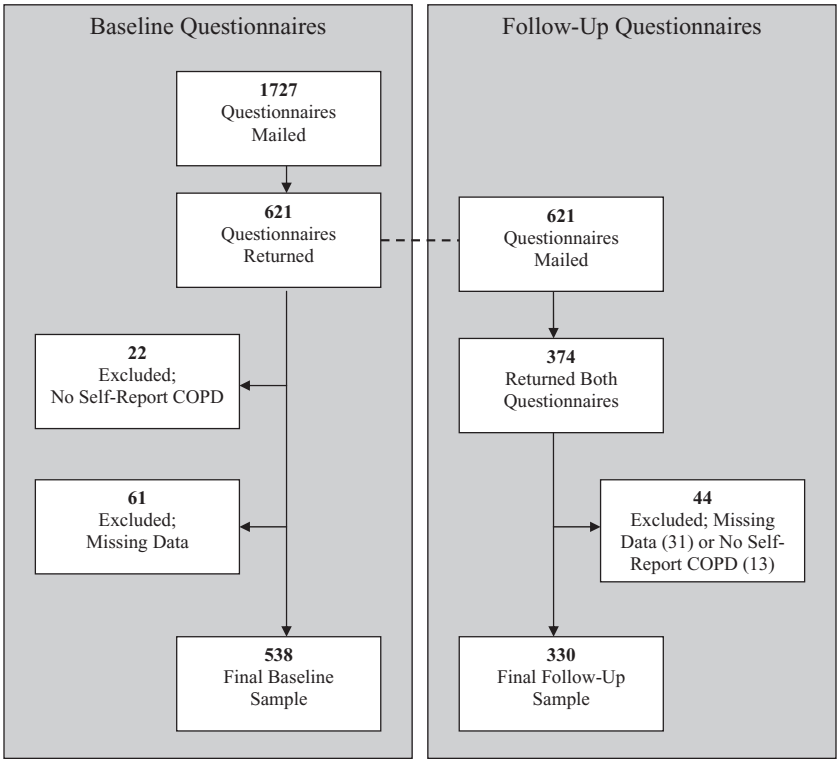

Figure 1. Recruitment flow diagram.

alcohol use. Importantly, in contrast to the CAGE which captures any lifetime history, the number of drinks in the past week represents recent behavior and thus was viewed as interesting additional information about participants' alcohol use.

A drink of alcohol was defined as 1 beer, 1 glass of wine, 1 wine cooler, 1 cocktail, or 1 shot of liquor. Cutoffs were created using the National Institute on Alcohol Abuse and Alcoholism definition of moderate alcohol use (i.e., 1 drink per day for women and 2 drinks per day for men) (20). Respondents who reported no drinks in the past week were categorized as non-drinkers. Low-to-moderate alcohol use was calculated as 1–7 drinks/week for women and 1–14 drinks/week for men. Women who reported ≥8 drinks/week and men who reported ≥15 drinks/week in the past week were defined as current heavy drinkers.

ER Visits and Hospitalizations

At baseline and in both follow-up questionnaires, participants were asked the following questions regarding health care utilization: 1) "How many times *in the past year* have you been to the emergency room for COPD?" and 2) "How many times *in the past year* have you been *admitted* to the hospital for COPD?" ER visits and hospital admissions were coded as none versus 1 or more.

Data analysis

SPSS Statistics Version 19 was used for all analyses, with a two-sided significance level of 0.05.

Primary analyses

For the first objective to examine the prevalence of PD, we calculated the number and percentage of participants meeting our criteria for problem alcohol use on the CAGE (i.e., score of ≥2). For the second objective, a simultaneous multiple logistic regression model was used to test which demographic and health-related characteristics were associated with PD at baseline on the CAGE. The independent variables entered into the model were: age, sex, education, tobacco exposure, alpha-1 genotype, oxygen use, history of augmentation therapy, depression, and anxiety. Independent variables were chosen *a priori* based on patient characteristics that seemed likely to be associated with PD. All independent variables were entered simultaneously.

