Childhood Alcohol Use May Predict Adolescent Binge Drinking: A Multivariate Analysis among Adolescents in Brazil

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Objectives To test the hypothesis that first alcohol use during childhood is associated with heavy drinking patterns during adolescence and with parental drinking patterns and parental rules about alcohol consumption.

Study design A national cross-sectional survey of 17 371 high-school students. Students were drawn from 789 public and private schools in all the Brazilian state capitals using a multistage probabilistic sampling method and a self-report questionnaire. Weighted data were analyzed through logistic regression testing for differences on the associated factors for first use of alcohol during childhood. Survival analysis and Cox proportional hazard models were used to confirm results.

Results Among the 82% alcohol lifetime users, 11% had first used alcohol before age 12 years. The lack of perception of possible punishment by parents is associated with childhood alcohol use (OR 2.22, 95% CI 1.67-2.95). Adolescents who first used alcohol during childhood compared with those who only used alcohol at later ages are more likely to engage in binge drinking behaviors (OR 1.57, 95% CI 1.17-2.10), to have a pattern of heavy alcohol use (OR 1.98, 95% CI 1.26-3.09), and to have recently used illegal drugs (OR 1.74, 95% CI 1.39-2.16). According to hazard ratios, students with an earlier age of onset were more likely to have used tobacco and any illegal drug in the past year.

Conclusions Childhood alcohol may be a risk factor for the most dangerous patterns of alcohol use in adolescence and is associated with parental alcohol use. Parental rules about child alcohol use must be clear because perception of punishment might delay the age of first alcohol use. *(J Pediatr 2013;163:363-8)*.

Episodes of binge drinking (BD) (≥5 alcoholic drinks on 1 occasion) during adolescence have become a public health issue due to its high prevalence in several countries, including Thailand (33.0%),[1] UK (47.0%),[2] Germany (26.9%),[3] Sweden (30.8%),[4] and Brazil (35.0%).[5] BD exposes the adolescent to a variety of risks, including the possibility of contracting sexually transmitted diseases and unwanted pregnancy,[6] illegal drug use,[7] violent behavior,[8] poor school performance,[9] alcohol dependence,[10] and a high rate of emergency hospital attendances.[11] Heavy drinking (defined as drinking almost every day) also is associated with criminal activities among adolescents in the US.[12] In Brazil, despite being prohibited by law,[13-15] the sale and consumption of alcohol by children under 18 years are facts, and the average age for first alcohol use is 12.5 years.[16]

Cross-sectional studies, and a few prospective studies, have suggested a positive association between age of onset of drinking and alcohol-related harm[17] and alcohol abuse and dependence in adulthood.[18,19] Family factors seem to be associated with the early age of alcohol onset. Studies suggest that parental monitoring,[20] social support and discipline,[21] communication,[22] and a close bond between parents and children[23] protect youth against early age of onset of alcohol use. Parental disapproval toward the use of drugs is related to lower levels of alcohol and other drug use.[24,25] However, parental alcohol consumption and drunkenness are positively associated with child onset of alcohol use and with parents' approval,[26] which seems to be an important precursor of adolescent general risk behaviors.[27]

There has been an increase in the number of studies on alcohol consumption in Brazil[28]; however, there are few on the impact of childhood onset with risk behaviors during adolescence. This study was performed to test the hypothesis that onset of alcohol use during childhood is associated with heavy episodic drinking (BD), heavy drinking (use in >19 days per month), and illegal drug use during adolescence. In addition, the association of childhood age of first alcohol use with family factors was examined.

Methods

Data came from a cross-sectional survey of youths attending school in all the 27 Brazilian state capitals, with classroom survey data collected in 2010 from

BD	Binge drinking
HR	Hazard ratio
SES	Socioeconomic status

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a sample of the cities' private and public schools. The study's target population was designed as a representative multistage probabilistic sample of high school students (10th-12th grades) in these schools, with a 2-step random selection process. A total of 789 schools participated in this study, with a school response rate of 86%. The sample size considered a maximum relative error of 10% and a 95% CI for a variation of 50%. The student response rate was 79.2% (20.5% were absent on the day of the survey and 0.3% refused to participate). Ninety-eight questionnaires were excluded from the analysis for having a positive answer for a fictitious drug. The present study was limited to high school students aged 13-18 years (17 371 students).

