

# Risks associated with alcohol-positive status among adolescents in the emergency department: A matched case-control study

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**Objective:** The purpose of this study was to examine alcohol use, alcohol-related problems, other risk-taking behaviors, and parental monitoring in adolescents who tested positive for alcohol in an emergency department.

**Study design:** A matched case-control design was implemented for adolescents presenting to a pediatric emergency department who were screened for alcohol use. An alcohol-positive sample (N = 150) was compared with a matched alcohol-negative sample (N = 150) for alcohol use, alcohol problems, depression, smoking, risk-taking behavior, and parental monitoring.

**Results:** The alcohol-positive group reported significantly higher drinking frequency, drinking problems, prior alcohol-related injuries, and episodes of driving after drinking and riding with a drinking driver than the alcohol-negative adolescents. The same pattern was true for depressed mood, reckless behaviors, poor grades in school, and daily smoking. The parents of alcohol-positive teens reported their teens had come home intoxicated more often than parents of alcohol-negative teens. There were no differences between parent groups in monitoring of teens.

**Conclusion:** Adolescents who test positive for alcohol in an emergency department are a high-risk group who meet the criteria for indicated prevention. Screening for alcohol abuse is recommended. (J Pediatr 2001;139:694-9)

in adolescence, including developmentally normative experimentation.<sup>5</sup> However, regular use or early initiation of use is associated with later substance abuse in a significant proportion of older adolescents.<sup>3,4</sup> In one study of 14- to 18-year-old high school students,<sup>5</sup> 17% reported at least 1 current alcohol abuse/dependence symptom, whereas another study found that 32% of high school seniors met lifetime criteria for a diagnosis of either alcohol abuse or dependence.<sup>6</sup> Adolescents who use alcohol regularly are of most concern to health care professionals.

BAL	Blood alcohol level
ED	Emergency department

Other studies have found a strong relation between the quantity/frequency of drinking in the prior month and problem behaviors such as other drug use, sex without contraception, delinquency, school failure, and school dropout.<sup>7,8</sup> Lack of parental monitoring has also been associated with greater alcohol use and related problems.<sup>9</sup> In addition, problematic alcohol use during adolescence has been shown to be related to higher levels of alcohol use and aggressive behavior in young adulthood for men.<sup>10</sup>

The purpose of this study was to examine the rates of alcohol use and related problem behaviors in a sample of adolescents presenting as alcohol positive to an emergency department (ED). Alcohol-positive adolescent patients were hypothesized to report significantly more alcohol use and problem behav-

Alcohol use among youth is a significant public health concern. Almost 20% of adolescents aged 12 to 17 years report current alcohol use, defined as at

least 1 drink in the prior month,<sup>1</sup> and about one third of all high school students report being drunk in the prior month.<sup>2</sup> Many paths lead to alcohol use

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iors than a matched sample of alcohol-negative adolescent patients presenting to the ED with injuries. A second purpose of the study was to examine whether parents of the alcohol-positive adolescents would report significantly less monitoring of their adolescents than the parents of alcohol-negative adolescents.

## METHODS

### *Identifying Alcohol Status*

Adolescents aged 13 to 17 years who were treated for an injury in the pediatric or adult ED of a level I regional trauma center in the Northeast were recruited for 2 different studies, one testing the effects of a brief motivational intervention on alcohol-positive adolescents<sup>11</sup> and one assessing the usefulness of brief alcohol screens on alcohol-negative adolescents.<sup>12</sup> Patients who were suicidal, in police custody, not oriented, non-English speaking, in severe pain, or who sustained severe trauma were excluded.

**ALCOHOL-NEGATIVE SAMPLE.** Adolescent patients presenting for treatment of an injury in the ED and their parents or guardians were approached by an interviewer who introduced the project as a study on adolescent alcohol use and injuries. After obtaining informed consent from the patient and the parent or guardian, the interviewer administered a saliva screen (Quantitative Enzyme Diagnostics A-150 Saliva Alcohol Test; STC Diagnostics, Bethlehem, Penn) to ensure that the patient was alcohol negative at the time of the interview. The study was introduced to 552 eligible adolescents, and 400 (72%) agreed to participate.

