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Binge Drinking and Insomnia in Middle-aged and Older Adults: The Health and Retirement Study

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Abstract

Objective—Alcohol use in later life has been linked to poor sleep. However, the association between binge drinking, which is common among middle-aged and older adults, and insomnia has not been previously assessed.

Methods—We studied participants aged 50 and older (n=6,027) from the 2004 Health and Retirement Study who reported the number of days they had ≥4 drinks on one occasion in the prior three months. Participants also reported the frequency of four insomnia symptoms. Logistic regression analyses assessed the association between binge drinking frequency and insomnia.

Results—Overall, 32.5% of participants had ≥0 to ≤2 binge drinking days/week; and 3.6% had >2 binge drinking days/week. After adjusting for demographic variables, medical conditions, body mass index, and elevated depressive symptoms, participants who binged >2 days/week had a 64% greater odds of insomnia than non-binge drinkers (adjusted odds ratio [aOR]=1.64, 95% confidence interval [CI]=1.09-2.47, p=0.017). Participants reporting ≥0 to ≤2 binge days/week also had a 35% greater odds of insomnia than non-binge drinkers (aOR=1.35, 95% CI=1.15-1.59, p=0.001). When smoking was added to the regression model, these associations fell just below the level of significance.

Conclusions—Results suggest that binge drinking is associated with a greater risk of insomnia among adults aged 50 and older, though this relationship may be driven in part by current smoking behavior. The relatively high prevalence of both binge drinking and sleep complaints among middle-aged and older populations warrants further investigation into binge drinking as a potential cause of late-life insomnia.

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Contributors

Author SC designed the study with input from AS, and managed the literature searches and summaries of previous related work. Authors SC, CK, and PM undertook the statistical analysis with input from AS and RM. Author SC wrote the first draft of the manuscript and authors CK, PM, AS, and RM provided guidance and critical feedback to drafts. All authors contributed to and have approved the final manuscript.

Conflict of Interest

Author RM has received consulting fees from Lundbeck pharmaceuticals. All other authors declare that they have no conflicts of interest.

Keywords

Alcohol; Aging; Binge drinking; Insomnia

INTRODUCTION

According to the 2011 National Survey on Drug Use and Health (NSDUH), 51% of 60 to 64 year olds and 40% of those aged 65 or older drink alcohol (Substance Abuse and Mental Health Services Administration (SAMHSA), 2012a). Binge drinking, defined as “having five or more drinks on the same occasion on at least 1 day in the past 30 days”, is reported in the NSDUH by 23% of men and 9% of women aged 50 to 64, and 14% of men and 3% of women aged 65 or older (Blazer and Wu, 2009). Among binge drinkers, adults aged 65 or older binge drink more frequently than other age groups (averaging 5.5 episodes per month), followed by adults aged 45 to 64 (averaging 4.7 episodes per month) when binge drinking is defined as consuming 5 or more drinks (for men) or 4 or more drinks (for women) per occasion (Centers for Disease Control and Prevention (CDC), 2012). For older adults, a lower threshold (3 or 4 drinks for men and 2 or 3 for women on one occasion) has been used or recommended by some investigators (Blow, 1998; Moore et al., 2003; SAMHSA, 2012b).

Moderate alcohol consumption may be beneficial for cognition, subjective well-being and depressive symptoms in middle-aged and older adults (Lang et al., 2007), and has been associated with improvements in cardiovascular health, perceived health, and decreases in hospitalization in older women (Balsa et al., 2008). However, binge drinking is associated with many negative health outcomes, including accidents, alcohol poisoning, sexually transmitted diseases, high blood pressure, stroke and other cardiovascular diseases, liver disease, neurological damage, sexual dysfunction, and poor control of diabetes (CDC, 2010). The negative effects of binge drinking may be particularly problematic for older adults, who often have co-morbid medical conditions, such as heart disease or diabetes, and who use certain medications, particularly psychoactive medications (SAMHSA, 2012b). These medical conditions and medications, along with physiological changes that accompany age such as decreased body water and alcohol metabolism, make older adults more sensitive to the effects of alcohol (Blow, 1998).