For the third objective, two simultaneous multiple logistic regression models were used to test whether PD predicted ER visits for COPD and hospital admissions for COPD during the two-year follow-up. The models were adjusted for age, sex, education, tobacco exposure, alpha-1 genotype, oxygen use, history of augmentation therapy, ER visits for COPD in the year prior to baseline, and hospital admissions for COPD in the year prior to baseline. These covariates were chosen *a priori* based on patient characteristics that seemed likely to be associated with ER visits and hospital admissions. Again, all independent variables were entered simultaneously.

Secondary Analyses

We repeated the analyses described above using the secondary measure of current alcohol use based on

Table 1. Demographic and health characteristics of the sample at baseline (N = 538)

Variable	N (%)
Sex	
Male	271 (50.4)
Female	267 (49.6)
Highest Level of Education	
Grade 12 or less	155 (28.8)
College 1 to 3 years	203 (37.7)
College graduate or more	180 (33.5)
Annual Household Income	
$35,000 or less	157 (30.4)
Between $35,001 and $75,000	185 (35.9)
$75,001 or more	174 (33.7)
Race/ethnicity	
Caucasian non-Hispanic	527 (98.5)
Black non-Hispanic	2 (0.4)
Hispanic	4 (0.7)
Other	2 (0.4)
Lifetime Tobacco Exposure	
Never smoked	165 (30.7)
1 to 20 pack years	197 (36.6)
More than 20 pack years	176 (32.7)
Genotype	
Severely deficient	442 (82.2)
Not severely deficient	45 (8.4)
Unknown	51 (9.5)
Currently Using Oxygen for COPD	
Yes	276 (51.3)
Current Smoker	
Yes	13 (2.5)
Ever Undergone Augmentation Therapy	
Yes	417 (77.5)
CAGE Problem Drinking	
No	457 (86.2)
Yes	73 (13.8)
Recent Alcohol Consumption Classification	
No alcohol consumption in past week	264 (51.3)
Low-to-moderate alcohol consumption in past week	212 (41.2)
Heavy drinking in past week	39 (7.6)
Variable	**M (SD)**
Age	59.7 (9.8)
Symptoms of depression (HADS)	5.4 (3.6)
Symptoms of anxiety (HADS)	6.4 (4.1)

Note: all categories do not add to 538 due to missing data.

the number of alcoholic drinks participants reported consuming in the past week (i.e., non-drinkers, low-to-moderate drinkers, and heavy drinkers). For the multiple logistic regression model with problem drinking as the dependent variable, non-drinkers and low-to-moderate drinkers were used as a single combined category that was compared to current heavy drinkers.

Results

Demographic and health characteristics of the sample at baseline are presented in Table 1. Individuals in our follow-up sample did not differ from individuals who are only in our baseline sample with regard to sex, education, oxygen use, augmentation therapy, or the measures of problem drinking ($p > 0.05$). However, individuals who are only in our baseline sample (i.e., dropouts) were more likely to have had an ER visit in the year prior to baseline ($\chi^2_{(df=1)} = 5.59$, $p = .018$) and to have been hospitalized in the year prior to baseline ($\chi^2_{(df=1)} = 9.17$, $p = .002$). Age also differed ($t_{(df=552)} = 2.08$, $p = .038$), with younger individuals more likely to drop out of the study (mean age of dropouts is 58.8, compared to 60.5 for completers).

Prevalence of problem drinking (PD)

The prevalence of PD is presented in Table 1. Overall, 14% of respondents had a lifetime history of PD as identified with the CAGE. When our secondary measure of number of drinks in the past week was used to classify current alcohol use, 8% reported heavy drinking in the past week, 41% consumed a low-to-moderate amount of alcohol, and 51% of the sample had not consumed any alcohol in the past week. PD identified on the CAGE was associated with recent heavy drinking identified based on report of number of drinks in the past week ($\chi^2_{(df=2)} = 67.09$, $p < .001$). As expected given the different time references (i.e., lifetime history of problem drinking on the CAGE vs. the past week), there was not perfect concordance between the two measures; for example, among the individuals who reported a lifetime history of PD on the CAGE only 28% reported heavy drinking in the past week.

Primary analyses: Demographic and health-related characteristics associated with problem drinking

Table 2 presents results of the regression model to examine variables associated with PD identified on the CAGE at baseline. Higher educational attainment was associated with PD. For example, having a high school education or less (as compared to having a college degree) was associated with a 73% decrease in the odds of being classified as a problem drinker on the CAGE (OR = 0.27, 95% CI = 0.13 – 0.58, p = .001). Lifetime tobacco exposure was also associated with PD, with more tobacco exposure increasing the odds of having a history of PD. Male sex and symptoms of anxiety were associated with PD.