**ALCOHOL-POSITIVE SAMPLE.** The alcohol-positive sample was composed of adolescents who had a positive blood alcohol level (BAL) or who reported drinking alcohol before an injury that required ED treatment. Alcohol-positive patients and their parents or

guardians were informed that the study was testing whether brief counseling in the ED after an alcohol-related event is helpful for adolescents. Before assent, the alcohol-positive patients had to pass a mental status examination that included the requirement that they be able to describe the study's essential elements. Of 286 eligible patients, 60 were discharged from the ED before completing recruitment. Of the remaining 226 adolescents, 73 patients or their parents declined to participate, resulting in 153 participants (68% participation rate). There were no differences between participants and nonparticipants in terms of age, sex, or BAL.

### *Matching Procedure*

To minimize alternate explanations for study findings, each alcohol-positive patient was matched with an alcohol-negative patient who was the next consecutive ED admission of the same age, sex, and race. Three alcohol-positive teens (2 Asian girls and 1 boy whose ethnicity was not known) were dropped from the alcohol-positive sample because they could not be adequately matched to an alcohol-negative adolescent. The final matched sample consisted of 300 patients (150 pairs).

### *Assessment Procedure*

Structured assessment interviews were conducted. Patients and their parents or guardians were told that the teens' reports of substance use would not be provided to parents or medical providers. Assessments reported here averaged 30 minutes and were typically conducted in a private or semiprivate area in the ED. Adolescents were read all questions aloud, and interviewers entered the answers on a laptop computer. Participants were given a store gift certificate for participating in the project. Parents were asked to complete measures regarding their monitoring of their adolescents and were given the option to complete a screening measure on their own alcohol use. Handouts that included a list of local mental health

agencies and strategies to avoid drinking and driving were provided to all participants. The Institutional Review Boards of both the hospital and university approved the project.

### *Adolescent Measures*

The Adolescent Drinking Questionnaire consists of 4 items from the Adolescent Health Behavior Questionnaire<sup>13</sup> and assesses drinking frequency (days per week), quantity (drinks per occasion), frequency of high volume drinking (5 or more drinks per occasion), and frequency of drunkenness for the past 3 months. The Adolescent Drinking Index<sup>14</sup> is a 24-item measure of the severity of alcohol involvement, with items scored on a 3-point or a 4-point frequency scale. The Adolescent Injury Checklist is a 14-item true/false self-report measure of injuries in the past year, determining whether the injuries required medical attention or whether alcohol was involved in an injury.<sup>15</sup> Drinking and driving was measured by items from the Young Adult Drinking and Driving Questionnaire.<sup>16</sup> The Center for Epidemiologic Studies-Depression Scale<sup>17</sup> is a 20-item measure of depressive symptoms in the prior week, with items answered on a 4-point scale. The Reckless Behavior Questionnaire<sup>18</sup> is a 10-item measure that asks the respondent to report how frequently he or she engaged in a variety of risk-taking behaviors during the previous year and how often alcohol was involved. Smoking status was determined by asking participants if they smoked 1 or more cigarettes per day. Parent perceptions and rules about drinking were derived from a measure of parent concerns and empowerment.<sup>19</sup> The Short Michigan Alcoholism Screening Test<sup>20</sup> is a 13-item self-report measure completed by parents to detect alcohol problems; a score of 5 indicates suspected alcoholism.

