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ADOLESCENT DRINKING ONSET AND ITS ADULT CONSEQUENCES AMONG MEN: A POPULATION BASED STUDY FROM INDIA

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Abstract

Background—Few population-based studies from low and middle-income countries have addressed adolescent drinking onset and its association with adult alcohol-related adverse outcomes. The aims of this study were to: (1) estimate the rate of adolescent drinking onset and its trend over time among men (2) describe demographic and socioeconomic factors associated with adolescent drinking onset; and (3) examine the association between adolescent drinking onset and adverse outcomes in later life, including hazardous or harmful alcohol use, heavy episodic drinking, alcohol dependence, injuries, and psychological distress.

Methods—Population based survey of men ($n=1899$) from rural and urban communities in northern Goa, India. Analysis addressed age of drinking onset among those who reported ever drinking in their lifetime, and drinking patterns and consequences among current drinkers.

Results—Adolescent drinking onset showed an increasing trend over time ($p<0.001$), from 19.5% for those born between 1956 and 1960 to 74.3% for those born between 1981 and 1985. Urban residence, Christian religion and low standard of living were associated with adolescent drinking onset. Adolescent drinking onset was associated with psychological distress (OR 2.82; 95% CI 1.41–5.63), alcohol dependence (OR 2.56; 95% CI 1.79–3.68), lifetime history of alcohol related injuries (OR 3.07; 95% CI 1.16–8.14), alcohol related injuries during the past year (OR 3.04; 95% CI 1.35–6.81), and a Alcohol Use Disorder Identification Test (AUDIT) score 8 indicating hazardous or harmful alcohol use (OR 1.9; 95% CI 1.17–3.08) in adulthood.

Conclusions—This study among men in Goa, India suggests a substantial increase in adolescent drinking onset in more recent birth cohorts. Consistent with other countries, adolescent drinking

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Competing interest

None.

onset increased the likelihood of lifetime alcohol dependence, hazardous or harmful alcohol use, alcohol related injuries, and psychological distress. These findings highlight the need for policies and programs to delay drinking onset in India.

Keywords

Adolescent; Alcohol drinking; Low and middle-income country; India; mental health

Introduction

A life course approach to harm reduction relies on identifying and modifying early life exposures that affect adult health. In high income countries, early age of drinking onset is a strong, consistent predictor of alcohol-related harm across the life-course¹, including increased risk of alcohol abuse, dependence, and injuries associated with early onset of alcohol use²³. However, several gaps remain in our understanding of the association between early onset alcohol use and its adverse effects, and little is known about this relationship in low and middle-income countries (LAMIC) such as India.

Human adolescence (10–19 years) is a distinctive phase of development during which the brain is particularly sensitive to the disrupting properties of alcohol; early onset of drinking has been associated with several short-term and long-term adverse outcomes⁴. Acute effects of adolescent drinking such as motor vehicle crashes, suicides, and violence are globally recognized as serious public health issues⁵. Evidence from large national surveys in the USA have found an increased risk of alcohol abuse and dependence across the life-course linked to an early age drinking onset^{6–8}, consistent with cross-sectional studies from other high-income countries¹⁹. Some researchers question the causal nature of this association, suggesting that early drinking onset indicates *susceptibility* to problematic alcohol use across the life course rather than causing alcohol use disorders (AUDs)¹⁰. However, a U.S. national prospective study addressed many of these concerns¹¹. After controlling for a wide range of childhood and baseline risk factors, family history, and duration of drinking, a modest association was observed between early onset of drinking, alcohol dependence and alcohol abuse. Based on this, the authors proposed that early drinking, leading to substantial exposure to ethanol during a period of physical and neurological maturation, is a risk factor for future AUD¹¹.

Thus, current evidence highlights the complex nature of the association between adolescent drinking onset and AUD. It is likely that this association operates through multiple pathways and that the adverse effect of age of drinking onset may be influenced by other factors in different settings. Most of the evidence on early drinking and later problems is based on data derived from the U.S.A and European countries that have minimum legal drinking ages and make efforts to enforce these. However, alcohol use patterns vary greatly among different countries and cultures over the life course¹². This variation underscores the need for further research on early drinking and its association with drinking patterns, and adverse outcomes in later life in diverse settings where unique cultural traditions, social norms, and life experiences around alcohol use may lead to different relationships.