Primary analyses: Problem drinking as a predictor of ER visits and hospital admissions for COPD

During 2 years of follow-up, 26.1% of the sample reported at least one ER visit for COPD and 19.1% reported at

Table 2. Results of simultaneous multiple logistic regression models to predict problem drinking (N = 538)

	Primary Analysis (CAGE is Dependent Variable)		Secondary Analysis (Recent Alcohol Use Classification is Dependent Variable)	
	OR (95% CI for OR)	*p*	OR (95% CI for OR)	*p*
Age	0.97 (0.95 – 1.00)	0.086	0.98 (0.94 – 1.02)	0.271
Sex				
Male	Reference		Reference	
Female	0.44 (0.25 – 0.77)	0.004	1.69 (0.82 – 3.50)	.155
Highest Level of Education				
Grade 12 or less	0.27 (0.13 – 0.58)	0.001	0.17 (0.05 – 0.54)	0.003
College 1 to 3 years	0.53 (0.29 – 0.97)	0.039	0.63 (0.29 – 1.34)	0.227
College graduate or more	Reference		Reference	
Lifetime Tobacco Exposure				
Never smoked	Reference		Reference	
1 to 20 pack years	1.70 (0.81 – 3.57)	0.161	6.50 (1.81 – 23.37)	0.004
More than 20 pack years	2.39 (1.12 – 5.10)	0.024	6.73 (1.80 – 25.21)	0.005
Genotype				
Severely deficient	Reference		Reference	
Not severely deficient	0.63 (0.18 – 2.25)	0.474	0.36 (0.04 – 3.32)	0.371
Unknown	0.77 (0.30 – 1.99)	0.590	1.58 (0.54 – 4.64)	0.408
Using Oxygen for COPD				
No	Reference		Reference	
Yes	1.21 (0.67 – 2.19)	0.535	0.56 (0.26 – 1.23)	0.149
Augmentation Therapy				
No	Reference		Reference	
Yes	0.76 (0.35 – 1.63)	0.472	1.10 (0.43 – 2.84)	0.846
Symptoms of Depression	0.95 (0.86 – 1.05)	0.304	1.05 (0.93 – 1.19)	0.453
Symptoms of Anxiety	1.11 (1.02 – 1.21)	0.015	0.99 (0.89 – 1.11)	0.864

least one hospital admission for COPD. Table 3 presents results of the regression model to predict ER visits. Problem drinking as identified by the CAGE was not associated with ER visits during follow-up. In addition, problem drinking identified on the CAGE was not significantly associated with risk of hospital admission during follow-up.

Secondary analyses: Current drinking classification

We repeated the primary regression analyses described above using our secondary measure classifying current alcohol use based on number of drinks in the past week (i.e., no alcohol consumption, low-to-moderate consumption, heavy consumption). In the regression model to identify characteristics associated with current heavy drinking, higher educational attainment and greater lifetime tobacco exposure were associated with self-report of recent heavy drinking (see Table 2). This is similar to the findings using the CAGE. In the regression using current alcohol use to predict ER use (see Table 3), heavy drinkers were the reference group and therefore these individuals were compared to: 1) individuals who had not consumed any alcohol in the past week, and 2) individuals who had consumed a low-to-moderate amount of alcohol in the past week. Both of these groups had significantly reduced odds of an ER visit for COPD when compared to current heavy drinkers, with the lowest odds for individuals with low-to-moderate alcohol intake. Individuals who had not consumed any alcohol had a 68% decrease in odds of an ER visit for COPD (OR = 0.32, 95% CI = 0.10 – 0.97, p = 0.043). Individuals who had consumed a low-to-moderate amount of alcohol had a 75% decrease in odds of an ER visit for COPD (OR = 0.25, 95% CI = 0.08 – 0.77, p = 0.016). Number of drinks in the past week was not a significant predictor of hospital admission during follow-up.