### *Statistical Analyses*

Statistical analyses included directional dependent Student *t* tests for

**Table I.** Alcohol use and other indicators of risk by alcohol status at ED visit

	Alcohol positive			Alcohol negative			N of pairs	Statistical test
	M	SD	%	M	SD	%		
ADQ Average No. of:								
Days drank past month	4.2	5.1		1.5	3.6		144	t = 5.24*
Days drank $\geq 5$ drinks past month	2.4	4.1		0.6	2.1		144	t = 4.67*
Days drunk past month	2.4	3.9		0.6	2.2		144	t = 4.62*
ADI total score	16.9	10.4		5.6	8.3		148	t = 11.13*
AIC: Alcohol-related injury past year			20.7%			3.4%	149	$\chi^2 = 19.53^{**}$
D&D: No. times drove after drinking at all in past year <sup>†</sup>	2.1	5.7		0.1	0.4		66 <sup>†</sup>	t = 2.77 <sup>‡</sup>
Drove after drinking, lifetime <sup>†</sup>			31.1%			8.7%		$\chi^2 = 13.88^{\ddagger}$
D&D: Rode with a drinking driver past year			59%			40%	143	$\chi^2 = 11.70^{\ddagger}$
CES-D total score	17.4	12.8		14.3	10.8		134	t = 2.22 <sup>§</sup>
RBQ total score	6.8	5.6		3.4	4.3		145	t = 5.77 <sup>§</sup>

Because these were matched samples, N refers to number of participants in each group (eg, number of pairs). ADQ, Adolescent Drinking Questionnaire; ADI, Adolescent Drinking Inventory; AIC, Adolescent Injury Checklist; Dc3D, Young Adult Drinking and Driving Questionnaire; CES-D, Center for Epidemiologic Studies–Depression Scale; RBQ, Reckless Behavior Questionnaire.

\* $P < .001$ .  
<sup>†</sup>This sample is composed of drivers only.  
<sup>‡</sup> $P < .01$ .  
<sup>§</sup> $P < .05$ .

matched samples to test for group differences on the continuous dependent measures, Wilcoxon signed rank tests for matched samples to test for differences on ordinal measures, and McNemar chi-square tests for dichotomous variables.

## RESULTS

### Characteristics of Matched Participants

The matching procedure resulted in an exact match by age (mean 15.6 years, standard deviation 1.2 years), sex (65% male, 35% female), and race (71.3% white, 18.7% Hispanic, 6.7% African American, 2% Asian/Pacific Islander, 0.7% American Indian, and 0.7% unknown). In addition, the samples were almost identical for other sociodemographic variables, including living with parents (91% alcohol-positive, 93% alcohol-negative), single parent households (34% alcohol-positive, 26% alcohol-negative), and Hollingshead so-

cioeconomic status ( $4.7 \pm 2.5$  alcohol-positive,  $4.8 \pm 2.4$  alcohol-negative). A greater proportion of the alcohol-positive group had dropped out of school ( $\chi^2[1, N = 150] = 4.32, P < .05$ ). After eliminating the drop-outs, the alcohol-negative group reported higher school grades than the alcohol-positive group (Wilcoxon signed rank tests = 2.69,  $P < .01$ ).

The mean BAL in the alcohol-positive sample was 140.5 mg/dL (standard deviation = 78.2), most determined by serum assay (94%) with the remainder determined by breath analysis (1%) or saliva (5%). Alcohol intoxication without injury (eg, treatment for intoxication) accounted for most visits (54%) in the alcohol-positive group, followed by motor vehicle crashes (18.7%), assaults (10.7%), falls (10%), and other injuries (6.7%). The alcohol-negative sample presented to the ED most often after motor vehicle crashes (35.3%), athletic injuries (22%), other injuries (21.3%), falls (17.3%), and assaults (4%).

### Alcohol Use and Alcohol-Related Problem Behaviors

Self-reported alcohol use and problems are reported in Table I. Across indices of drinking frequency (Adolescent Drinking Questionnaire) and drinking problems (Adolescent Drinking Index), the alcohol-positive group showed significantly higher levels. One half the alcohol-positive sample reached the Adolescent Drinking Index cut-off score, indicating a need for further evaluation of alcohol abuse, compared with only 10.8% in the alcohol-negative sample. The alcohol-positive group also had a significantly higher incidence of prior alcohol-related injuries (Adolescent Injury Checklist) and more episodes of driving after drinking and riding with a drinking driver (drinking and driving).

