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Psychological Factors Affecting Alcohol Use after Spinal Cord Injury

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Abstract

Objective—The purpose of this study is to assess risk factors, including personality and socioeconomic indicators, with alcohol use among persons with spinal cord injury.

Study Design—Cross-sectional

Setting—A large rehabilitation hospital in the southeastern United States

Methods—1,549 participants responded to a survey on outcomes after SCI. We used polychotomous logistic regression to assess the relationships of personality and socioeconomic factors with alcohol use.

Results—In this study population, 19.3% were heavy drinkers, 29.4% moderate, and 51.7% abstinent. Annual household income and education were both associated with heavy alcohol use, with persons with higher income or education more likely to be heavy drinkers. Impulsive sensation seeking, neuroticism/anxiety, and aggression/hostility were associated with increased odds of heavy drinking.

Conclusion—This study adds to the body of evidence indicating a substantial portion of individuals with SCI are heavy drinkers, and that personality and socioeconomic status are associated with heavy drinking.

Keywords

Spinal Cord Injuries; Alcohol Drinking; Personality; Socioeconomic Factors

Introduction

Heavy alcohol use after spinal cord injury (SCI) has been linked with serious outcomes, including pain, lower satisfaction with life,1 and mortality.2 In a community-based sample, alcohol abusers were more likely to perceive their overall health as worse, were more depressed, and experienced more stress in daily life than non-alcohol abusers.3 Heavy

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alcohol use has been linked to secondary conditions after SCI, including subsequent injuries[4] and pressure ulcers.[5] As there are serious consequences to alcohol abuse, it's important to identify pertinent risk factors to alcohol abuse after SCI.

Most studies that assess alcohol use after SCI utilize self-report interviews or surveys. A recent study using the CAGE from the Model SCI Systems found 14.2% were likely to have abused alcohol at some time.[1] In this study, they also assessed drinking similarly to the Behavioral Risk Factor Surveillance System (BRFSS) conducted by the Centers for Disease Control and Prevention. They found 15% reported binge drinking during the previous month, and 7.2% of participants who drank reported drinking on average 5 or more drinks per occasion. A community-based study, using the short version of the Michigan Alcohol Screening Test, found 21% of persons in their study met the criteria for alcohol abuse.[3] Kolakowsky-Haner and associates[6] used a version of the Quantity-Frequency-Variability Index and found 16.7% of persons seen at one Model SCI Systems Center (n=30) were heavy drinkers at one-year post-injury. Tate and associates[1] assessed risk factors for heavy drinking and found persons who were younger, single, male, and had less education were more likely to be heavy drinkers. They did not assess other environmental or psychological factors.

Measurement of personality has been structured in different ways, including the Big Five and the Alternative Five. The Big Five describe five basic dimensions of personality; openness, conscientiousness, extraversion, agreeableness, and neuroticism.[7] Zuckerman and associates[8] used factor analysis and developed an alternative five factor model (Zuckerman-Kuhlman Personality Questionnaire; ZKPQ) of personality. Their factors include: impulsive sensation seeking; neuroticism-anxiety; aggression-hostility; sociability; and activity.

The ZKPQ has been used in previous studies of drug and alcohol use. Among cocaine users, neuroticism-anxiety, impulsive sensation seeking, and aggression-hostility were related to drug abuse and addiction severity.[9] Zuckerman and associates[10] found impulsive sensation seeking, aggression-hostility, and sociability to be positively correlated with drinking among males and females; although, the correlation between impulsive sensation seeking and drinking was much higher for women than men. A relationship between impulsive sensation seeking and alcohol use has also been seen in a small (n=44) study of persons after SCI.[11] In addition to alcohol use, the ZKPQ has been associated with increased risk for injury after SCI.[4] Specifically, impulsive sensation seeking was associated with one or more injuries in the past year.