Discussion

The current study is one of the first to focus on PD in patients with AATD-associated COPD. In our sample of 538 patients we found that 14% of the sample endorsed a lifetime history of PD on the CAGE screening questionnaire, and 8% had consumed more alcohol than recommended in the past week compared to national guidelines (20). Patients who reported a lifetime history of PD tended to be male, have higher education, greater lifetime tobacco exposure, and report more symptoms of anxiety. Although the association between education and PD was not anticipated, there is support in the epidemiology literature suggesting a positive relationship between higher socioeconomic status and educational achievement and alcohol abuse (21, 22).

Alcohol consumption in the week prior to baseline predicted ER visits for COPD over the next 2 years, but lifetime history of PD did not. Although recent alcohol consumption was considered a secondary measure in our analyses, it is logical that recent behavior has

Table 3. Results of simultaneous multiple logistic regression models to predict ER use (N = 330)

	Primary Analysis (CAGE is Predictor)		Secondary Analysis (Recent Alcohol Consumption Classification is Predictor)	
	OR (95% CI for OR)	*p*	OR (95% CI for OR)	*p*
CAGE Problem Drinking				
No	Reference		NOT IN MODEL	
Yes	1.81 (0.86 – 3.81)	0.118		
Recent Alcohol Consumption				
No consumption in past week			0.32 (0.10 – 0.97)	0.043
Low-to-moderate in past week	NOT IN MODEL		0.25 (0.08 – 0.77)	0.016
Problem drinking in past week			Reference	
Age	1.02 (0.99 – 1.05)	0.195	1.02 (0.99 – 1.05)	0.262
Sex				
Male	Reference		Reference	
Female	1.04 (0.59 – 1.86)	0.883	0.85 (0.46 – 1.55)	.589
Highest Level of Education				
Grade 12 or less	1.19 (0.56 – 2.56)	0.651	1.06 (0.48 – 2.35)	0.888
College 1 to 3 years	1.69 (0.84 – 3.41)	0.143	1.75 (0.86 – 3.57)	0.121
College graduate or more	Reference		Reference	
Lifetime Tobacco Exposure				
Never smoked	Reference		Reference	
1 to 20 pack years	1.72 (0.82 – 3.62)	0.152	1.81 (0.84 – 3.91)	0.132
More than 20 pack years	1.80 (0.81 – 3.99)	0.147	1.87 (0.82 – 4.26)	0.137
Genotype				
Severely deficient	Reference		Reference	
Not severely deficient	1.59 (0.47 – 5.43)	0.457	1.56 (0.45 – 5.36)	0.481
Unknown	1.78 (0.64 – 4.91)	0.267	1.43 (0.47 – 4.40)	0.529
Using Oxygen for COPD				
No	Reference		Reference	
Yes	2.09 (1.15 – 3.80)	0.016	2.00 (1.07 – 3.71)	0.029
Augmentation Therapy				
No	Reference		Reference	
Yes	1.74 (0.68 – 4.42)	0.246	1.60 (0.63 – 4.08)	0.321
ER Use Prior to Baseline				
None	Reference		Reference	
1 or more ER visits for COPD	7.38 (2.76 – 19.76)	< 0.001	7.64 (2.77 – 21.06)	< 0.001
Hospitalizations Prior to Baseline				
None	Reference		Reference	
1 or more hosp. for COPD	0.74 (0.24 – 2.27)	0.593	0.78 (0.25 – 2.47)	0.677

more of an impact than lifetime history. Although the two measures of PD were highly associated with each other, it appears as though the measure of recent alcohol consumption captures relevant information that is not captured by the CAGE and, in fact, only 28% of the individuals who reported a lifetime history of PD on the CAGE also reported heavy drinking in the past week. Results suggest that it may be more useful for physicians to inquire about recent alcohol use than lifetime history of alcohol use.

Individuals who had not consumed any alcohol in the past week had a 68% decrease in the odds of visiting the ER in the next two years than heavy drinkers. Individuals who had consumed a low-to-moderate amount of alcohol had a 75% decrease in their odds of an ER visit in the next two years relative to heavy drinkers. Thus, individuals with recent low-to-moderate alcohol consumption were least likely to visit the ER in the subsequent two years. This association was present after controlling for several demographic and health-related variables including lifetime tobacco exposure and past history of ER visits. Thus, although problem drinking and greater tobacco use were associated, the relationship between recent problem drinking and increased risk of a subsequent ER visit existed above and beyond the influence of tobacco use.

