

Blood alcohol concentrations at arrest and the subsequent diagnosis of alcohol dependence.

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Abstract

This study was conducted to determine the association between arrest blood alcohol concentration (BAC) and alcohol use disorders among convicted drunk driving offenders. We analyzed data from a 5-year follow-up study of offenders who initially reported to a court-ordered drunk driving screening program in Albuquerque, NM. The sample included 1184 subjects interviewed at follow-up: 45% were male, 36% non-Hispanic white, 47% Hispanic, 14% American Indian, and 3% belonged to other races. Subjects were interviewed using the Diagnostic Interview Schedule, which ascertains DSM-III-R diagnosis of alcohol abuse and dependence. If the age at onset of alcohol disorders was the same as or younger than the age at screening the person was classified as having alcohol abuse or dependence at the time of screening. Arrest BAC ranged from .01 to .45 (mean = .156). Alcohol dependence at screening was found for 58% of offenders with BAC < .15, 66% of offenders with BAC .15 to .19, and 72% of offenders with BACs of 0.20 or above ($p < .001$). The overall accuracy of BAC of .15 or higher and .20 or higher as a screening test for alcohol dependence ranged from .45 to .64. We conclude that although arrest BAC is associated with alcohol use disorders it provides limited utility as an objective indicator of alcohol dependence.

Introduction

Inaccuracy of self-report information provided during screening evaluations is a recognized problem in evaluating driving while impaired (DWI) offenders. Although a number of studies indicate that self-reports are a valid measure of substance abuse (Hesselbrock et al., 1983; Sobell et al., 1974; Polich, 1982; Sobell and Sobell, 1975; Sobell and Sobell, 1978), the implied coercive nature of the interviews and the threatening context in which the screening evaluations often occur may compromise the validity of the information gathered. For example, Chang and Lapham (1996) showed that DWI offenders attending a court-mandated screening program underreported their criminal histories--65% of DWI offenders with at least one previous criminal offense or traffic violation under-reported the extent of these offenses to counselors.

This study examines the efficacy of using blood alcohol concentration (BAC) at arrest as a screening test for alcohol dependence. Arrest BAC is appealing as an indicator of the amount of alcohol consumed prior to arrest because it is an objective physiological measure that cannot be disguised by the offender. Yet limited conclusions can be drawn from the arrest BAC. BAC decreases as alcohol is metabolized, and there is substantial individual variation in the amount of

alcohol absorbed and the rate at which alcohol is metabolized. Due to these uncertainties, the BAC, at best, can be used to estimate the minimum amount of alcohol consumed prior to the time it is measured, either as a blood level, or more commonly as the level of alcohol exhaled in the breath.

Several investigators have examined correlates of BAC with other criterion measures for alcohol use problems among DWI offenders. Previous studies conducted at our center determined that BAC was not highly correlated with test scores on alcoholism assessments (Lapham et al., 1995). Studies have also shown that high BACs are associated with DWI recidivism (Marowitz, 1998; Lapham et al., 1998). Another study showed that BAC was associated with DSM-III diagnosis and that it identified alcohol problems as well as three widely-used paper and pencil instruments (Lucker and Gold, 1995).

Other studies have concluded that BAC levels (.15 or above) are not a sensitive measure of alcohol-related problems (Gijsbers et al., 1991, Wiczorek et al., 1992). Nonetheless, very high BACs (.20 or above) may indicate behavioral or physiological tolerance to alcohol, a criterion for alcohol dependence (National Institute on Alcohol Abuse and Alcoholism, 1995). Therefore, it is reasonable to anticipate that a disproportionate number of DWI offenders with very high BACs at arrest may be alcohol dependent. The present study was conducted to determine the relationship between BAC at arrest and a retrospective diagnosis of alcohol dependence. This report compares the arrest BAC among DWI offenders referred for DWI screening with retrospective diagnoses of alcohol dependence ascertained during a follow-up study.

Materials and Methods

Study Population

The study population is a multiethnic cohort of convicted DWI offenders who participated in a follow-up interview five years after their initial referral for screening. Eligible subjects were those who initially reported to the Lovelace Comprehensive Screening Program (LCSP), Albuquerque, NM, from April 1989 through March 1992 and provided demographic information. Information obtained at screening included arrest BAC for those who completed a breath test prior to arrest. BAC at the time of arrest was determined by the CMI Intoxilyzer (NM Model 5000, CMI, Owensboro, Ky.). The purpose of screening was to determine the presence, and nature, of any alcohol-related problems (Lapham et al., 1995).