In addition to conceptual issues related to personality, alcohol misuse is an important parameter in the theoretical risk model of secondary conditions and mortality outlined by Krause.[12] According to the model, inclusion of psychological factors, such as personality and environmental factors, including socioeconomic status indicators as proxy variables, will significantly enhance prediction of health behaviors (alcohol use) beyond that of demographic/injury factors. Alcohol misuse is a type of risk behavior that could ultimately lead to an elevated risk of secondary conditions and mortality according to the model. Previous research has indicated general support for the model, particularly as related to each

of the risk components (health behaviors, psychological factors, and environmental factors) in the prediction of mortality.13, 14

The purpose of this study is to assess risk factors, including personality and socio-economic indicators, associated with alcohol use after SCI. We hypothesize: 1) persons with personalities higher in impulsive sensation seeking, aggression-hostility, sociability, and activity will be more likely to be heavy drinkers, and 2) persons with lower income/ education will be more likely to be heavy drinkers.

Methods

Participants

Participants were identified through a rehabilitation hospital in the Southeast United States. Survey inclusion criteria included: 1) 18 years or older, 2) at least one year post-injury and 3) residual impairment from their injury. Of 2,480 potential participants, 1,549 (62.5% response rate) persons participated. Of these, 75 reported no residual impairment from their injury, 1 completed the survey less than one year post-injury, and 38 did not have complete information on alcohol use, leaving 1,435 eligible participants.

We assessed differences between those with and without complete information on alcohol use. There were no significant differences by gender, injury severity, years post-injury, age at injury, or age at time of survey. Blacks were more likely to be missing information on alcohol use than whites (χ^2=6.84; p<0.001).

Procedures

This study was a follow-up to data collected from 1997–1998. Data collection for the current study was initiated in 2007 and completed in 2009. All who participated at baseline were contacted for this study, and additional participants were also contacted. Potential participants were sent an initial letter introducing them to the study and informing them of the forthcoming survey. The survey was then mailed, and two additional mailings were sent for non-respondents. Lastly, follow-up calls were made, and additional materials sent if requested. Remuneration was $50 for participation.

Statement of Ethics

We certify that all applicable institutional and governmental regulations concerning the ethical use of human volunteers were followed during the course of this research.

Measures

Three questions from the BRFSS were asked to assess alcohol use in the past month.15 Questions asked were: "During the past month, how many days per month did you drink any alcoholic beverages, such as, beer, wine, wine coolers, or liquor?"; "On the days when you drank, how many drinks per day did you drink on average?"; and "Considering all types of alcoholic beverages, how many times during the past month did you have 5 or more drinks on an occasion?" These questions were used to classify heavy drinking similar to the National Institute of Alcohol Abuse and Alcoholism (NIAAA) definition.16 Heavy drinking

was defined for men younger than 65 years as binge drinking and/or more than 14 drinks per week. Heavy drinking was defined for all women and for men over 65 years of age as binge drinking, having more than 7 drinks a week, and/or having more than 3 drinks per day. Moderate drinking was defined for men younger than 65 as up to 14 drinks a week and no episodes of binge drinking. Moderate drinking was defined for all women and for men over the age of 65 as up to 7 drinks per week, no episodes of binge drinking, and fewer than 3 drinks a day. Abstinent was defined as not drinking alcohol (for all men and women). We decided not to use the CAGE as the focus of this manuscript was on usage, whereas the CAGE reflects an individual's perception of their problem.

Personality was assessed at baseline using the ZKPQ,[8] a 99-item measure generating information on five scales. Impulsive sensation seeking was designed to measure lack of planning and tendency to act impulsively, and served as a proxy for reckless and dangerous behavior. Neuroticism-anxiety measures tension, worry, and fearfulness. Aggression-hostility reflects items that express rude, thoughtless, or antisocial behavior. Activity has items describing a need for high-energy activity, and sociability reflects social contacts and friends. The latter two scales served as proxies for protective behaviors required to develop needed support networks. The ZKPQ is a highly reliable instrument, with test-retest reliability ranging from .70 to .86.[8]

Education was categorized as less than high school, high school diploma or some college, and a bachelor's degree or more. Annual household income was categorized as less than $25,000; $25,000–$74,999; and $75,000 or more. Demographic variables were age, gender, and race. Injury severity was categorized as C1–C4, non-ambulatory; C5–C8, non-ambulatory; non-cervical, non-ambulatory; and ambulatory regardless of level.

Analyses

Descriptive statistics were calculated on all relevant variables. Our outcome, alcohol use, was categorized as: abstinent, moderate, or heavy drinking. We first examined relationships between the independent variables and outcome using χ^2 tests for categorical variables and ANOVA for continuous.