While research has suggested that short-term (2-3 days), low-to-moderate alcohol consumption reduces the time it takes to fall asleep in non-dependent and non-chronic users (Roehrs et al., 1991; Stein and Friedmann, 2005), chronic alcohol dependence is associated with insomnia in the general adult population (Stein and Friedmann, 2005; Crum et al., 2004). Heavy alcohol consumption has been shown to be associated with sleep complaints among adult workers (Haario et al., 2013; Härmä et al., 1998; Tachibana et al., 1996) and male veterans (Fabsitz et al., 1997). Alcohol-dependent adults aged 55 and older have more disturbed sleep than alcoholics under age 55 or non-alcoholics of any age (Brower and Hall, 2001). Heavy drinking and binge drinking have been shown to be associated with subsequent insomnia symptoms among 40- to 60-year-old workers in Finland; baseline insomnia symptoms have been associated with subsequent heavy drinking, but not subsequent binge drinking (Haario et al., 2013). Furthermore, both heavy alcohol use and

sleep disturbances are associated with increased risks of cognitive decline or impairment (Chan et al., 2010; Cricco et al., 2001) and depression (Choi and DiNitto, 2011; Lee et al., 2013) in older populations. Cigarette smoking is also associated with both binge drinking (Kirchner et al., 2007) and insomnia (Brook et al., 2012). Given that heavy alcohol use is associated with sleep problems, and binge drinking is problematic in older samples, the effects of binge drinking may negatively affect sleep in middle-aged and older adults.

We aimed to extend the existing literature to a community-based sample of middle-aged and older adults by examining the association between the frequency of binge drinking and insomnia using data from the Health and Retirement Study. We hypothesized that, after adjusting for potential confounders, more frequent binge drinking would be associated with insomnia.

METHODS

Study

We performed a cross-sectional analysis of the 2004 wave (data collected from March 2004 through February 2005) of the Health and Retirement Study core data file (HRS; Health and Retirement Study website, 2013a). The HRS is a longitudinal population-based study of non-institutionalized Americans over age 50 conducted by the University of Michigan and sponsored by the National Institute on Aging (grant number U01AG009740). The HRS, which began in 1992 and has been conducted biannually since, collects information on economic well-being, labor force participation, health, and family status in adults from pre-retirement into retirement (HRS website, 2013b; Heeringa and Connor, 1995). HRS sample design and procedures have been reported in detail elsewhere (Heeringa and Connor, 1995).

Participants

HRS participants were selected using a multi-stage probability sampling design (HRS website, 2013b; Heeringa and Connor, 1995). The study oversampled African Americans, Hispanics, and residents of Florida, and provided sampling weights to account for the unequal probability of selection into the study (HRS website, 2013b; Heeringa and Connor, 1995). Additional details on the sample design have been described previously (HRS website, 2013b; Heeringa and Connor, 1995). In the 2004 HRS, 6,491 participants responded to the binge drinking question about their frequency of binge drinking episodes. Of these, we excluded 342 participants who were younger than 50 years, 25 with missing sleep data, and 97 with a sampling weight of zero (8 of whom were in a nursing home; 48 who were “not cohort-eligible”; and 41 who were “non-original sample member, not coupled with an original sample member”). Our final sample consisted of 6,027 adults. We compared our sample to those who were excluded to identify between-group differences. Included individuals were slightly younger, more educated, more likely to be White, male, married, and be normal or overweight, and less likely to have elevated depressive symptoms and all medical conditions except for cancer diagnoses than those excluded (all p 's < 0.001).

Measures

Binge drinking—Participants who answered “yes” to the initial prompt question, “Do you ever drink any alcoholic beverages such as beer, wine, or liquor?”, were asked an open-ended question about their frequency of binge drinking episodes: “In the last three months, on how many days have you had four or more drinks on one occasion?” Responses ranged from 0 to 92 binge drinking days in the last 3 months. To estimate participants’ weekly binge drinking frequency, we divided the reported number of binge drinking days by 12.9 weeks (which sums up to 90 days). Based on these reports, we categorized participants into the following categories: a) participants who reported no binge drinking days/week (0 binge days; reference group); b) participants whose average weekly consumption averaged >0 to 2 binge drinking days/week (that is, 1 to 25 binge drinking days in the last 3 months); and c) participants whose average weekly consumption averaged >2 binge drinking days/week (that is, 26 to 92 binge drinking days in the last 3 months). These groups are subsequently referred to as non-binge drinkers, occasional binge drinkers (>0 to 2 binge days/week), and frequent binge drinkers (>2 binge days/week), respectively.