The sample selected included 1208 consecutive female offenders, and a sample of 1407 male offenders frequency-matched to females by same date of referral to screening and ethnicity, and drawn from all males referred for screening in the study period (Lapham et al., 1999a). About 80% were first offenders. Complete methods for locating and interviewing study participants are presented elsewhere (Lapham et al., 1999b). To summarize, subjects were selected weekly over a 36-month period corresponding to the subjects' 5-year anniversaries of their LCSP referral. The primary data source for locating clients was the LCSP database, but researchers also used other databases to track clients whose addresses and telephone numbers had changed since their enrollment in the LCSP program 5 years earlier. Interviewees were contacted and invited to participate and were paid to complete the interview process.

Of the 1208 females and 1407 males selected for the study, 81% were located. Identifying information for records of not-located subjects was sent to the National Death Index to match against death certificates filed in all states (excluding New York City). This index identified 18 deceased females and 38 deceased males. Of those located and not deceased 68% were interviewed (Lapham et al., 1999a).

The sample used in the present study includes 1184 of the 1396 interviewed subjects whose arrest BAC was known and with completed interviews. There were 116 cases with missing BAC values, 86 persons had refused to take the breath test, and 10 were missing other data.

Retrospective Alcohol Dependence Diagnosis

The diagnostic interview used for the study included a computerized version of the Diagnostic Interview Schedule (DIS)(1990) developed by Lee Robins and her colleagues (Robins et

al., 1981) for use in the Epidemiologic Catchment Area study. The DIS has been widely used and has been shown to have good to acceptable levels of validity and reliability when administered to general population samples (Robins et al., 1982, Warner et al., 1995, Helzer et al., 1985). The interview is highly structured and was designed for use by lay interviewers with no psychiatric clinical skills. The DIS determines symptomatology and diagnoses corresponding to the Diagnostic and Statistical Manual of Mental Disorders, Version-III-R (DSM-III-R) (American Psychiatric Association, 1987). Rates of lifetime alcohol abuse and dependence were assessed. If diagnostic criteria for alcohol abuse or dependence were met, age of onset, was obtained. To assess whether the subject had an alcohol abuse or dependence diagnosis at the time of the initial screening at the LCSP the age of onset of the diagnosis was compared to the age of the client when s/he was screened. If the age at onset was the same or younger as the age at screening then the person was classified with alcohol abuse or dependence at the time of screening.

Statistical Methods

Standard statistical tests included chi-square analysis for cross-tabulations and Somers D, to test the relationship of alcohol diagnosis as a dependent variable and BAC group as an independent variable. Sensitivity, specificity, predictive value positive and negative, and overall accuracy for ascertaining alcohol dependence were calculated for BAC classifications .15 and above and .20 and above.

Results

Sixty percent of subjects were under age 30 when interviewed at initial screening (Table 1). BAC values at the time of arrest ranged from .01 to .45 with a mean of .156 (.159 for males and .154 for females).

Table 1. Characteristics of Offenders at Initial Screening (N=1,184).

	N	Percent
Age:		
Under 20 years	86	7.3
20-29	622	52.5
30-39	298	25.2
40+	178	15.0
Race/Ethnicity:		
Non-Hispanic White	426	36.0
Hispanic	558	47.1
American Indian	166	14.0
Other	34	2.9
Arrest BAC (mg %)		
Less than 0.10	38	3.2
0.10–0.14	471	39.8
0.15–0.19	477	40.3
0.20–0.24	162	13.7
0.250 or more	36	3.0

A higher proportion of offenders under 20 years of age had BACs less than .15 compared to older age groups (55% versus 42%, p=.02). However, overall there was a small but statistically significant negative correlation between BAC and age (Spearman r=-0.059, p=0.04). The proportion of offenders with BACs above .15 were 58.7% for Non-Hispanic whites, 51.1% for Hispanics, 71.7% for American Indians, and 61.8% for those of other ethnicities (p < .001).

The study sample included 654 females and 530 males. Males had higher rates of alcohol dependence (67.4%) than females (57.8%, p< .001). Offenders under age 30 had higher rates of alcohol dependence (65.1%) than offenders over age 30 (57.6%). Alcohol dependence was found

among 71.6% of non-Hispanic whites, 54.7% of Hispanics, 60.2% of American Indians, and 73.5% of other ethnicities.

Table 2 demonstrates the relationship between alcohol diagnoses and BAC group for three drunk driver populations. In the LCSP sample and the population described by Lucker and Gold (1995) there is a strong positive relationship of increasing BAC and higher severity of alcohol-related problems. This was not the case in the third population (Wieczorek et al., 1992).