After the descriptive analyses, we conducted regression analyses. Since the outcome had three levels, we used polychotomous logistic regression for our multivariable modeling. A test for appropriateness of proportional odds showed the assumption to be unreasonable (χ^2=54.97, DF=13, p<.0001), thus we used a generalized logistics model for nominal responses. Variables with a significance of 0.15 or less in the preliminary analyses were considered for the multivariable model. All variables were entered simultaneously, and the least significant variables were removed from the model one at a time until all variables were significant (p<.05). Goodness of fit was assessed using the Hosmer-Lemeshow test [17] by assessing the fit of the two logistic models separately (Heavy vs. Abstinent, Moderate vs. Abstinent) and are described with the results.

Missingness

212 participants had one or more variables with missing data, and were excluded from the final analysis. Excluded participants were not associated with alcohol use, gender, or injury

severity. Persons who were missing information were older than those with complete information (t=−2.58, p<.05).

Results

Descriptive

Of those included in the analysis (n=1223), 74.2% were white and 73.8% male. The average age of respondents at follow-up was 44.8±13.3, with an average age at injury of 32.0±13.1 and average years since injury at follow-up of 18.6±6.4. 36.5% participants had a cervical injury and were not ambulatory. A total of 27.6% had at least a bachelor's degree, and 21.8% had an annual household income of $75,000 or greater.

Alcohol use patterns

Of participants, 48.7% reported drinking alcohol in the previous month. Of those reporting drinking, the average number of days of alcohol consumption during the previous month was 7.88.4, and the average number of drinks consumed per occasion was 2.5±2.0. Also, of persons who drank, 36.4% reported binge drinking at least once during the previous month. Using the criteria established by NIAAA16, 19.3% were heavy drinkers, 29.4% moderate drinkers, and 51.7% abstinent.

Modeling

There were significant differences in alcohol use by gender, injury severity, age at survey, and age at injury (Table 1). Persons with higher education and higher income were more likely to be moderate or heavy drinkers than persons with lower income or education. Four ZKPQ scales were significantly associated with drinking. Impulsive sensation seeking, aggression-hostility, and sociability were highest among heavy drinkers, whereas neuroticism-anxiety was highest among persons who were abstinent.

In the multivariable model, of the psychological variables, only impulsive sensation seeking, neuroticism-anxiety, and aggression-hostility were significantly associated with drinking (Table 2). The odds of heavy drinking increased 50% for each one standard deviation (SD) of impulsive sensation seeking, and the odds of moderate drinking increased 32% for each one SD of impulsive sensation seeking. Similarly, the odds of heavy drinking increased 53% for each SD of aggression-hostility. Neuroticism-anxiety was protective against both heavy and moderate drinking. Both environmental factors were predictive of drinking at follow-up. Persons with lower annual household income were less likely to be moderate or heavy drinkers than persons with high annual income (>$75,000). Similarly, persons with lower education were less likely to be heavy or moderate drinkers than persons with a bachelor's degree or higher. Of the demographic and injury characteristics, gender, injury severity, and age at survey remained significant, and age at injury was marginally significant (p=0.0560). Males were more likely to be heavy drinkers than females, and persons with more severe injuries were less likely to be heavy drinkers than persons who were ambulatory. Lastly, odds of heavy and moderate drinking decreased with increasing age.

Discussion

This study adds to evidence indicating a substantial portion of individuals with SCI are heavy drinkers,[1, 3] as we found 19.3% of the participants were heavy drinkers, slightly higher than the 17.0% found by Tate and associates[1] using the same NIAAA criteria. The unique aspect of this study was utilization of environmental and personality scores in prediction of alcohol behaviors after SCI.

Personality was highly related to alcohol use patterns. The most important characteristic was the impulsive sensation seeking scale which was significantly related with heavy drinking, even when controlling for all other factors. Additionally, aggression-hostility was significantly related to heavy drinking. In contrast, neuroticism-anxiety was associated with a greater likelihood of moderate drinking. It is not surprising that impulsive sensation seeking was related to heavy drinking, as this factor has been previously linked with increased risk behavior in persons with SCI.[4, 11] As many persons with SCI sustain their injury through risky behavior, it is not surprising that risky behavior continues even after the injury. Identification of persons who possess these personality traits early after SCI could result in more directed prevention strategies.