Insomnia—Participants responded to four questions regarding frequency of insomnia symptoms: “How often do you have trouble falling asleep?”; “How often do you have trouble with waking up during the night?”; “How often do you have trouble with waking up too early and not being able to fall asleep again?”; and “How often do you feel really rested when you wake up in the morning?” Possible responses were “most of the time”, “sometimes” or “rarely or never”. Participants reporting any of the first three symptoms “most of the time” or the fourth symptom “sometimes” or “rarely or never” were categorized as having insomnia.

Depressive symptoms—Past-week depressive symptoms were assessed using an 8-item short form of the Center for Epidemiologic Studies Depression Scale (CES-D) (Radloff, 1977). Individuals endorsing 4 or more depressive symptoms “most of the time” in the past week were categorized as having elevated depressive symptoms, consistent with prior studies (Mojtabai and Olfson 2004; Steffick, 2000).

Covariates—Participants reported their age, gender, race (categorized in the HRS as White, Black, or other), educational level (which we categorized as less than high school, GED/high school diploma, some/completed college, or graduate degree), and marital status (which we dichotomized as married or other). We categorized body mass index (BMI) into four categories based on World Health Organization (2006) guidelines: underweight (BMI: <18.5), normal weight (BMI: 18.5-24.9), overweight (BMI: 25-29.9), or obese (BMI: ≥ 30). Additionally, participants reported prior or current medical conditions, including heart conditions, stroke, memory-related disease, hypertension, diabetes, cancer, arthritis, and pain, which were coded dichotomously (yes or no). Participants also indicated whether they were current smokers.

Statistical analysis

Contingency tables and Wald statistics were used to compare participant characteristics across binge drinking categories. To assess the association between binge drinking

frequency and the presence of insomnia, we then used multivariable logistic regression with presence of insomnia as the outcome and mean number of binge drinking days/week categories as the predictor of interest. We fit three separate models. Model I controlled for demographic characteristics, including age, gender, race, educational level, and marital status. Model II controlled for all variables in Model I as well as common health conditions associated with insomnia: heart conditions, stroke, memory-related disease, hypertension, diabetes, cancer, arthritis, pain, and elevated depressive symptoms. Finally, Model III controlled for all variables in Model II as well as current cigarette smoking. Individual-level survey weights were applied to all analyses to account for the unequal probability of participants' selection into the study (HRS website, 2013b, 2013c). Analyses also took account of clustering and stratification of the data. Because the HRS enrolled some participants' spouses, we performed a sensitivity analysis to investigate whether excluding the approximately 40% of the sample that shared a household with another participant affected results. There were no significant differences between results of our main analyses, which included participants from shared households, and the sensitivity analyses, which excluded participants from shared households. We, therefore, only report results of the main analyses below. Data were analyzed using Stata version 12SE (StataCorp, 2011).

RESULTS

The study sample ($n=6,027$) ranged in age from 50 to 106 (mean age=62.27). Participants were primarily male (58.4%), White (91.3%), married (68.9%), and had a high school diploma (50.4%) (Table 1). Participants were primarily overweight (42.3%), with 44.4% of participants reporting hypertension and 45.5% reporting arthritis. More than a quarter of participants reported pain (26.8%) and 17.1% reported a heart condition. Overall, 29.5% of the sample reported current smoking.

The majority (63.9%) of participants reported no binge drinking; 32.5% of participants reported occasional binge drinking; and 3.6% of participants reported frequent binge drinking. Men were more likely than women to report either occasional or frequent binge drinking. Among participants who were occasional binge drinkers or frequent binge drinkers, 74.4% and 86.9% were men, respectively. Smoking was reported by 22.8% of non-binge drinkers, 37.9% of occasional binge drinkers, and 51.6% of frequent binge drinkers. Occasional and frequent binge drinkers were more likely to be younger, male, less educated, obese or overweight, current cigarette smokers, and less likely to have had a heart condition, diabetes, cancer, or arthritis compared to non-binge drinkers (Table 1).