### Adolescent Problem Behaviors

The alcohol-positive group reported significantly higher scores than the alcohol-negative group for depressed

**Table II.** Responses of the alcohol-positive and alcohol-negative samples on the individual items of the Reckless Behavior Questionnaire (N = 145 pairs)

	Alcohol-positive		Alcohol-negative		$\chi^2$
	N	% Reporting	N	% Reporting	
Driven while under the influence of alcohol	31	21.4%	11	7.6%	10.62*
Driven >20 miles per hour over the speed limit	55	37.9%	48	33.1%	0.68
Driven a car at >80 miles per hour	38	26.2%	39	26.9%	0
Had sex without using contraceptives	49	33.8%	31	21.4%	5.35 <sup>†</sup>
Had sex with someone you didn't know well	21	14.5%	9	6.2%	4.03 <sup>†</sup>
Damaged or destroyed public property	40	27.6%	30	20.7%	1.62
Stolen or shoplifted	44	30.3%	20	13.8%	9.45*
Used marijuana	106	73.1%	47	32.4%	41.53 <sup>‡</sup>
Used cocaine	5	3.4%	2	1.4%	1.33
Used illegal drugs other than marijuana or cocaine	19	13.1%	6	4.1%	11.08 <sup>†</sup>

\* $P < .01$ .  
<sup>†</sup> $P < .05$ .  
<sup>‡</sup> $P < .001$ .

**Table III.** Parent report of adolescent alcohol use and family rules about alcohol

	Alcohol-positive		Alcohol-negative		Statistical test
	N	%	N	%	
How often discuss drinking with teen					
Never	11	8.8%	14	11.8%	Wilcoxon Z = 1.04
Few times per year	50	40.0%	49	41.2%	
Once a month or more	64	51.2%	56	47.0%	
Allow teen to drink					
Never	108	85.7%	90	75.6%	Wilcoxon Z = 1.32
Special occasions	16	12.7%	26	21.8%	
At home, but not if going to drive	2	1.6%	2	1.7%	
At home, whenever wants to	0		1	0.8%	
Penalties for violating family drinking rules					
Yes	86	76.8%	78	72.9%	$\chi^2 = 0.59$
No	26	23.2%	29	27.1%	
Think teen has come home intoxicated					
Yes	71	62.8%	24	21.4%	$\chi^2 = 24.50^*$
No	42	37.2%	88	78.6%	
If teen came home intoxicated, what action was taken					
Ground	64	53.3%	67	56.3%	Wilcoxon Z = 0.84
Discipline (severe)	6	5.0%	8	6.7%	
Discipline (mild)	18	15.0%	21	17.6%	
Discuss	32	26.7%	23	19.3%	

Some percentages do not add up to 100% because of rounding.  
\* $P < .001$ .

mood (Center for Epidemiologic Studies–Depression Scale) and reckless behaviors (Reckless Behavior Questionnaire) (Table I). More

alcohol-positive adolescents smoked daily (51.3%) than did alcohol-negative adolescents (18.7%;  $\chi^2[1, N = 150 \text{ pairs}] = 31.56, P < .001$ ).

Table II shows the responses of the alcohol-positive and alcohol-negative groups on the individual items of the Reckless Behavior Questionnaire. The

alcohol-positive group reported significantly higher rates of risky behaviors in the prior year on 6 out of the 10 items. In a follow-up question, we asked adolescents how often alcohol was involved when they engaged in the risk-taking behavior. The alcohol-positive group reported drinking alcohol when they were engaged in the risky behavior significantly more often than the alcohol-negative group on 4 items: sex without contraception (16% vs 6%,  $\chi^2[1, N = 145] = 7.26, P < .01$ ); damaged public property (17% vs 6%;  $\chi^2[1, N = 145] = 7.50, P < .01$ ); used marijuana (47% vs 15%,  $\chi^2[1, N = 145] = 30.68, P < .001$ ); and used other illegal drugs (9% vs 0%,  $\chi^2[1, N = 145] = 11.08, P < .001$ ).

