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Insomnia in Alcohol Dependent Subjects is Associated with Greater Psychosocial Problem Severity

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Abstract

Introduction—Although psychosocial problems are commonly associated with both alcohol misuse and insomnia, very little is known about the combined effects of insomnia and current alcohol dependence on the severity of psychosocial problems. The present study evaluates whether the co-occurrence of insomnia and alcohol dependence is associated with greater psychosocial problem severity.

Methods—Alcohol dependent individuals (N=123) were evaluated prior to participation in a placebo-controlled medication trial. The Short Index of Problems (SIP), Addiction Severity Index (ASI), Insomnia Severity Index (ISI), and Time Line Follow Back (TLFB), were used to assess psychosocial, employment, and legal problems; insomnia symptoms; and alcohol consumption, respectively. Bivariate and multivariate analyses were used to evaluate the relations between insomnia and psychosocial problems.

Results—Subjects' mean age was 44 years (SD=10.3), 83% were male, and their SIP sub-scale scores approximated the median for normative data. A quarter of subjects reported no insomnia; 29% reported mild insomnia; and 45% reported moderate-severe insomnia. The insomnia groups did not differ on alcohol consumption measures. The ISI total score was associated with the SIP total scale score ($\beta=0.23$, $p=0.008$). Subjects with moderate-severe insomnia had significantly

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higher scores on the SIP total score, and on the social and impulse control sub-scales, and more ASI employment problems and conflicts with their spouses than others on the ASI.

Conclusion—In treatment-seeking alcohol dependent subjects, insomnia may increase alcohol-related adverse psychosocial consequences. Longitudinal studies are needed to clarify the relations between insomnia and psychosocial problems in these subjects.

Keywords

Alcoholism; psychosocial factors; insomnia; sleep initiation and maintenance disorders

1. Introduction

Alcohol dependence is defined as a maladaptive pattern of alcohol use, leading to significant impairment or distress. It is characterized by tolerance; withdrawal; alcohol use in larger quantities or over a longer time period than intended; repeated unsuccessful efforts to cut down or stop drinking; greater time dedicated to alcohol-related activities; continued alcohol use despite alcohol-related health problems, and interference with recreational, occupational or social activities (DSM-IV-TR, 2000). With the advent of DSM-5, alcohol abuse and dependence were replaced by Alcohol Use Disorder (AUD). The diagnosis of AUD is based on 11 diagnostic criteria: all criteria of alcohol dependence, three alcohol abuse criteria, and craving for alcohol (American Psychiatric Association. DSM-5 Task Force., 2013).

The psychosocial problems associated with alcohol dependence may take the form of marital or other interpersonal conflicts, abuse or neglect of a child, and absenteeism or other problems at work (Boden, Fergusson, & Horwood, 2013; Dube, et al., 2001; Miller-Tutzauer, Leonard, & Windle, 1991). These psychosocial problems may lead to loss of social supports, unemployment, and in extreme cases violence (Bastien, Vallieres, & Morin, 2004; Dube, et al., 2001; Harford & Muthen, 2001; Head, Stansfeld, & Siegrist, 2004; Zhang, Wieczorek, & Welte, 1997). The emotional reactions associated with these psychosocial problems may be anger, sorrow, worry, regret, guilt, and/or sleeplessness and they may manifest themselves as depressive, anxiety and/or insomnia disorders. Despite these negative consequences many alcohol dependent patients continue to drink actively which may be their way of self-medicating their psychiatric symptoms.

Drinking in the context of psychosocial problems and psychiatric symptoms may be explained by Conger's Tension Reduction (TR) Hypothesis. The TR Hypothesis states that psychological distress may be a trigger for alcohol consumption (Conger, 1956; Hodgson, Stockwell, & Rankin, 1979; Young, Oei, & Knight, 1990). Tension reduction has been implicated as contributing to pathological drinking in the context of work-family conflict (Frone & Russell, 1993), neighborhood problems (Hill & Angel, 2005), and economic problems (Pearlin & Radabaugh, 1976). Although prior studies of drinking have used anxiety and depressive symptoms to reflect psychological distress, insomnia [which may also be stress related (Spielman, Caruso, & Glovinsky, 1987), and is included on the Alcohol Effects Questionnaire (AEQ), which is used to assess Tension Reduction (Rohsenow, 1983)] has not been. Therefore, it is possible that stress precipitates insomnia, leading to greater anxiety and depressive symptoms, which could lead to psychosocial

problems. Pathological drinking could be used to cope with stress, insomnia, anxiety or depressive symptoms, and psychosocial problems.

Insomnia Disorder (as defined by the American Academy of Sleep Medicine) requires the presence of at least one of the following complaints: difficulty initiating sleep, difficulty maintaining sleep, or waking up earlier than desired. These symptoms are associated with at least one of following: fatigue or malaise, attention or memory problems, impairment of social or occupation or family or educational performance, mood disturbances, daytime sleepiness, behavioral problems, reduced motivation or energy, proneness for errors, and, concern or dissatisfaction with sleep. In addition to the above, these complaints must occur despite an adequate opportunity and circumstance for sleep and are present for most nights of the week for 3 or more months (AASM, 2014).