Study Population	<.15		.15-.19		.20+		Total		Somers's D*
	N	(%)	N	(%)	N	(%)	N	(%)	
LCSP									
No Diagnosis	100	(19.6)	72	(15.1)	18	(9.1)	190	(16.0)	
Abuse	122	(24.0)	95	(19.9)	42	(21.2)	259	(21.9)	.098
Dependence	287	(56.4)	310	(65.0)	138	(69.7)	735	(62.1)	(p <.001)
Lucker & Gold									
No Diagnosis	111	(20.6)	42	(8.7)	3	(1.1)	156	(12.2)	
Abuse	254	(47.1)	231	(47.8)	72	(27.6)	557	(43.4)	.272
Dependence	174	(32.3)	210	(43.5)	186	(71.3)	570	(44.4)	(p <.001)
Wieczorek et al.									
No Diagnosis	16	(29.1)	15	(19.2)	21	(21.6)	52	(22.6)	
Abuse	36	(65.5)	47	(60.3)	60	(61.9)	143	(62.2)	.073
Dependence	3	(5.4)	16	(20.5)	16	(16.5)	35	(15.2)	(p = .16)

* Somers's D is based on diagnosis as the dependent variable and BAC as the independent variable.

The efficiencies of BAC categories for detecting alcohol dependence in the LCSP and other DWI offender populations are shown in Table 3. The overall accuracy is the proportion of offenders correctly classified. Among all the studies the highest overall accuracy was .64. In the LCSP population the overall accuracy of various demographic subgroups was calculated separately for the .15 or above and the .20 or above categories. Among males the overall accuracy was .55 and .41, respectively. For females it was .58 and .48. For offenders aged under 30 at screening the accuracy was .55 and .40, respectively, compared with .59 and .51, respectively, for offenders over age 30. Among the ethnic groups the overall accuracy was equally low, ranging from .38 to .59.

	LCSP (N=1184)		Lucker & Gold (N=1283)		Wieczorek et al. (N=235)	
	.15+	.20+	.15+	.20+	.15+	.20+
Sensitivity	.61	.18	.69	.33	.91	.46
Specificity	.49	.87	.51	.90	.27	.58
Positive predictive value	.66	.70	.53	.71	.18	.16
Negative predictive value	.44	.39	.68	.62	.95	.86
Overall Accuracy	.57	.45	.59	.64	.37	.57

Discussion

Our study, while demonstrating that higher rates of alcohol dependence are found among individuals with higher BACs, also shows that arrest BAC is not particularly efficient as a screening tool. Alcohol dependence was diagnosed in 56% of offenders in the lowest BAC category and 70% in the highest category, a 13% difference. At the same time, the overall accuracy of BAC was below .65 using cut-off points of .15 and above and .20 and above.

The percent of offenders in the LCSP population with alcohol dependence was very high--nearly two-thirds of all offenders. This rate is higher than what was found in the other two offender populations. Possible explanations for this difference include use of different diagnostic criteria

(DSM-II-R vs. DSM-III), the circumstances surrounding the interview (i.e. whether the offenders were in a court-ordered program), differences among the populations studied, or other factors. The arrest BAC and the diagnosis of alcohol dependence varied among the ethnic groups. These findings merit further study.

Our findings with respect to the association between BAC category and diagnosis are consistent with those of Lucker and Gold (1995) but diverge from those of Wiczorek and colleagues (1992). The population in the latter study may not be comparable to the study population in the present report as it had many fewer offenders (235), did not report demographic information such as gender and race, and involved offenders who had been specifically referred because of alcohol problems, such as repeat DWI offenses and high levels of BAC. With respect to overall efficiency of BAC categories all three studies found relatively low overall accuracy, although the predictive value varied among the three populations.

The major limitation of this study is the method of ascertaining the retrospective diagnosis. Diagnoses were based on the results of one structured interview conducted by lay interviewers and ascertained 5 years after subjects were screened. Retrospective diagnoses may not be accurate as they rely on the subjects' ability to recall the age at which they experienced alcohol-related problems. However, since the follow-up study was unrelated to the court or sentencing and subjects were paid volunteers, this probably reduced the level of dissimulation and encouraged honest reporting.

In conclusion, high arrest BACs, while associated with higher prevalences of alcohol use disorders, do not provide sufficient overall accuracy to be useful in classifying offenders as alcohol dependent. With rates of alcohol diagnoses as high as reported in the LCSP population, the most important challenge may not be to find better screening tools in this population but rather to develop more effective interventions for alcohol-impaired offenders.

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