Our results were consistent with Krause's theoretical risk model.[12] His model predicts psychological and environmental factors (socioeconomic indicators are proxies for environmental factors) would be more immediate predictors of health behavior than demographic/injury factors. We found psychological and environmental factors added to the modeling of heavy drinking beyond the demographic/injury factors but did not mediate the relationship of demographic/injury variables with heavy alcohol use.

Additionally, results fit the rationale behind the personality scales, particularly the impulsive sensation seeking scale, which measures tendency to act impulsively (i.e. heavy drinking).[7] Consistent with our results, previous research using the ZKPQ showed impulsive sensation seeking to be positively correlated with drinking[10, 11] and as well as with drug abuse and addiction severity[9].

Our results showing a relationship between income and education with alcohol use are supported by previous research in the general population. Keyes and Hasin[18] found income was significantly positively related to hazardous alcohol use, and Hasin and associates[19] found persons with higher education and those with higher income were more likely to have an alcohol abuse disorder over a lifetime. However, these results are opposite from what was found by Tate et al. in a study of persons with SCI.[1] Other interesting findings included a lower risk of heavy drinking among those who had high level cervical injuries (non-ambulatory). Men were also more likely to report heavy drinking, whereas age was negatively associated with heavy drinking.

Limitations

Our data are self-report, and could be subject to recall bias. However, most of our questions were limited in scope to the previous year as to minimize recall bias. Additionally, a previous study of traumatic brain injury and alcohol use concluded that a participant's self-

reported alcohol use was concordant with what their relative reported about them.20 Second, we were limited in our measurement of SES and psychological factors, including only education, household income, and personality. Third, blacks were more likely to be missing data on the outcome than whites. This could affect findings regarding the relationship between race and alcohol use, which was non-significant. Fourth, we used a single measure of personality. Other measures, including the traditional big five characteristics, may provide additional insights.

Future Research

Future studies should expand the measurement of personality and psychological characteristics to explore further relationships with alcohol use post-SCI. Studies predictive of other substance misuse, such as illicit or prescription drug use would be beneficial. Combinations of more diverse psychological measures and behavioral measures will help us to better understand their relationship with health risk behavior.

Acknowledgements

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Table 1

Characteristics of persons by alcohol use.

Characteristic at baseline	N	Alcohol Use at Baseline			
		Heavy (n=236)	Moderate (n=360)	Abstinent (n=627)	p-value[*]
		Row Percents or mean (SD)			
Gender					
Female	321	21.2	29.3	49.6	0.0169
Male	902	14.02	29.91	56.07	
Race					
White	905	19.9	30.8	49.3	0.0938
Black	241	19.5	25.3	55.2	
Other	73	12.3	24.7	63.0	
Injury Severity					
C1–C4, Non-ambulatory	125	8.8	26.4	64.8	0.0127
C5–C8, Non-ambulatory	322	19.6	31.1	49.4	
NonC, Non-ambulatory	417	19.2	28.1	52.8	
Ambulatory	359	22.8	30.6	46.5	
Chronological Age	1223	39.7±12.6	43.3±12.7	47.5±13.1	<.0001
Age at Injury	1223	27.7±11.1	30.8±13.3	37.3±13.2	<.0001
Household income					
<$25,000	484	18.6	22.7	58.7	<.0001
$25,000–$74,999	472	17.4	29.5	53.2	
>$75,000	267	24.0	41.6	34.5	
Education Level					
< High School	166	19.8	13.9	66.3	<.0001
High School/Associates	719	18.5	26.5	54.9	
Bachelor +	338	20.7	43.2	36.1	
Employment					
Currently employed	327	22.9	40.4	35.8	<.0001
Employed post-inj (not curr)	270	22.6	32.2	45.2	
Not employed post-injury	620	15.3	22.6	62.1	

Characteristic at baseline		Alcohol Use at Baseline			
	N	Heavy (n=236)	Moderate (n=360)	Abstinent (n=627)	p-value [*]
ZKPQ					
Impulsive Sensation Seeking	1223	5.1±2.8	4.4±2.6	3.7±2.6	<.0001
Neuroticism-Anxiety	1223	2.7±2.6	2.2±2.5	2.9±2.6	0.0005
Aggression-Hostility	1223	4.9±2.7	3.6±2.6	3.5±2.7	<.0001
Activity	1185	4.9±2.9	4.8±2.8	4.7±2.7	0.5845
Sociability	1192	5.3±2.4	5.3±2.4	4.9±2.5	0.0212
Purpose in Life	1186	35.6±8.5	37.4±7.7	35.9±8.7	0.0102