In India, alcohol is emerging as a major public health problem. Although relatively fewer men drink in India than in many high-income countries, the usual pattern of alcohol use is one of heavy drinking of spirits, and drinking to intoxication¹³, and the proportion of hazardous users among current drinkers is greater than in many high-income countries¹³. Studies conducted by our team in Goa, India have found that 39% of men between 18–49 years are current drinkers¹⁴. Among them, about 15% usually consume six or more drinks per occasion, 29% indulge in heavy drinking (six drinks or 60 grams of pure alcohol) and about 34% get drunk at least monthly or more frequently¹⁴. Alcohol sales and regulations are not under federal jurisdiction in India. The legal drinking age varies from 18 years to 25 years among different Indian states; the minimum legal drinking age is 18 years in the state of Goa, where our study was conducted. However, legal drinking age is often ignored in India, the law is rarely enforced in bars or liquor stores, and alcohol is easily available to underage drinkers in most parts of the country.

Trends in the age of drinking onset is a valuable indicator that may be used to monitor larger variations in overall drinking patterns among youth¹⁵. The little information available from India suggests a significant drop in the age of drinking onset over the past decade^{16,17}. However to date, no population studies on age of drinking onset, its trend and adverse outcomes associated with early drinking onset have been published from India.

The aims of this study were therefore to: (1) Estimate the rates of adolescent drinking onset among men in our study population in Goa, India, and evaluate secular trends in adolescent drinking onset; (2) describe the demographic and socioeconomic factors associated with adolescent drinking onset; and, (3) examine the association between adolescent drinking onset and adverse outcomes in later life, including heavy episodic drinking (HED), hazardous and harmful alcohol use, alcohol dependence, injuries, and psychological distress. We examined these outcomes controlling for life time duration of alcohol use and demographic and socioeconomic factors that could influence both early age drinking onset and adverse outcomes.

Methods

Study setting and sample

This study used data from respondents aged 20 years to 49 years randomly selected from urban and rural communities for a population-based survey in northern Goa, India conducted in 2005–2006. A two-stage interview methodology was adopted. The first stage comprised a screening interview that included current drinking status. In the second stage, a sub-sample, comprising of (A) all current male drinkers (those who had at least one whole drink containing 10 g of alcohol in the past year) and (B) non-drinkers (including past drinkers) randomly selected in a 1:4 ratio, were invited to participate in a longer interview which assessed alcohol use patterns, problems, age of drinking onset and adverse outcomes. This study includes all current drinkers and a randomly selected subsample of past drinkers from the screening interview who completed the main interview. A detailed description of the sampling procedure and methods is published elsewhere^{14,18}. Drinking among women is rare in India; hence this study examining age of drinking onset included only men.

Measures

Age of drinking onset was determined by asking all drinkers how old they were when they first started drinking, not counting small sips or tastes. This is a standard question used to ascertain age of drinking onset in several U.S. large-scale studies^{11, 19}. Men who reported drinking onset at 19 years or younger were categorized as adolescent drinkers.

Demographic and socioeconomic information assessed included area of residence (urban / rural), education, ethnicity, migrant status (native of Goa or not) and religion. A standard of living index (SLI) was calculated based on asset score¹⁴.

Hazardous and harmful alcohol use was ascertained using the Alcohol Use Disorder Identification Test (AUDIT) administered to men who reported consuming a minimum of one alcoholic drink during the past one year. The AUDIT is a 10-item screener developed for international use by the World Health Organization (WHO) to detect alcohol use disorders²⁰. Prior studies from Goa have used AUDIT among industrial workers²¹ and in primary care samples²². The validity and reliability of the AUDIT scale in the adult general population of Goa has been established²³. We used a cut-off score of 8 or more (AUDIT positive), which is recommended as an indicator of hazardous and harmful alcohol use as well as possible alcohol dependence²⁴.