### *Parent Substance Use, Monitoring, and Rules About Drinking*

There was no significant difference between the percentages of parents of the alcohol-positive patients (6.7%) and the alcohol-negative patients (3.3%) who scored in the probable alcoholism range (score of 5 or above) on the Short Michigan Alcoholism Screening Test ( $\chi^2[1, N = 91] = .51, P = \text{not significant}$ ). Table III shows the parental report of adolescent alcohol use and family rules about drinking. There were no group differences between the parents of alcohol-positive and alcohol-negative adolescents on history of discussing drinking with their teen, allowing teens to drink, or having penalties for violating family rules about drinking. The parents of alcohol-positive adolescents reported that their teens had come home intoxicated more often than the parents of alcohol-negative teens (62.8% vs 21.4%) but did not report any differences in their response to this behavior. The alcohol-negative teens reported their parents asked where they were going at night more often than did alcohol-positive teens ( $z[144 \text{ pairs}] = 2.55, P < .05$ ). There were no differences between the 2 groups on teen reports of

parent checking where they went at night, ( $z[144 \text{ pairs}] = 1.95, P = \text{not significant}$ ).

## DISCUSSION

As hypothesized, the alcohol-positive adolescent patients reported a substantial history of drinking, with significantly greater alcohol use, including greater frequency of drinking, heavy drinking, and drunkenness than their alcohol-negative peers. The data from the Adolescent Drinking Inventory suggest that 1 of every 2 alcohol-positive adolescent patients in the ED will have drinking problems at a level indicating the need for further assessment. The average BAL of the alcohol-positive patients was almost 40% higher than legal limit for adults, indicating these patients on average had a significant drinking episode before being treated in the ED. On all other alcohol-related measures these patients showed greater severity as well; 20% of alcohol-positive adolescent patients reported having had an alcohol-related injury within the past year, and 30% admitted driving after drinking in the prior year. Finally, those patients who were treated for alcohol-related reasons reported significantly higher scores on other measures of adolescent problems, including depressed mood and reckless behavior, and higher rates of cigarette smoking and other drug use. Thus, these data suggest that most adolescents treated for alcohol-related reasons in the ED meet at least the criteria for the American Academy of Pediatrics classification of substance problem (eg, use of substances more than once that has not become a repeated behavior),<sup>21</sup> and many would be diagnosed with substance abuse.

We did not find the expected group differences in parent report of family rules, discussion about drinking, and punishment for alcohol use. Although it is difficult to interpret a lack of group differences, there are several possible explanations. It may be that parents of

alcohol-positive teens were affected by the immediate circumstances, thereby making their self-report inaccurate. In other words, having their adolescent treated in the ED for drinking may have made parents of alcohol-positive adolescents report that they are more strict in their parenting than they actually are in practice. Second, it is possible that our questions regarding parental behavior may not have adequately assessed monitoring behavior. Third, high rates of disturbance on a number of dimensions, including problem behavior, risky sexual and antisocial behavior, and other drug use was noted in the alcohol-positive group. Thus, multiproblem adolescents may still engage in problematic behaviors even when their parents use monitoring and family rules comparable with the parents of the less problematic teens. Finally, adolescents in the alcohol-negative group may not be representative of the general population of adolescents. However, rates of current alcohol and tobacco use in our sample were similar to rates in a large survey of high school students in the state (Rhode Island)<sup>22</sup> and a national school-based survey,<sup>23</sup> suggesting that our sample of alcohol-negative injured patients was not atypical of the general population of adolescents.

Despite the challenging data collection circumstances, recruitment rates were high for this study comparing adolescent patients treated in an ED for an alcohol-related injury or alcohol intoxication with adolescents treated for injuries that did not involve alcohol. An additional strength of the study is that patients were matched on age, sex, and race, thus eliminating the possibility that differences between groups were caused by differences on these variables. A possible limitation of this study is that it relied solely on adolescent self-report of alcohol consumption and problem behavior. However, research supports the validity of adolescent self-report of alcohol use and problems.<sup>24,25</sup> The study did not exam-

ine other drug abuse at the time of the ED admission either through self-report or urine toxicologies; therefore, the reader cannot assume that alcohol was the only substance use that was related to the ED visit.

This study has several implications for intervention and referral of alcohol-positive adolescents seen in the ED. First, 1 of every 2 alcohol-positive adolescents seen in the ED reported a history of substance use reaching the clinical cut-off for further assessment. Thus, they are a high-risk population meeting the Institute of Medicine's criteria for indicated prevention.<sup>26</sup> Referral of adolescents who screen positive should be the standard of care.

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