Insomnia has been associated with alcohol abuse in prior epidemiological studies (Ford & Kamerow, 1989; Weissman, Greenwald, Nino-Murcia, & Dement, 1997). The significance of insomnia in alcohol dependence lies in its widespread prevalence with estimates of prevalence ranging from 30-95%, depending on the sample investigated (Baekeland, Lundwall, Shanahan, & Kissin, 1974; Bokstrom & Balldin, 1992; Brower, Aldrich, Robinson, Zucker, & Greden, 2001; Caetano, Clark, & Greenfield, 1998; Cohn, Foster, & Peters, 2003; Escobar-Cordoba, Avila-Cadavid, & Cote-Menendez, 2009; Foster, Marshall, & Peters, 2000). These prevalence estimates are up to 9 times higher than in the general population (NIH, 2005). Insomnia has been reported in alcohol dependent subjects when drinking (Chakravorty, et al., 2013; Mello & Mendelson, 1970; Skoloda, Alterman, & Gottheil, 1979), during alcohol withdrawal (Bokstrom & Balldin, 1992; Caetano, et al., 1998; Escobar-Cordoba, et al., 2009), and during early recovery (Brower, et al., 2001; Drummond, Gillin, Smith, & DeModena, 1998; Foster, et al., 2000).

It is to be noted that insomnia has been independently associated with a variety of psychosocial problems as well. These symptoms have been associated with neurocognitive impairments and problems with impulse control which in turn contribute to psychosocial problems (Fortier-Brochu, Beaulieu-Bonneau, Ivers, & Morin, 2012; Ohayon, 2002; Paine, Gander, Harris, & Reid, 2004; Shochat, Cohen-Zion, & Tzischinsky, 2014; Simola, Liukkonen, Pitkaranta, Pirinen, & Aronen, 2012).

Thus, the above literature demonstrate that psychosocial problems are independently associated with active drinking in alcohol dependence and with insomnia. But insomnia and psychosocial problems are commonly comorbid in actively drinking alcohol dependent subjects. It is possible that insomnia and alcohol use disorder could interact to increase the number or severity of psychosocial problems especially in those seeking treatment (Miller, Tonigan, & Longabaugh, 1995; Moss, Chen, & Yi, 2010).

A recent study of alcohol-dependent subjects who were currently in treatment provided some initial data at this interface (Zhabenko, Wojnar, & Brower, 2012). Subjects with insomnia were significantly less satisfied by their current monetary situation, drank more frequently and consumed more alcoholic beverages, had higher scores on the SIP scales and total scores, had higher scores on the MAST (Michigan Alcoholism Screening Test) and

lower mental and physical composite scale scores on the SF-36 (Short Form 36-item) scale, and were more likely to report a history of childhood sexual or physical abuse than alcohol dependent subjects without insomnia. Subjects with insomnia also reported more alcohol-related problems, as reflected by the total score on the SIP (Short Index of Problems). A multivariable analysis showed that the SF-36 mental and physical composite scores, the number of prior drinking days, MAST score, and a history of physical and sexual abuse were significant correlates of insomnia. This study was unique in that it used multiple assessment scales in a Polish sample. However, no information was available on the specific psychosocial problems and the subjects were currently involved in treatment, which may have possibly led to some decrease in their psychosocial problems.

Accordingly, in the present study, we explored the relationship between insomnia and psychosocial problems in a sample of actively drinking alcohol dependent subjects who were recruited from an alcohol treatment setting. It was hypothesized that subjects with insomnia, as compared to those with subclinical insomnia or without insomnia, would have more severe psychosocial and other problems. Knowledge gained from these associations may help us to identify individuals at higher risk of recidivism and thus may aid in the development of a comprehensive treatment plan.

2. Methods

2.1 Design

The study is a secondary, cross-sectional analysis of pre-treatment data from a randomized, placebo-controlled, double blind trial of quetiapine treatment for alcohol dependence ([ClinicalTrials.gov](https://clinicaltrials.gov/ct2/show/study?term=NCT00674765) identifier # NCT00674765).

2.2 Setting

The study was conducted at the University of Pennsylvania's Treatment Research Center. The Institutional Review Board at the University of Pennsylvania approved the conduct of the study and all participants provided written, informed consent prior to enrollment.

2.3 Subjects

Subjects were recruited through advertisements in local print and electronic media, and through referrals from their outpatient treatment providers. Inclusion criteria were age 18-70 years, a current diagnosis of DSM-IV alcohol dependence, drinking to intoxication for 15 of the past 30 days, consumption of 10 standard drinks/drinking day (men) or 8 drinks/drinking day (women) over the past 30 days, an ability to abstain from alcohol for 3 consecutive days, and fluency in English. Subjects were excluded from the study if they had past-year dependence on another substance (excluding nicotine or marijuana); had a positive urine drug screen at initial screening; had an unstable/serious medical illness; had a diagnosis of current unstable or serious psychiatric conditions such as bipolar affective disorder, schizophrenia; had used psychotropic medication regularly within the last 2 weeks or needed immediate treatment with a psychotropic medication (with the exception of detoxification medications or diphenhydramine used sparingly for sleep); were pregnant or at a risk of becoming pregnant; or used any investigational drug within 30 days of

randomization. Participants were not compensated for completing the baseline assessments. The final sample for the analysis consisted of 123 participants for whom complete data were available.