PD was not a significant predictor of hospital admission in our sample. It appears as though problem drinking leads patients to seek emergency health services at the ER, which is a behavioral choice of the patient, but their symptoms do not meet a threshold that would require inpatient hospital treatment.

Strengths of the study include the large sample size recruited from a nationwide disease registry and prospective study design. Using the disease registry we obtained a diverse sample of patients from a broad geographic area. Limitations of the study include the fact that the dataset was not originally designed to focus on the association between alcohol use, ER visits, and hospital

admissions. The CAGE screening questionnaire and number of alcoholic drinks in the past week were the measures of alcohol use that were available in the dataset. Although the CAGE is a very commonly employed measure of problematic alcohol use, it is brief and captures any lifetime history of potentially harmful or dependent alcohol use rather than determining current patterns of use or establishing substance use diagnoses. Classifying current alcohol consumption based on the number of alcoholic drinks consumed in the past week is not a validated measure, but it did allow us to examine recent patterns of use as they related to ER visits and hospitalizations. Several other measures of alcohol use could have been included (e.g., AUDIT, RAPS4).

Identifying the alcohol use measure that is most sensitive for use in COPD populations is an area for future study. Future research could also focus on creating a composite measure of past and current alcohol use to assess the impact of discrepancies between past and current use. For example, individuals who currently abstain from alcohol are likely a heterogeneous group with some who have historically chosen not to drink and others who have a history of PD and may be currently too ill to drink. In the sample we had available for follow-up analyses, only seven of the participants who had not consumed any alcohol in the week prior to baseline reported a lifetime history of PD on the CAGE.Thus, we did not have enough participants with highly discrepant past and current alcohol use to create a composite measure and investigate the impact of this discrepancy on healthcare utilization.

The fact that data were collected via de-identified questionnaires mailed to members of the Alpha-1 Foundation Research Registry allowed us to collect information about alcohol use among a large sample of geographically diverse patients; however, we were not able to gather objective measures of COPD severity, liver disease, or health care utilization from medical records. Our participants were asked to recall the number of ER visits and hospital admissions they had for COPD in the past year, which was a relatively low base-rate event for most individuals.Research is mixed regarding rates of agreement between self-reported health care utilization and objective medical records, with agreement varying under different circumstances. This research suggests that several aspects of our sample and our utilization measures (i.e., relatively young average age, outpatient vs. inpatients, focus on ER visits and hospitalization rather than general provider visits) would lead to more accurate patient reporting than other circumstances (23). One previous study in respiratory patients found that specific wording separating ER visits from hospital admissions is important to increase accuracy of report (24), which is consistent with our survey questions. There is also evidence of stronger agreement for contact utilization measures (i.e., whether contact occurred or not) than frequency of utilization (i.e., how many contacts occurred) (25). This suggests that our classification of ER visits and hospitalization based on the presence or absence of any reported event is likely the strongest way to examine the data that we do have regarding utilization. The prospective study design with yearly data collection likely also reduced the risk of bias from retrospective reporting, nonetheless, we cannot rule out that inaccuracy of patient reporting led to incorrectly classifying some participants.

Finally, our sample was reduced both from nonresponse to the original questionnaire and the follow-up questionnaires. Individuals who responded to the original questionnaire may not represent the entire population of individuals with AATD-associated COPD. Individuals who dropped out during the course of our study were more likely to have had an ER visit and to have been hospitalized in the year prior to baseline. Thus, dropouts may have had more severe illness and therefore limited our analyses to an investigation of the link between PD and ER visits/hospitalization among the more healthy members of our sample.

Past studies suggest a U-shaped association between alcohol consumption and mortality in COPD, with a protective effect of moderate drinking (6, 7). Consistent with this, in our sample the group with the lowest risk of visiting the ER for COPD during the two years of follow-up was the group of patients reporting low-to-moderate alcohol consumption at baseline. Our analyses focused on comparing heavy drinkers to patients who abstain from alcohol and those with low-to-moderate use, and our findings suggest that heavy drinking placed patients at elevated risk of an ER visit for COPD relative to the other two groups.