Some participants had missing or invalid responses to key study variables. For this reason, the effective sample size for the present investigation, and the proportion of designated participants with useable data for lifetime alcohol use, is 17 366 (99.9%). Among lifetime users of alcohol (14 146 students), 72.5% had answered the question about the age of onset of alcohol use, allowing logistic regression and Cox proportional hazard estimates.

Anonymous standardized paper-and-pencil questionnaire data were gathered by a trained team of interviewers who worked in the classroom without a teacher present. A questionnaire, with closed form questions adapted from standardized World Health Organization items[29] and the European School Survey Project on Alcohol and Other Drugs questionnaire,[30] was used. In average, it took 40 minutes for students to complete the questionnaire.

The protocol was reviewed and approved by the Universidade Federal de São Paulo Research Ethics Committee (Protocol 0348/08), with provisions for participants to participate anonymously, to decline to participate, to leave questions unanswered, or to interrupt their participation at any time.

Measures

Key Response Variable. The key response variable in this study was age of onset of alcohol use (in years), using the question, "How old were you when you first tried any alcoholic drinking?" For binary logistic regression, lifetime alcohol users were divided into 2 groups: (1) first tried alcohol before the age of 12 years and (2) first tried alcohol at the age of ≥12 years. For Cox proportional hazard model, the exact age of first alcohol use was used as the indicator of time, and data from respondents not experiencing the specified outcome (lifetime alcohol use) by the time of the survey were censored. In cases in which the outcome and time-dependent covariate (tobacco use and illicit drug use) occurred during the same year (ties), it was impossible to determine which came first. To avoid imposing a temporal sequence based on a priori assumptions, observations with tied onset were censored just before the year in which the tie occurred.

Covariates under Study. The suspected covariates of central interest were grouped into 3 categories: sociodemographic (age, sex, socioeconomic status [SES]), type of school (private or public), drug use (alcohol, tobacco, and illicit drug use in the 12 months before the survey [past year use]), and family factors (alcohol use and BD by mother and father and lack of perception of punishment if the student is caught drunk). Questions about alcohol use, tobacco smoking, and illicit drug use were based on the World Health Organization instrument for student drug use survey[29] and had the following structure: "From 1 year until now, that is, in the last 12 months, did you drink any alcoholic beverage?" For the illicit drug variable, we considered ≥1 use in the past year of ≥1 of these drugs: cocaine, crack, marijuana, inhalants, ecstasy, and/or lysergic acid diethylamide. BD in the past year was defined as ≥1 episode of consumption of ≥5 servings of alcoholic beverages on the same occasion, as used in the European School Survey Project on Alcohol and Other Drugs survey. A serving was defined as a 5-oz glass of wine, a 12-oz can of beer, or a 1.5-oz shot of liquor, and the equivalence examples were drawn on the questionnaire to facilitate students' understanding.[30] Heavy drinking was measured in the 30 days before the survey (drinking in ≥19 days in the past month). Frequent drinking was considered the use of alcohol from 5-18 days in the month before the survey.[29]

Alcohol use and BD by parents indicate the perception that the student has of their parents' drinking (eg, Does your mother usually drink? Does your mother usually get drunk?). Lack of perception of punishment (yes or no) is the result of the question: "If your parents have caught you drunk, do you think they would punish you?"

SES was evaluated as indexed in relation to a highly standardized survey assessment of SES known as the Associação Brasileira de Empresas de Pesquisa (Brazilian Association of Research Agencies) index. This index[31] is based on the educational level of the head of the household, possession of various types of household goods (eg, television sets), and number of housekeepers. This scale was used to sort participants into standardized subgroups labeled A-E (where A was the highest economic strata).

Statistical Analyses

Weighted data were analyzed through use of basic contingency tables and logistic regression testing for differences on the associated factors for first use of alcohol during childhood (until 11 years of age) or during adolescence (≥12 years of age). Survival analysis and Cox proportional hazard models were used to confirm results. Then, to investigate a potential pathway between alcohol use and tobacco and illicit drug use, using retrospective reports of age of onset, we used survival analyses methods, followed by Cox proportional hazards models with time-dependent covariates.[32] Hazard ratios (HRs) from Cox proportional hazards models provide estimates of the relative risk of an outcome over time for those with a specified risk factor versus those without the factor.[33]

Analyses were conducted on data weighted to correct for unequal probabilities of selection into the sample. The complex survey design took into account the city and type of school, the school as primary sampling unit, the expansion weight, and the final probability of drawing the student

Table I. Descriptive statistics and bivariate analysis of first alcohol use among 10 260 high school students in the 27 Brazilian state capitals according to sociodemographic characteristics, alcohol/drug use, and family factors