2.4 Assessment Measures

2.4.a. Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I) (First, Spitzer, Gibbon, & Williams, November 2002)—The SCID-I is a structured interview used to diagnose DSM-IV psychiatric disorders. It was used at baseline to screen for current (i.e., past year) alcohol and drug use disorders and to assess a lifetime diagnosis of mania or psychotic disorder.

2.4.b. Insomnia Severity Index (ISI) (Bastien, Vallieres, & Morin, 2001; Morin, 1993)—This 7-item, validated, self-report questionnaire evaluates individual insomnia symptoms and the associated impairment or distress caused by the insomnia symptoms. These items include the following: 1) Difficulty Falling Asleep (DFA), 2) Difficulty Staying Asleep (DSA), 3) Early Morning Awakening (EMA), 4) Satisfaction/dissatisfaction with current sleep pattern (Satisfaction), 5) How noticeable to others do you think your sleep problem is in terms of impairing the quality of your life (Noticeable), 6) How worried/distressed are you about your current sleep problem (Distressed), 7) To what extent do you consider your sleep problem to interfere with your daily functioning (e.g., daytime fatigue, mood, ability to function at work/daily chores, concentration, memory, mood, etc.) currently (Interferes)? Each item was evaluated on a Likert scale with a range from 0-4, from “none” to “very severe” (for items 1-3), from “very satisfied” to “very dissatisfied” for item 4, and “not at all” to “very much” (for items 5-7). The ISI yields a total score of 0-28. The scores are interpreted as follows: 0-7 = absent (no) insomnia; 8-14 = mild (sub-threshold) insomnia; 15 = moderate to severe (clinically significant) insomnia. Cronbach's alpha for the ISI in this sample was 0.89.

2.4.c. Short Index of Problems (SIP-2R) (Alterman, Cacciola, Ivey, Habing, & Lynch, 2009; Feinn, Tennen, & Kranzler, 2003)—This validated 15-item questionnaire is an abbreviated version of the 45-item Drinker Inventory of Consequences (DrInC) (Miller, et al., 1995) and evaluates the adverse consequences of alcohol abuse in the last 3 months. Responses to each of the 15 questions are arrayed on a 4-point Likert scale ranging from 0-3, as follows: “never”, “once or a few times”, “once or twice a week”, “daily or almost daily.” The instrument separately evaluates these problems over the last 3 months (recent) and generates a global score, as well as 5 individual sub-scales (Physical, Social, Interpersonal, Intrapersonal and Impulse Control). Although the validation data of the SIP demonstrated a single factor solution (the SIP global score), 4 out of the 5 subscales provided unique variance to warrant independent interpretation (Feinn, et al., 2003). Therefore, we report here the results using the SIP total score and the individual subscales. The Cronbach's alpha for the SIP in this sample was 0.92.

2.4.d. Addiction Severity Index (ASI) (McLellan, et al., 1992)—This validated and widely used instrument comprehensively assesses the subject's substance-related problems across 7 domains to generate a clinical profile over the individual's lifetime, as well as for

the past 30 days. In this study, we used information from the following areas: general information (demographic information); employment/support and legal sections (psychosocial problems); drug/alcohol use (alcohol treatment history); psychiatric status sections (prior psychiatric treatment and history of suicidal ideation).

2.4.d. Timeline Follow-back interview (TLFB) (Sobell, Sobell, Leo, & Cancilla, 1988)—The TLFB interview assesses the number of standard alcoholic beverages consumed per day using a calendar format. We used it to assess drinking over the 90 days prior to entry into the study. Heavy drinking was defined as the consumption of 5 drinks per day in men and 4 drinks per day in women (NIAAA, 2012). We used TLFB data on the number of drinking days, drinks per day, drinks per drinking day, and heavy drinking days.

2.4.e. Hamilton Depression Rating Scale (HDRS) (Hamilton, 1967)—This validated, 24-item, interviewer-rated instrument evaluates the overall severity of depressive symptoms. Each item is evaluated on a 5-point scale ranging from “0” (absent) to “4” (severe), to yield a global score of 0-96. A global score of 7 denotes the absence of depressive disorder, 8-16 denotes a mild depressive disorder, 17-24 denotes a moderate depressive disorder, and 24 denotes a severe depressive disorder. (Zimmerman, Martinez, Young, Chelminski, & Dalrymple, 2013). Cronbach's alpha for the HDRS in this sample was 0.83.

2.4.f. Hamilton Anxiety Rating Scale (HARS) (Hamilton, 1959)—This validated, 14-item interviewer-rated instrument evaluates the overall severity of anxiety symptoms on a 5-point scale ranging from “0” (absent) to “4” (severe), to yield a global score of 0-56. A score of 17 denotes the presence of mild anxiety symptoms, 18-24 denotes mild-moderate symptoms; 25-30 denotes moderate-severe anxiety, and scores 30 denote severe anxiety symptoms. The Cronbach's alpha for the HARS in this sample was 0.81.