Overall, 37.6% of the sample reported insomnia. Almost half (48.1%) of the participants who reported frequent binge drinking reported insomnia, while 39.2% of the participants who reported occasional binge drinking and 36.3% of non-binge drinkers reported insomnia (Table 2). After adjustment for age, gender, race, education level, and marital status (Model I), individuals reporting frequent binge drinking had a 79% greater odds of reporting insomnia compared to non-binge drinkers (adjusted odds ratio [aOR]=1.79, 95% confidence interval [CI]=1.25-2.56, $p=0.002$). This association persisted after adjusting for health conditions and elevated depressive symptoms (Model II; aOR=1.64, 95% CI=1.09-2.47, $p=0.017$). When we added current cigarette smoking to the regression model, the association

fell just below the level of significance (Model III: aOR: 1.53, 95% CI=0.98-2.37, $p=0.059$). A similar pattern was observed for participants reporting occasional binge drinking who also had a greater odds of insomnia compared to non-binge drinkers in Model I (aOR=1.27, 95% CI=1.10-1.47, $p=0.002$) and Model II (aOR=1.35, 95% CI=1.15-1.59, $p=0.001$) (Table 2). Again, when current cigarette smoking was added to the regression model, the association fell just below the level of significance (Model III: aOR: 1.16, 95% CI=1.00-1.35, $p=0.055$).

DISCUSSION

In this cross-sectional study, we examined the association between the frequency of binge drinking and self-reported insomnia in a community-based sample of adult drinkers aged 50 and older. We found that occasional and frequent binge drinking among older adults in the last three months was associated with insomnia, after controlling for demographic characteristics, health conditions, and elevated depressive symptoms. When current cigarette smoking behavior was added to the regression model, the association between both categories of binge drinking frequency and insomnia fell just below the level of significance, suggesting that the association between binge drinking and insomnia may be driven in part by current smoking behavior. As prior research has found, smoking commonly occurs with binge drinking (Kirchner et al., 2007) and cigarette smokers are more likely to report sleep disturbances and insomnia than non-smokers (Brook et al., 2012; McNamara et al., 2013), though this has not been a consistent finding (Riedel et al., 2004).

Our findings from a sample of middle-aged and older drinkers build upon prior research which has found greater odds of insomnia among persons with chronic alcohol dependence compared to persons whose alcohol dependence remitted (Crum et al., 2004), as well as research suggesting that both chronic alcohol use (Stein and Friedmann, 2005) and heavy levels of alcohol consumption disturb sleep (Fabsitz et al., 1997; Haario et al., 2013; Härmä et al., 1998; Roehrs et al., 1991; Tachibana et al., 1996; Williams et al., 1983). Our study builds on this literature to include adults who report occasional and frequent binge drinking.

We found that the proportion of men who reported occasional or frequent binge drinking was larger than that of women. This extends previous research that reported a greater prevalence of alcohol use and binge drinking among men (Naimi et al., 2003) to include middle-aged and older adults. Though we had no information regarding whether participants with insomnia used alcohol to alleviate symptoms, alcohol use may be a form of self-medication for sleep difficulties (Stein and Friedmann 2005; Costa et al., 1996; Dufour et al., 1992), particularly among men (Johnson et al., 1998; Kaneita et al., 2007). Alcohol use as a sleep aid may be a behavior which clinicians can target in order to improve sleep quality among middle-aged and older adults; alternatively, the reduction of sleep difficulties in late life may reduce binge drinking. Indeed, non-pharmacological interventions should be employed as therapy for insomnia in older people (Morin et al., 2006). Behavioral and cognitive behavioral therapies for insomnia are effective among older adults, and are more effective than medications approved to treat insomnia in both the short- and long-term (Morin et al., 1999; Sivertsen et al., 2006).

As discussed previously, binge drinking among older adults may be more appropriately defined as 3 or 4 drinks on one occasion for men and 2 or 3 drinks on one occasion for women (Blow, 1998; Moore et al., 2003; SAMHSA, 2012b). Using these criteria, our finding that 36% of participants reported binge drinking in the previous 3 months may be a conservative estimate of the association between binge drinking (which was defined by the HRS as 4 or more drinks on one occasion) and insomnia. If a lower threshold of drinks on one occasion was used to define binge drinking, consistent with recommendations for older adults, the prevalence of binge drinking in the sample could have been larger. Future research needs to explore this possibility.