	≥12 y (adolescence)			<12 y (childhood)			
	No.	%	SE	No.	%	SE	*P*
Sex							
Male	3978	43.6	0.8	599	53.1	2.3	.0001
Female	5175	56.4	0.8	478	46.9	2.3	
SES*							
A	1658	13.8	1.6	234	18.8	2.4	.008
B	3474	43.2	1.1	392	44.9	2.5	
C	2508	38.9	1.3	253	32.5	2.6	
D/E	288	4.0	0.3	35	3.8	0.8	
Type of school							
Private	3810	22.4	1.9	521	27.5	2.5	.002
Public	5370	77.6	1.9	559	72.5	2.5	
Past year alcohol use	7219	79.1	0.7	861	82.8	1.6	.045
Past year tobacco use	1662	18.4	0.8	300	30.3	2.4	<.0001
Past year illicit drug use	1629	17.2	0.7	328	31.8	2.1	<.0001
Past year BD	3500	38.6	1.1	566	55.2	2.6	<.0001
Past month heavy drinking†	196	2.5	0.3	67	6.6	1.1	.0002
Past month frequent drinking‡	512	6.0	0.5	133	12.3	1.5	<.0001
Father usually drinks	5734	60.6	0.9	699	65.3	2.1	.033
Mother usually drinks	3805	40.6	1.0	482	47.6	2.2	.002
Father usually gets drunk	1997	21.3	0.7	276	26.3	2.0	.007
Mother usually gets drunk	543	5.8	0.4	84	8.3	1.4	.054
Perception of punishment§	511	6.4	0.5	136	14.9	1.7	<.0001

*Social rank is defined according to Associação Brasileira de Empresas de Pesquisa (Brazilian Association of Research Agencies's) classification, where A is the richest socioeconomic stratum and E is the poorest. Stratum is a proxy for monthly family income: *A*, ≥US$7500; *B*, US$2200-US$7499; *C*, US$750-US$2199; *D*, US$350-US$749; *E*, US$235-US$344, considering the conversion rate US$1 = R$2).
†Drinking ≥20 d/mo.
‡Drinking 5-19 d/mo.
§Lack of perception of punishment if parents caught the student drunk.

who answered the questionnaire. All the independent variables presented in Table I were tested in the models of logistic regression and Cox proportional hazard models. Tables II and III present only the estimates for significant results (final model).

Analyzes were performed using Stata Version 11 (StataCorp, College Station, Texas), with set procedures to address variance estimation under the complex sample design. Results are presented as weighted proportions, crude ORs, adjusted ORs, crude HRs, adjusted HRs, and 95% CIs.

Results

Among the 17 366 students who answered the question about lifetime alcohol use, 81.7% (14 146 students) (95% CI 80.5%-82.7%) declared that they have tried alcohol at least once in their lifetime. Among the alcohol lifetime users, 10.9% (95% CI 10.0%-11.8%) had first used alcohol before age 12 years (1080 students).

Descriptive statistics of the 2 groups (alcohol onset before or after 12 years) and bivariate analysis showed an association between earlier age of onset and risky alcohol and other drug use during the high school years (Table I). BD, frequent drinking, and heavy drinking were more prevalent among students who first used alcohol before age 12 years. For example, BD in the past year was reported by 38.6% of the students who first used alcohol at age >12 years, and it was reported by 55.2% of the students who have first used alcohol at an earlier age ($P < .0001$). Heavy drinking is 3 times more prevalent among students who first used

Table II. Results of logistic regression estimates for childhood onset of alcohol use (<12 y) among 9807 high school students in the 27 Brazilian state capitals

	Crude OR	95% CI	*P*	Adjusted OR	95% CI	*P*
Past month frequent drinking*	2.19	1.65-2.89	<.0001	1.56	1.15-2.13	.005
Past month heavy drinking†	2.74	1.78-4.23	<.0001	1.98	1.26-3.09	.003
Past year BD	1.95	1.57-2.43	<.0001	1.57	1.17-2.10	.002
Past year illicit drug use	2.23	1.83-2.73	<.0001	1.74	1.39-2.16	<.0001
Perception of punishment‡	2.56	2.00-3.28	<.0001	2.22	1.67-2.95	<.0001
Age	0.72	0.66-0.80	<.0001	0.64	0.59-0.71	<.0001
Female	0.68	0.56-0.82	<.0001	0.72	0.58-0.87	.001

Data presented as adjusted and crude ORs and 95% CIs for the variables that remained significant in the final model.
*Drinking 5-19 d/mo.
†Drinking ≥20 d/mo.
‡Lack of perception of punishment if parents caught the student drunk.