2.5. Statistical Analyses

Bivariate correlations among the variables ranged from 0.19-0.93 (Table 1), with the highest correlations being among the drinking variables. The SIP total score was moderately correlated with the ISI total, HAM-A, and HAM-D scores. The ISI total score was used to categorize insomnia status into the following groups: “absent” (0-7), “mild insomnia” (8-14), and, “moderate-severe” insomnia (15), as recommended (Bastien, et al., 2001). Multivariate Analysis of Variance (MANOVA) for continuous variables and Chi-square tests for categorical variables were used to evaluate group differences across insomnia severity categories for psychosocial problems, alcohol consumption and psychiatric symptoms. Post-hoc testing used Tukey's Honestly Significant Difference (HSD) test, as appropriate. Linear regression analysis was also used to evaluate the relationship between psychosocial problems (SIP total score) and insomnia (ISI total score).

Finally, the interaction of psychiatric symptoms $\times$ alcohol consumption on insomnia and its association with psychosocial problems was analyzed using different models. Here, the alcohol consumption variables included the number of drinking days, drinks per day, drinks

per drinking day, or heavy drinking days. The psychiatric variables included HDRS and HARS total scores. Individual insomnia items were excluded from the HDRS and HARS total scores to avoid collinearity and/or model evaluation problems.

3. Results

3.1 Baseline Demographics

As shown in Table 2, the only demographic difference between the insomnia sub-groups was on employment-related problems in the past 30 days. Subjects with moderate-severe insomnia reported more “extreme” employment-related problems.

3.2 Insomnia

The mean ISI score was 13.02 (SD=7.21). The distribution of the insomnia categories was as follows: Absent (N=31, 25.20%); Mild Insomnia (N=36, 29.27%); and Moderate-Severe Insomnia (N=56, 45.52%).

3.3 Alcohol Use

On average, subjects reported 15.7 (SD=8.8) drinks per day over the last 90 days. The only difference between the insomnia groups on any of the alcohol-related measures was on the number of heavy drinking days. Post-hoc testing showed that subjects with moderate-severe insomnia had a significantly higher number of heavy drinking days than those with mild insomnia ($p=0.043$). The reported “importance of addiction treatment” (from the ASI) scores increased across the categories, from no insomnia to moderate-severe insomnia. See Table 3. Post-hoc testing showed that subjects without insomnia had significantly lower scores than those with mild insomnia ($p=0.009$) or moderate-severe insomnia ($p=0.001$). Thus, subjects with insomnia, in comparison to those without, reported a higher need for addiction treatment.

3.4 Psychiatric Symptoms

The mean scores for the HARS and HDRS were 3.8 (SD=4.3), and 7.2 (SD=6.6), respectively. As expected, the following psychiatric characteristics increased across insomnia categories, from absent to moderate-severe insomnia: HARS total score, HDRS total score, severity of psychiatric problems, and lifetime prevalence of suicidal ideation. See Table 3.

Post-hoc tests showed the following: 1) for HARS, subjects with moderate-severe insomnia had significantly higher scores than those without insomnia ($p = 0.001$) and mild insomnia ($p = 0.011$); 2) for HDRS a similar picture was seen, such that those with moderate-severe insomnia had higher scores than those without insomnia ($p < 0.001$), and mild insomnia ($p = 0.001$); 3) patient rated psychiatric problems were significantly more in those with moderate to severe insomnia as compared to those with no insomnia ($p = 0.001$), and mild insomnia ($p = 0.018$). Thus, psychiatric symptoms were significantly higher in those with moderate to severe insomnia, in comparison to the other categories, across multiple assessment instruments.

3.5 Psychosocial problems

For the total sample, the SIP subscale scores were distributed around the median value (4th-7th deciles) of the normative data for alcohol dependent subjects (Miller, et al., 1995). The ISI total score was associated with the SIP total score ($\beta=0.23$, [95% CI: 0.10, 0.66], $p=0.008$). Individuals with moderate-severe insomnia had significantly higher scores than the other two insomnia categories for the SIP total score, as well as subscale scores for physical problems, social problems, and impulse control problems. See Table 4.

Post-hoc tests showed that the Physical Problems subscale score was significantly higher for subjects with moderate-severe insomnia than those without insomnia ($p = 0.010$). Subjects with moderate-severe insomnia, as compared to those with mild insomnia, had higher scores on the SIP total score ($p = 0.031$), as well as the sub-scale scores for Social Problems ($p = 0.050$), and Impulse Control ($p = 0.030$). In summary, those with moderate-severe insomnia demonstrated the highest scores on global psychosocial problems, and specifically for social and impulse control problems.

B) ASI—i) ASI-conflict. Subjects with moderate-severe insomnia had the highest scores for overall social problems, serious conflict with others over the past month, and lifetime conflicts with their mothers and spouses. Post-hoc tests showed that those with moderate-severe insomnia, as compared to mild insomnia, had significantly higher scores for patient-rated social problems ($p = 0.009$), and serious conflicts with others ($p = 0.021$). Employment problems over the past 30 days increased significantly across categories of increased severity of insomnia symptoms ($p=0.052$). There were no differences between the groups for prior physical or sexual abuse; ii) ASI-Legal. Subjects with mild insomnia had the highest prevalence of lifetime driving violations ($p=0.013$). Those without insomnia constituted the largest proportion of subjects on parole ($p=0.012$); iii) ASI-Satisfaction. There were no statistically significant group differences for these variables. See Table 4. Thus, a similar pattern involving those with moderate-severe category of insomnia was seen across different social situations. This category of subjects reported the highest overall social problems as well as serious conflict with others; they were more likely to have recent conflict with their spouses, and higher lifetime conflict with their mothers, yet they were less likely to have interaction with law-enforcement agencies.