Several additional limitations should be noted. First, alternative dimensions used to define heavy alcohol use, such as the amount and frequency of consumption, and problem drinking were not assessed in the current analyses. An example of this could be to use Luy and Lee's (2012) criteria for heavy drinking: "drinking on one or more days a week and having three or more drinks per occasion for males, and two or more drinks per occasion for females" (p. 1385). As Haairo et al. (2013) suggest, heavy drinking and binge drinking are distinct drinking habits and may affect insomnia symptoms differently. Our overall aim was to improve our understanding of the relationship between binge drinking and insomnia; therefore, we did not include alcohol abstainers in our analyses, and instead focused on a sample of drinkers with different frequencies of binge drinking.

Further, as the time of day that participants consumed alcohol was not collected, we could not assess whether and how the timing of alcohol use affected sleep. Future research should explore whether and how the timing of binge drinking influences insomnia in middle-aged and older adults. Further, due to the cross-sectional design of the study, we are unable to assess temporal relationships between binge drinking days and insomnia. Not only does alcohol use and alcoholism result in poor sleep outcomes in late life, but alcohol problems in adulthood can be brought on by sleep disturbances (Ford and Kamerow, 1989). Given our findings of an association between binge drinking and insomnia, future studies should explore how changes in the average number of binge drinking days/week might affect reports of insomnia, and how changes in sleep disturbance may affect alcohol consumption over time. This study is also limited in that the insomnia symptoms studied may reflect different sleep disorders, such as obstructive sleep apnea. Previous research (Haario et al., 2013) has reported similar limitations. For example, feeling unrested may be related to insomnia and other sleep disorders such as obstructive sleep apnea. We did, however, adjust for age and BMI, two major risk factors for obstructive sleep apnea.

Finally, our community-based sample may not accurately represent clinical populations with an insomnia diagnosis, individuals receiving inpatient treatment for substance use disorders, or those affected by dementia or cognitive impairment (Blazer and Wu, 2009). Though there may be limitations to self-reported data, an individual's perceptions of his or her sleep and alcohol use are clinically important, so such data have great value (Steffick, 2000). Nonetheless, subjective measures are often in conflict with objectively estimated sleep variables (Reite et al., 1995; Tworoger et al., 2005). Studies are needed that examine associations between objective measures of sleep disturbance using actigraphy or polysomnography and binge drinking.

In summary, we found that among community-dwelling adult drinkers aged 50 and older, both occasional and frequent binge drinking were associated with self-reported insomnia symptoms. This finding builds on prior studies of the association between alcohol use and insomnia. However, smoking may account, at least in part, for this observation. Clinicians should be aware of the prevalence of binge drinking in late life and discuss the use of alcohol and cigarettes with their aging patients, particularly adults who report poor sleep. Insomnia may be a clinical symptom of problematic drinking behavior (Stein and Friedmann, 2005). Brief physician advice in community-based settings has been found to be beneficial in decreasing alcohol use by older adults (Fleming et al., 1999). Screening instruments and clinical vigilance may result in early detection and management of binge drinking in middle-aged and older adults.

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Key points (up to 4)

- We found that after accounting for demographic characteristics, medical conditions, BMI, and elevated depressive symptoms, binge drinking was associated with an increased odds of insomnia.
- Clinicians working with older adults should consider binge drinking as a potential contributor to, or outcome of, insomnia.