[*] p-value from Chi-square test of association for categorical variables and from ANOVA test for continuous variables

Table 2

Crude and Adjusted Odds Ratios and 95% Confidence Intervals for Moderate and Heavy drinking at Baseline.*

Characteristic at baseline	Crude Odds Ratios (95%CI)		Adjusted Odds Ratios (95%CI)		p-value†
	Heavy	Moderate	Heavy	Moderate	
Gender (vs. female)					
Male	1.71 (1.18–2.47)	1.11 (0.83–1.48)	1.83 (1.21–2.79)	1.17 (0.84–1.63)	0.0178
Race (vs. White)					
Black	0.88 (0.60–1.27)	0.73 (0.52–1.03)	--	--	--
Other	0.49 (0.23–1.01)	0.63 (0.36–1.10)	--	--	--
Injury Severity (vs. Ambulatory)					
C1–C4, Non-ambulatory	0.27 (0.14–0.55)	0.62 (0.39–0.99)	0.21 (0.01–0.43)	0.52 (0.31–0.87)	0.0015
C5–C8, Non-ambulatory	0.81 (0.54–1.20)	0.96 (0.68–1.35)	0.64 (0.41–0.99)	0.87 (0.59–1.27)	
NonC, Non-ambulatory	0.74 (0.51–1.07)	0.81 (0.58–1.12)	0.62 (0.41–0.93)	0.74 (0.51–1.05)	
Chronological age	0.95 (0.94–0.97)	0.98 (0.97–0.99)	0.98 (0.96–0.99) *0.72***	0.98 (0.96–0.99) *0.74***	0.0106
Age at Injury	0.96 (0.95–0.97)	0.98 (0.97–0.99)	0.97 (0.95–0.99) *0.71***	0.99 (0.98–1.01) *0.92***	0.0560
Household income (vs. >$75,000)					
<$25,000	0.46 (0.31–0.68)	0.32 (0.23–0.46)	0.47 (0.29–0.75)	0.48 (0.32–0.72)	0.0015
$25,000–$74,999	0.47 (0.31–0.71)	0.46 (0.33–0.65)	0.49 (0.31–0.77)	0.56 (0.39–0.82)	
Education Level (vs. Bachelor +)					
< High School	0.52 (0.32–0.85)	0.18 (0.11–0.29)	0.49 (0.27–0.88)	0.23 (0.13–0.40)	<.0001
High School/Associates	0.59 (0.41–0.84)	0.40 (0.30–0.54)	0.53 (0.35–0.80)	0.46 (0.33–0.63)	
ZKPQ					

Characteristic at baseline	Crude Odds Ratios (95%CI)		Adjusted Odds Ratios (95%CI)		p-value[†]
	Heavy	Moderate	Heavy	Moderate	
Impulsive Sensation Seeking	1.23 (1.16–1.31)	1.11 (1.01–1.17)	1.17 (1.09–1.24) *1.50**	1.11 (1.06–1.17) *1.32**	<.0001
Neuroticism-Anxiety	0.98 (0.92–1.04)	0.90 (0.85–0.95)	0.94 (0.88–1.01) *0.85**	0.92 (0.86–0.97) *0.79**	0.0136
Aggression-Hostility	1.20 (1.13–1.26)	1.01 (0.96–1.06)	1.17 (1.09–1.25) *1.53**	1.03 (0.97–1.09) *1.08**	<.0001
Activity	1.03 (0.97–1.08)	1.02 (0.97–1.07)	--	--	--
Sociability	1.06 (1.00–1.13)	1.07 (1.02–1.31)	--	--	--
Purpose in Life	1.00 (0.98–1.01)	1.02 (1.01–1.04)	--	--	--

*
Hosmer-Lemeshow Goodness of Fit Test: chi-square=7.21, DF=8, p=0.5135 (Heavy); chi-square=11.13, DF=8, p=0.1946 (Moderate)

†
p-value from the multivariable logistic model.

**
Standardized Odds Ratios; standardized ORs are reported for 1 Std change in continuous variables.