3.6 Interaction of insomnia with other clinical variables and their association with psychosocial problems

The individual analyses of interactions involving drinking/depressive/anxiety variables on insomnia were not associated with the SIP total score.

4. Discussion

The present study investigated the association between insomnia and psychosocial problems from a qualitative and a quantitative perspective in a treatment-seeking sample of alcohol dependent subjects. Insomnia was reported by 75% of the subjects, and 61% of these subjects had insomnia that was moderate-severe in intensity (clinically significant

insomnia). Subjects with insomnia, as compared to those without, endorsed a higher need for addiction treatment.

Patients with moderate to severe insomnia (as compared to those with mild insomnia and those without insomnia) demonstrated the following differences: on the SIP, they reported the highest scores on social and impulse control problem scales, and the SIP total score; on the ASI, from a generalized perspective, they endorsed the highest scores on the overall social problems and serious conflict with others, and, specifically, they were more likely to have conflicts with their spouses over the last 30 days and higher lifetime conflict with their mothers. In addition, subjects with moderate-severe insomnia also had the highest scores on psychiatric symptoms severity on multiple instruments. Despite the higher intensity of the above symptoms, they were less likely to have interactional problems with law-enforcement agencies as compared to the other groups.

The 75% prevalence rate of insomnia in our sample of actively drinking subjects is consistent with a range of 30-95% reported by prior studies (Baekeland, et al., 1974; Bokstrom & Balldin, 1992; Caetano, et al., 1998; Escobar-Cordoba, et al., 2009; Foster, et al., 2000; Zhabenko, et al., 2012). Reasons for varying estimates of prevalence of insomnia in prior studies include the stage of alcohol dependence of the sample, e.g., during alcohol withdrawal (Bokstrom & Balldin, 1992; Caetano, et al., 1998; Escobar-Cordoba, et al., 2009) and early recovery (Brower, et al., 2001; Foster, et al., 2000), when estimates of the prevalence of insomnia may be higher than at other times. Variation in prevalence may also be a function of including alcohol dependent subjects from both inpatient and outpatient settings (Brower, et al., 2001; Escobar-Cordoba, et al., 2009; Zhabenko, et al., 2012). Subjects requiring inpatient treatment may have a greater severity of alcohol dependence, which may be associated with a greater severity of insomnia (Brower, et al., 2001; Cohn, et al., 2003; Zhabenko, et al., 2012).

Insomnia has been independently associated with psychosocial problems (Ohayon, 2002; Paine, et al., 2004). Our subjects with moderate-severe insomnia had higher intensities of psychosocial problems, and alcohol consumption, similar to the findings by Zhabenko and colleagues (Zhabenko, et al., 2012). These subjects also reported a higher severity of psychiatric symptoms and lifetime suicidal ideation. It is possible that insomnia and its associated symptoms of irritability and anxiety leading to psychosocial problems were being self-medicated with alcohol as postulated by Conger's Tension Reduction hypothesis. These factors could have led participants to seek treatment, as reflected by higher scores on the "need for addiction treatment" on the ASI. In addition to the above, another important reason for seeking treatment may have been suicidal ideation in the context of insomnia in these subjects (Chakravorty, et al., 2014; Klimkiewicz, et al., 2012) with or without psychosocial problems.

A lower prevalence of legal problems was reported in individuals with moderate-severe insomnia, as compared to the other insomnia categories. This unique finding occurred despite these subjects reporting higher psychiatric symptoms and psychosocial problems (including impulse control problems). One explanation for these findings may be because of the presence of daytime sleepiness in some of these subjects with moderate-severe insomnia.

Daytime sleepiness is one of the ramifications of insomnia, heavy drinking, and alcohol dependence (AASM, 2006; Ohayon, 2012; Penning, McKinney, & Verster, 2012; Zwyghuizen-Doorenbos, Roehrs, Lamphere, Zorick, & Roth, 1988). It is possible that the level of sleepiness is exaggerated in subjects with a short/inadequate sleep duration in the context of heavy alcohol consumption (Chaput, McNeil, Despres, Bouchard, & Tremblay, 2012; John, Meyer, Rumpf, & Hapke, 2005; Schuckit & Bernstein, 1981). Sleepiness has also been associated with neurobehavioral impairment (Dinges, et al., 1997). Therefore, it stands to reason that an exaggerated sleepiness in our subjects with moderate-severe insomnia may have increased mood and anxiety symptoms as well as increased psychosocial problems but deterred them from driving automobiles. The sleepiness may also have had a protective role against legal problems by markedly impairing neurobehavioral functioning as demonstrated in the healthy subjects previously (Roehrs, Zwyghuizen-Doorenbos, Timms, Zorick, & Roth, 1989; Yesavage & Leirer, 1986).