Table III. Results for survival analysis (Cox proportional hazard model) for drug use patterns according to age of onset of alcohol use (10 260 students)

	Crude HR	95% CI	P	Adjusted HR	95% CI	P
Tobacco use after alcohol*	2.29	2.09-2.51	<.0001	1.59	1.43-1.77	<.0001
Illicit drug use after alcohol*	1.73	1.55-1.94	<.0001	1.18	1.05-1.32	.004
Past month heavy drinking†	2.48	2.26-2.72	<.0001	1.32	1.19-1.47	<.0001
Past year alcohol use	4.23	3.98-4.50	<.0001	3.41	3.17-3.67	<.0001
Past year BD	2.46	2.35-2.58	<.0001	1.14	1.07-1.20	<.0001
Past year tobacco use	2.16	2.04-2.29	<.0001	1.14	1.05-1.23	.001
Past year illicit drug use	2.00	1.88-2.13	<.0001	1.15	1.07-1.25	<.0001
Mother usually drinks	1.56	1.48-1.64	<.0001	1.13	1.07-1.19	<.0001
SES	0.82	0.80-0.85	<.0001	0.93	0.90-0.97	<.0001
Private school	1.40	1.33-1.47	<.0001	1.13	1.07-1.19	<.0001

Data presented as adjusted and crude HRs and 95% CIs for the variables that remained significant in the final model.
*Age of onset of tobacco/illicit drug use is higher than age of onset of alcohol use.
†Drinking ≥20 d/mo.

alcohol before age 12 years. Parental alcohol consumption and BD were associated with the age of onset of alcohol use of the students.

Using logistic regression, high school students with a lack of perception of possible punishment by parents (if the student was caught drunk) were 2.2 times more likely to have first used alcohol during childhood (before age 12 years). Adolescents who first used alcohol during childhood were more likely to engage in BD, to have a heavy pattern of alcohol use, and to have recently used illegal drugs (Table II). Girls were 30% less likely to initiate alcohol use during childhood.

Cox proportional hazard models showed that students with an earlier age of onset were more likely to have used alcohol, tobacco, and any illegal drug in the past year. BD and heavy drinking were associated with early age of onset of alcohol. Students attending private schools seem to have an earlier age of alcohol onset. The earlier age of onset is also true for students who have mothers who drink.

Discussion

This study indicates that the earlier the onset of alcohol use, the higher is the risk of alcohol misuse (eg, BD and heavy drinking) and other drug use during adolescence. Maternal drinking, private school attendance, and the lack of perception of the possibility of being punished for drunkenness were associated an early onset of alcohol use.

Before detailed discussion of our findings, a few limitations should be mentioned. Due to the fact that a self-report questionnaire was used, the questions were subject to interpretation by the participants. However, the anonymous nature of the survey and the absence of a teacher in the classroom should help promote response validity. Also, the question about a fictitious drug allowed us to drop the questionnaires with proved bias information. Some degree of nonparticipation (especially because of absence on the day of the survey) and missing data excluded some students from the analysis. However, the levels of participation were larger than those obtained in the US Monitoring the Future study,[34] considering that almost all the students who were invited agreed to participate in the study. Also, because it is a retrospective survey, we must consider the problems associated with recall bias. Nevertheless, because the participants were still adolescents, the first use of alcohol was fairly recent. Another limitation is the inability to evaluate regular and moderate alcohol use due to limited data on alcohol doses consumed per day.

Recent literature suggests some explanations for early age of onset of alcohol use and later harm. However, they are usually grounded in data in which alcohol harmful outcomes are measured in adulthood, especially concerning alcohol dependence. In our study we focused on early harm, such as BD, heavy drinking, and illicit drug use during adolescence, that leads the adolescent to immediate negative effects such as unprotected sex (unwanted pregnancy and contamination by sexually transmitted diseases and/or human immunodeficiency virus infection), episodes of violence, traffic accidents, suicide, and loss of consciousness.[35]

In Canada, DeWit et al[36] found a similar association of early use of alcohol and later harm. Adults who first tried alcohol at age 11 or 12 years were the most likely to exhibit alcohol abuse or dependence during adulthood. In Europe, according to Stolle et al,[3] adolescents who begun to engage in BD before age 15 years are 4 times more likely to develop alcohol dependence compared with those who first engaged in BD at age ≥20 years.