Detailed information about the underlying cause of ER visits for COPD was not available given the self-report nature of data collection. This information could have provided insight into the mechanisms linking heavy or problematic alcohol use and increased ER visits. It is possible that alcohol-induced immunosuppression of lung defenses leads heavy drinkers to have more COPD exacerbations than moderate drinkers or those who abstain from alcohol. Some support for this idea was published by Sisson and colleagues (26), who examined a large population-based sample of U.S. adults to examine the association between alcohol intake and odds of obstructive lung function. The authors found increased odds for an obstructive lung pattern on spirometry only in former heavy drinkers. In contrast, low-to-moderate alcohol intake was associated with better forced vital capacity and forced exhaled volume in 1 second in the absence of obstruction, consistent with reduced odds for lung restriction. Those with low-to-moderate alcohol intake had lower risk of congestive heart failure, diabetes, obesity, and lower markers of inflammation (white blood cell, fibrinogen, and C-reactive protein). This previously observed cardio- and immuno- protective effect of moderate alcohol intake might be a plausible mechanism underlying the lower risk of ER visits among low-to-moderate drinkers in our sample.

Importantly, our sample included only patients with AATD-associated COPD. Although we asked participants to report about COPD-associated ER visits, given the increased risk of liver damage among patients with AATD we cannot rule out the possibility that liver complications of heavy alcohol intake also contributed to increased ER visits in our sample. A previous study of participants in the Alpha-1 Foundation Research Registry found that those with advanced liver disease and viral hepatitis reported greater mean daily alcohol intake than those without advanced liver disease (27). Given the range of potential mechanisms linking heavy alcohol use in COPD and ER visits we would expect the association between problematic drinking and increased ER visits to extrapolate beyond AATD-associated COPD to the population of patients with COPD that is not due to AATD. Future studies including COPD patients with and without AATD that carefully document details of ER visits for COPD and pulmonary status will be essential to better understand the mechanisms linking problematic alcohol use and ER visits.

Conclusions

The current study provides several unique contributions to the literature. It is the first study to focus on problematic alcohol use in patients with AATD-associated COPD. We found that 14% of our sample was identified as having a history of problematic alcohol use on the CAGE screening questionnaire, and that at baseline 8% had consumed more alcohol than recommended in the past week compared to national guidelines (20). Second, individuals who reported problematic drinking in the week prior to baseline were more likely to have an ER visit for COPD in the subsequent 2 years than those who did not report problematic drinking. The observation that patients who reported low-to-moderate alcohol use in the week prior to baseline had a reduced risk of an ER visit for COPD during the subsequent two years relative to heavy drinkers and abstainers parallels the physiology literature suggesting a U-shaped association between alcohol intake and pulmonary function (6, 7).

The current study did not include information about mechanisms linking alcohol intake and ER visits; however, the findings suggest that future research examining the underlying causes of ER visits for COPD among individuals with problematic patterns of alcohol use will be important. Furthermore, screening for recent heavy alcohol use during routine health care appointments may identify individuals at risk for future ER visits and allow for interventions to reduce this risk factor.

Declaration of Interest

This work was supported by the National Institutes of Health (Grants F32HL083687, UL1RR025780); and the Alpha-1 Foundation. Dr. Hoth has received research grants from the National Institutes of Health. Dr. Ford has received research grants from the National Institutes of Health and Department of Defense. Dr. Sandhaus is the medical director for two not-for-profit organizations that support research and provide health management for the Alpha-1 Antitrypsin Deficiency community Dr. Strange has research grants, consultancies, and speakers bureau disclosures related to COPD, Alpha-1 Antitrypsin Deficiency, and other pulmonary diseases that do not influence the content of this manuscript. Dr. Wamboldt has received grant support from governmental and private foundations and his wife has received funding from pharmaceutical firms unrelated to the topic of this report. Dr. Holm has received research grants from the National Institutes of Health and the Alpha-1 Foundation. Drs. Hoth, Sandhaus, Wamboldt and Holm are employed by National Jewish Health. Drs. Ford and Strange are employed by the Medical University of South Carolina. This work was supported by the National Institutes of Health (Grants F32HL083687, UL1RR025780, K23HL091049, K23095658). The authors alone are responsible for the content and writing of the paper.

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