There are several limitations associated with this study that need to be considered, including a relatively small sample size, the lack of collateral data on psychosocial problems, exclusion of subjects on hypnotic or other psychiatric medications, and the cross-sectional nature of the study. Collateral data from friends, family or law enforcement agencies could provide more accurate information about the subjects' psychosocial function, as it is possible that some subjects under-reported their psychosocial problems. The exclusion of subjects who used hypnotic or other psychotropic medications is likely to have biased the sample to exclude subjects with more severe insomnia or insomnia comorbid with psychiatric disorders. Therefore, these results may not be representative of all treatment-seeking alcohol dependent subjects in the community. The focus on treatment-seeking patients limits our ability to generalize the findings to all alcohol dependent subjects in the community. The cross-sectional nature of the study prevented us from evaluating the cause-effect relationship between psychosocial problems and insomnia symptoms. Despite these limitations, this is one of the first studies to evaluate the relationship between insomnia and the psychosocial problems experienced in alcohol dependent subjects using validated instruments. Future studies should investigate these relationships using larger samples, with collateral information from close family members and friends and legal records, and using a longitudinal design. The use of real-time data collection by means of ecological momentary assessment methods would add a level of detail within subjects that could be helpful in understanding the relations among insomnia, drinking behavior, and psychosocial problems.

5. Conclusions

In actively drinking alcohol dependent subjects, the presence of insomnia was associated with recent psychosocial problems. Future studies should clarify this relationship between insomnia and psychosocial problems using longitudinal studies.

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Highlights

- Insomnia was prevalent in 75% of actively---drinking alcohol dependent subjects
- Those with moderate---severe insomnia had higher scores for most psychosocial problems
- They also reported having more employment problems and conflicts with their family
- Insomnia may aggravate psychosocial problems in alcohol dependent subjects

Table 1

Correlation matrix of the variables

Variable	SIP-total	ISI-total	HARS-total	HDRS-total	DD	DPD	DrPDD	HDD
SIP-total	-							
ISI-total	0.23 (0.008)	-						
HARS-total	0.21 (0.025)	0.38 (<0.001)	-					
HDRS-total	0.31 (0.001)	0.41 (<0.001)	0.80 (<0.001)	-				
DD	0.11 (0.239)	0.06 (0.463)	-0.11 (0.238)	-0.06 (0.481)	-			
DPD	0.002(0.986)	0.01 (0.893)	-0.03 (0.751)	0.04 (0.648)	0.48 (<0.001)	-		
DrPDD	-0.05 (0.591)	-0.03 (0.676)	-0.02(0.786)	0.05 (0.589)	0.16 (0.073)	0.93 (<0.001)	-	
HDD	0.10 (0.282)	0.12 (0.181)	-0.08 (0.344)	-0.05 (0.594)	0.94 (<0.001)	0.49 (<0.001)	0.19 (0.035)	-

Correlation matrix results in each cell report r (p); r = Pearson's Correlation coefficient; p = p value; SIP-total = Short Index of Problems total score; ISI-total = Insomnia Severity Index total score; HARS-total = Hamilton Anxiety Rating Scale total score (excluding insomnia item); HDRS-total = Hamilton Depression Rating Scale total score (excluding insomnia items); DD = Total Drinking Days in the Last 90 Days; DPD = Drinks per Day in the Last 90 Days; DrPDD = Drinks per Drinking Day; HDD = Number of Heavy Drinking Days.

Table 2

Demographic characteristics of the subjects

	Demographics	Total Sample (N=123)	Insomnia Status			p
			Absent (N=31)	Mild (N=36)	Moderate-Severe (N=56)	
Age	Years, mean (SD)	44.0(SD=10.3)	42.7(SD=10.5)	43.6(SD=11.6)	44.9 (SD=9.4)	0.624
Gender N (%)	Male	103 (83.7%)	28 (90.3%)	29 (80.5%)	46 (82.1%)	0.507
Marital Status N (%)	Married	21 (17.0%)	2 (6.4%)	5 (13.8%)	14 (25.0%)	0.325
Race N (%)	White	51 (41.8%)	9 (30.0%)	14 (38.8%)	28 (50.0%)	0.287
	Black	67 (54.9%)	21 (70.0%)	20 (55.5%)	26 (46.6%)	
	Other	4 (3.2%)	0 (0.0%)	2 (5.5%)	2 (3.5%)	
Education	Education in years, mean (SD)	13.4(SD=2.8)	13.1(SD=1.5)	13.0(SD=3.3)	13.8 (SD=3.0)	0.354
Profession Skills N (%)	Present	87 (71.1%)	20 (66.6%)	28 (77.7%)	39 (69.6%)	0.569
Employment N (%)	Full time Employment	74 (60.6%)	16 (53.3%)	21 (58.3%)	37(66.0%)	0.487
	Part time Employment	28 (22.9%)	7 (23.3%)	9 (25.0%)	12 (21.4%)	
	Other Employment	20 (16.3%)	7 (23.3%)	6 (16.6%)	7 (12.5%)	
Employment Problems N (%)	Not at all	66 (53.6%)	21(67.7%)	20 (55.5%)	25 (44.6%)	0.032
	Slightly	4 (3.2%)	1 (3.2%)	2(5.5%)	1 (1.7%)	
	Moderately	7 (5.6%)	0 (0.0%)	4(11.1%)	3 (5.3%)	
	Considerably	15 (12.2%)	6 (19.3%)	4 (11.1%)	5 (8.9%)	
	Extremely	31(25.2%)	3 (9.6%)	6(16.6%)	22 (39.2%)	
Most Time Spent With N (%)	Family	43 (35.2%)	13 (41.9%)	13 (36.1%)	17 (30.9%)	0.837
	Friends	28 (22.9%)	7 (22.5%)	7 (19.4%)	14 (25.4%)	
	Alone	51 (41.8%)	11 (35.4%)	16 (44.4%)	24 (43.6%)	
Financial Support N(%)	No	69 (56.0%)	21 (67.7%)	19 (52.7%)	29 (51.7%)	0.318