It seems that alcohol use during childhood disrupts many social learning and cognitive processes that would determine adequate social and cognitive functioning in later life.[37] However, it is not the only explanation for the association between early age of onset of alcohol use and the development of alcohol problems. According to Hawkins et al,[38] early age of onset of alcohol use might be the expression of some childhood condition such as a psychiatric disorder or inappropriate family behavior, and these events might be causally related to the manifestation of later alcohol problems.

Corroborating this last hypothesis, a review of the literature on the biopsychosocial aspects of alcohol dependence indicated that risk factors could be identified in early childhood.[39] The author asserts that children with low levels of

harm-avoidance behavior and high level of novelty-seeking behavior are more likely to develop alcohol-related problems, such as BD, during adolescence. In addition, these young children, who are potentially at risk for alcohol abuse, are more active, more impatient, and more aggressive than are low-risk children.[39]

Besides the association between BD and age of onset of alcohol, it is important to note that heavy drinking was associated with early age of onset of alcohol in both the regression analysis and Cox model. Although heavy drinking is not as prevalent as BD in this sample, it seems to be more harmful than adolescent BD. According to a national household survey among adolescents in the US, teenagers who were heavy drinkers were more likely than those who drank less often and who engaged in BD to be involved in criminal behaviors, aggressive behaviors (eg, threatening to hurt people, physically attacking people, destroying property), and a wide range of delinquent behaviors (eg, running away from home, cutting classes or school). There is an association between frequency and quantity of alcohol monthly use with delinquent and aggressive behaviors.[12] Other studies also point to adolescent heavy drinking in this age group as a trigger for impulsive behavior, especially in boys. This type of behavior affects not only the daily life of the teenager but decisions for their adult lives, including future career and forming a family.[40]

Unfortunately, although the association between early age of onset of alcohol use and future harm is not new,[41] the investigations of the effect of age at first alcohol use on the development of alcohol problems have been limited in several aspects. One limitation is the failure to control for the confounding influence of parents' drinking behavior. It is expected that parents who drink are more tolerant of their children's alcohol initiation and create a home environment that promotes alcohol availability.

In this sense, an important innovation in our study is the inclusion of parental alcohol drinking behavior in the hazard models. Besides age of first alcohol use being a powerful predictor of progression to alcohol-related harm and illicit drug use, our analysis shows that it is independently associated with maternal drinking behavior and with the adolescent perception of punishment of being drunk.

Results of the present study reinforce the role of parents in relation to their children's alcohol use, both by the lack of clear rules against alcohol use during childhood and adolescence and by the example given at home, especially by the mother.

A cohort study conducted in the US showed that family can be a risk factor for early alcohol onset, whether by providing alcohol directly to their child or by just having it accessible in their house. Students who took alcohol from home were 5 times more likely to have recently engaged in BD.[26] On the other hand, Stoolmiller et al[42] suggested that the family can be protective by limiting the onset of alcohol use, by keeping alcohol at home in a safe place and by not drinking frequently. However, it is important to note that data on the role of direct provision of alcohol by family and its association with youth drinking behavior have not produced consistent findings.[43]

Numerous approaches have been developed to prevent underage drinking and studied. Some strategies try to involve the adolescents' families in the prevention programs. We suggest a number of possible interventions, including the interruption of parent's drunkenness behavior and permissiveness of their children's drunkenness. Parents' warnings and clear rules stating their disagreement about drinking would be a protective factor against BD among adolescents. Other approaches are school-based ones, involving curricula targeted at preventing alcohol, tobacco, and other drug use, or extracurricular based, offering activities outside of school in the form of social or life skills training or alternative activities. Public policy strategies, such as an increase in the minimum legal drinking age (≥21 years), a restriction of the commercial and social access of adolescents to alcohol, and a reduction in the economic availability of alcohol by increasing pricing and taxation, have shown efficacy in preventing underage drinking and alcohol-related harm in other countries[44] and could be beneficial if incorporated into the Brazilian scenario, where they have never been tested. Among those most-studied alcohol control measures relevant to underage youth is the establishment of the minimum legal drinking age at 21 years. Many longitudinal studies have shown that a minimum legal drinking age of 21 is effective in reducing alcohol consumption and traffic crashes among 18- to 20-year-olds, with reductions in other problems, such as alcohol-related suicide and vandalism among underage youth.[45]

Future research involving longitudinal data is required to test pathways among childhood alcohol use, parental drinking behavior, and BD in adolescence. ■

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