Table 1

Participant characteristics by category of binge drinking days/week; Health and Retirement Study, 2004

	Total Sample (N=6,027) Mean (SE) or N (%)	Binge Drinking per Week			p-value **
		0 (N=4,095) Mean (SE) or N (%) *	>0 to 2 (N=1,733) Mean (SE) or N (%) *	>2 (N=199) Mean (SE) or N (%) *	
Demographic					
Age in years, mean (SE)	62.27 (0.23)	63.99 (0.28)	59.17 (0.26)	59.73 (0.58)	<0.001
Gender					<0.001
Male	3,349 (58.4)	1,930 (48.6)	1,249 (74.4)	170 (86.9)	
Female	2,678 (41.6)	2,165 (51.4)	484 (25.6)	29 (13.2)	
Race					0.214
White	5,334 (91.3)	3,665 (92.2)	1,497 (89.9)	172 (88.7)	
Black	563 (6.4)	363 (6.0)	181 (7.1)	19 (6.3)	
Other	130 (2.4)	67 (1.9)	55 (3.0)	8 (5.1)	
Marital status					0.358
Married	4,185 (68.9)	2,829 (69.4)	1,224 (68.6)	132 (63.3)	
Other	1,842 (31.1)	1,266 (30.6)	509 (31.4)	67 (36.7)	
Education					<0.001
<High school	754 (9.9)	464 (9.1)	244 (10.6)	46 (19.6)	
GED/HS diploma	3,091 (50.4)	2,042 (48.3)	938 (54.1)	111 (54.9)	
Some/compl. college	1,366 (24.2)	980 (25.5)	361 (22.5)	25 (16.1)	
Graduate degree	816 (15.4)	609 (17.1)	190 (12.8)	17 (9.5)	
BMI					<0.001
Underweight	83 (1.2)	73 (1.5)	9 (0.6)	1 (0.3)	
Normal	2,137 (34.5)	1,562 (37.6)	509 (28.6)	66 (32.4)	
Overweight	2,509 (42.3)	1,622 (39.7)	799 (47.3)	88 (43.8)	
Obese	1,298 (22.0)	838 (21.2)	416 (23.5)	44 (23.5)	
Current smoker	1,068 (29.5)	527 (22.8)	456 (37.9)	85 (51.6)	<0.001
Health conditions ***					
Heart condition	1,193 (17.1)	860 (18.2)	303 (15.7)	30 (11.5)	0.009
Stroke	262 (3.5)	183 (3.6)	72 (3.3)	7 (3.2)	0.878
Memory-related disease	63 (1.0)	42 (0.9)	18 (1.0)	3 (2.5)	0.572
Hypertension	2,915 (44.4)	2,006 (44.8)	803 (42.8)	106 (51.4)	0.073
Diabetes	655 (9.7)	466 (10.5)	172 (8.4)	17 (6.7)	0.040
Cancer	830 (11.6)	608 (12.9)	202 (9.7)	20 (7.6)	0.007
Arthritis	3,071 (45.5)	2,194 (49.1)	785 (39.2)	92 (38.1)	<0.001
Pain	1,631 (26.8)	1,076 (26.1)	491 (27.7)	64 (31.1)	0.218
Elevated Depressive	580 (10.3)	370 (9.8)	179 (10.2)	31 (19.5)	0.051

* All percentages correspond to column totals, and are corrected to account for complex sampling design and unequal probabilities of participant selection.

** p-value corresponds to the Wald statistic corrected for the complex sampling design and unequal probabilities of participant selection.

***
Column percentages do not add up to 100% since participants with each health condition are compared to all other participants in the study. For example, individuals with a heart condition are compared to participants who never experienced a heart condition.

Table 2

Association between binge drinking days/week and insomnia; Health and Retirement Study, 2004

	Respondents with insomnia (%)	Model I[*] OR (95% CI)	Model II^{**} OR (95% CI)	Model III^{***} OR (95% CI)
Binge drinking				
0 days/week	36.3	(ref)	(ref)	(ref)
>0 to 2 days/week	39.2	1.27 (1.10, 1.47)	1.35 (1.15, 1.59)	1.16 (1.00, 1.35)
>2 days/week	48.1	1.79 (1.25, 2.56)	1.64 (1.09, 2.47)	1.53 (0.98, 2.37)

Note: N=6,027 for Model I; N=5,554 for Model II; and N=3,687 for Model III.

* Adjusted for age, gender, race, marital status, and education.

** Adjusted for same variables as Model I as well as BMI, heart conditions, stroke, memory-related disease, hypertension, diabetes, cancer, arthritis, pain, and elevated depressive symptoms.

*** Adjusted for same variables as Model II as well as current cigarette smoking. All odds ratios account for the complex survey design and are weighted.