Table 3

Addiction and psychiatric status of participants across insomnia categories

Category	Sub-category	Total Sample (N=123) Mean (SD)	Insomnia Status			Statistic	p
Addiction							
TLFB	Number of drinking days (past 90 days)	75.5 (15.4)	74.5 (14.5)	71.3 (17.9)	78.8 (13.6)	F (2,105) = 2.4	0.094
	Drinks per day (past 90 days)	15.7 (8.8)	15.8 (7.6)	13.3 (7.3)	17.3 (10.1)	F (2,105) = 1.8	0.156
	Drinks per Drinking Day (past 90 days)	18.4 (8.5)	19.0 (7.9)	16.8 (7.3)	19.2 (9.46)	F (2,105) = 0.8	0.435
ASI	Number of Heavy Drinking Days (past 90 days)	74.1 (16.7)	71.5 (16.3)	69.4 (19.9)	78.5 (13.6)	F (2,105) = 3.3	0.037
	Lifetime alcohol use (in years)	18.9 (11.0)	18.0 (9.5)	19.0 (12.2)	19.3 (11.1)	F (2,105) = 0.1	0.884
	Alcohol used to intoxication (days in past mo. ⁴)	21.5 (6.8)	21.4 (7.4)	21.6 (6.6)	21.5 (6.7)	F (2,105) = 0.007	0.993
	Alcohol used to intoxication (years, lifetime)	18.6 (11.2)	18.0 (9.5)	19.4 (12.2)	18.4 (11.5)	F (2,105) = 0.1	0.890
	Longest alcohol abstinence (mo. ⁴)	10.9 (25.2)	18.1 (34.1)	9.6 (24.3)	8.0 (19.5)	F (2,105) = 1.4	0.242
	Importance of treatment now ¹	3.4 (1.0)	2.8 (1.6)	3.6 (0.7)	3.7 (0.7)	F (2,105) = 7.7	0.001
Psychiatric							
HARS	Anxiety (HARS Total Score)	3.8 (4.3)	1.7 (2.0)	2.8 (3.4)	5.6 (5.1)	F (2,105) = 8.8	< 0.001
HDRS	Depression (HDRS Total Score)	7.2 (6.6)	3.8 (3.8)	5.1 (4.5)	10.2 (7.5)	F (2,105) = 12.3	< 0.001
ASI	Severity of psychiatric problems (ASI) - mean (SD) ²	1.1 (1.8)	0.3 (0.7)	0.7 (2.3)	1.9 (1.7)	F (2,105) = 7.7	0.001
	Suicidal ideation-lifetime N (%)	18 (14.8%)	2 (6.6%)	3 (8.3%)	13 (23.6%)	χ^2 (2, 121) = 6.1	0.046
	Suicide attempts-lifetime N (%)	10 (8.2%)	1 (33.3%)	3 (8.3%)	6 (10.9%)	χ^2 (2, 121) = 1.4	0.480
	Use of psychotropic medications-lifetime N (%)	35 (28.9%)	6 (20.0%)	12 (33.3%)	17 (30.9%)	χ^2 (2, 121) = 1.6	0.448
	Trouble with violent impulses ³ -past mo. N (%)	5 (4.1%)	0 (0.0%)	3 (8.3%)	2 (3.6%)	χ^2 (2, 121) = 2.9	0.223
	Trouble with violent impulses ³ -lifetime N (%)	13 (10.7%)	1 (33.3%)	4 (11.1%)	8 (14.5%)	χ^2 (2, 121) = 2.5	0.279

Multivariate Analysis of Variance model statistics: F (26, 188) = 2.5, p < 0.001, Pillai's trace = 0.5.

TLFB = Timeline Follow Back measure; HARS = Hamilton Anxiety Rating Scale; HDRS = Hamilton Depression Rating Scale; ASI = Addiction Severity Index; SD = Standard Deviation, p = p values

¹ Responses were graded on a scale from 0-4, where "0" indicated "not at all," "1" indicated "slightly," "2" indicated "moderately," "3" indicated "considerably," and 4 indicated "extremely"² Severity of the problems was measured on a scale of 0-10 with 10 indicating most severe

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³ impulses = thoughts/behavior
⁴ mo. = month; Mod. = Sev. = Moderate – Severe

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Table 4
Psychosocial problems from the SIP and ASI for the total sample and across insomnia groups

Measure	Variable	Subcategory	Total Sample Mean (SD)	Insomnia Status					Statistic	p
				Absent	Mild		Mod-Severe			
					Mean (SD)	d	Mean (SD)	d		
SIP (past 3 months)	Physical Problems	-	4.9 (2.8)	3.8 (2.9)	4.6(2.8)	0.2	5.7 (2.6)	0.6	F (2, 119) = 4.8	0.010
	Social Problems	-	5.3 (2.9)	5.0 (3.0)	4.5(2.8)	-0.1	6.0 (2.8)	0.3	F (2, 119) = 3.0	0.050
	Intrapersonal Problems	-	5.9 (2.6)	5.3 (2.9)	5.5 (2.5)	0.07	6.5 (2.5)	0.4	F (2, 119) = 2.7	0.069
	Interpersonal Problems	-	4.2 (3.0)	4.2 (3.2)	3.7 (3.0)	-0.1	4.6 (3.0)	0.1	F (2, 119) = 0.8	0.445
	Impulse Controls	-	3.3 (2.3)	3.1 (2.2)	2.6 (1.9)	-0.2	3.9 (2.6)	0.3	F (2, 119) = 3.6	0.030
	SIP Total Score	-	23.8 (11.6)	21.5 (12.1)	21.1(10.6)	-0.03	26.8 (11.3)	0.4	F (2, 119) = 3.5	0.031
ASI- Conflict	Patient-rated social problems	Past 30 days	0.5 (1.2)	0.3 (1.0)	0.0 (0.5)	-0.3	0.8 (1.5)	0.3	F (2, 119) = 4.8	0.009
	Serious conflicts with others	Past 30 days	2.0 (6.5)	1.3 (4.2)	0.0 (0.3)	-0.4	3.8 (8.9)	0.3	F (2, 119) = 4.0	0.021
	Conflict with spouse N(%)	Past 30 days	14 (11.4%)	1 (3.2%)	1 (2.7%)		12 (21.8%)		χ^2 (4,122) = 11.0	0.026
	Patient-rated empl. problems	Past 30 days	10.0 (12.8)	6.5 (11.0)	8.3 (12.3)	0.1	13.0 (13.5)	0.5	F (2, 120) = 3.0	0.052
	Conflict with coworkers N(%)	Past 30 days	7 (5.7%)	1 (3.2%)	0 (0.0%)		6 (10.9%)		χ^2 (4, 121) = 13.9	0.237
	Conflict with spouse N(%)	Lifetime	50 (40.9%)	5 (16.6%)	20 (55.5%)		25 (45.4%)		χ^2 (4, 121) = 10.4	0.003
	Conflict with mother N(%)	Lifetime	33 (27.2%)	2 (6.6%)	11 (30.5%)		20 (36.3%)		χ^2 (4, 120) = 5.5	0.034
	Conflict with coworkers N(%)	Lifetime	21 (17.5%)	2 (6.8%)	5 (13.8%)		14 (25.4%)		χ^2 (4, 120) = 7.9	0.095
	Emotional abuse N(%)	Lifetime	35 (28.9%)	4 (13.3%)	12 (33.3%)		19 (34.5%)		χ^2 (2, 121) = 4.7	0.094
	Physical abuse N(%)	Lifetime	23 (19.0%)	4 (13.3%)	9 (25.0%)		10 (18.1%)		χ^2 (2, 121) = 1.5	0.474
	Sexual abuse N(%)	Lifetime	6 (4.9%)	1 (3.3%)	2 (5.5%)		3 (5.4%)		χ^2 (2, 121) = 0.2	0.894
	Driving violation/s N(%)	Lifetime	14 (11.4%)	3 (9.6%)	8 (22.2%)		3 (5.4%)		χ^2 (2, 122) = 19.3	0.013
ASI- Legal	Current parole/probation N(%)	Yes	7 (5.7%)	5 (16.1%)	0 (0.0%)		2 (3.6%)		χ^2 (2, 122) = 8.8	0.012
	Currently on trial N(%)	Yes	8 (6.5%)	3 (9.6%)	1 (2.7%)		4 (7.2%)		χ^2 (2, 122) = 1.4	0.502
ASI -Satisfaction	Current Marital Status N(%)	Yes	73 (59.8%)	17 (54.8%)	25 (69.4%)		31 (56.3%)		χ^2 (2, 122) = 4.8	0.303
	Current Living Situation N(%)	Yes	80 (65.5%)	22 (70.9%)	26 (72.2%)		32 (58.1%)		χ^2 (4, 122) = 4.7	0.314
	How free time is spent N(%)	Yes	92 (75.4%)	29 (93.5%)	26 (72.2%)		37 (67.2%)		χ^2 (4, 122) = 7.9	0.093

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Multivariate Analysis of Variance model statistics - $F(14, 228) = 1.9$, $p = 0.025$, Pillai's trace = 0.2, SIP – Short Index of Problems; ASI = Addiction Severity Index; SD = Standard Deviation, $p = p$ values;
 d = effect size (Cohen's d ; computed for both insomnia categories in comparison to Absent category)