Alcohol use variables including frequency of HED (≥ 60 grams of alcohol; sometimes termed binge drinking) were adapted to the local setting by using systematically assessed beverage-specific drink-strength and vessel size information to define a drink; reported numbers of drinks were based on grams of pure ethanol (one drink = 10 g of pure ethanol)²⁵. HED drinking pattern was defined as consuming six or more drinks per occasion at least weekly.

Duration of alcohol use in years was calculated by subtracting age of drinking onset from current age.

Psychological distress was evaluated using the General Health Questionnaire (GHQ). The GHQ has been extensively used in diverse international settings for screening of anxiety and depressive symptoms^{26, 27}. The validity of the Goan language (Konkani) version of the GHQ has been demonstrated previously²⁸. GHQ has been shown to be superior to several other primary care questionnaires for detection of probable cases of CMD in Goa²⁹. We used a cut-off score of 5, recommended for case detection in primary care samples to denote probable CMDs²⁹.

Injury related to alcohol use was determined by asking whether the participant or someone else had been injured because of the participant's drinking in the past year or ever.

The alcohol dependence measure used was from the US National Alcohol Survey based on seven symptom subscales of two to four items each, totaling 17 items³⁰ assessing DSM-IV symptom domains³¹ reflecting criteria for alcohol dependence³². Participants reporting at least one positive item from each of three or more symptom domains were classified as alcohol dependent. For further details on the dependence measure, see Greenfield et al³⁰.

Analysis

We used the `svy` commands in STATA version 10.0 to estimate proportions and conduct tests of independence and to estimate multivariable logistic regression models adjusting for the complex sampling design, which included stratification by urban vs. rural areas and with villages defining primary sampling units. Sampling weights were also included in analyses, which adjusted for village sizes, age distribution, and number of gender-specific adults aged 18–49 years in the household (each obtained from electoral rolls) as well as for non-response and under sampling of non-drinkers. Weights were capped when outside ‘rule of thumb limits’ to lower unstable estimates as a result of divergent weights and rescaled to represent urban and rural sample sizes

First, we described the proportion of current drinkers and past drinkers (defined as those not consuming alcohol in the prior 12 months) who described adolescent drinking onset. The possibility of a birth cohort effect on adolescent drinking onset was analyzed by grouping participants into six groups according to their year of birth (born between 1956–1960, 1961–1965, 1966–1970, 1971–1975, 1976–1980, 1981–1985). In the second step, we examined possible socioeconomic and demographic predictors of adolescent drinking onset.

Finally, we examined the association between adolescent drinking onset and the following adverse adult outcomes: hazardous and harmful alcohol use, HED, alcohol related injuries (ever and past twelve months), psychological distress, and alcohol dependence. Only current drinkers were included in this analysis as data on adult adverse outcomes were not available for past drinkers. We used separate logistic regression models with each adverse outcome modeled as dependent variable. The model included potential confounders among the socioeconomic and demographic predictors we examined and lifetime duration of alcohol use in years as covariates. Missing data were treated as missing in analysis and were not replaced. Valid numbers of observations for analysis are noted in table 1 and table 2.

Results

In all, 1867 men between 20 years and 49 years completed the screening interview; 751 were current drinkers (40%; 95% CI 38%–42%) and 256 (13.7%; 95% CI 12.2%–15.3%) were past drinkers. Current drinkers (n=728; 97%) and all past drinkers randomly selected from the screening interview (n=81) completed the second-stage interview, in which age of drinking onset was determined. Complete data on age of drinking onset were available for 722 (96%) current drinkers and 80 (99%) past drinkers.

Age of drinking onset

About a third of male drinkers (n=263; 33%) reported adolescent drinking onset. The proportion of adolescent drinkers increased from 19.5% in the 1956–1960 birth cohort to 74.3% for those born between 1981 and 1985 (χ^2 p<0.001) (figure 1).

Factors associated with adolescent drinking onset (Table 1)

Compared with younger men, older men were less likely to report drinking onset under 20 years. Men from urban areas, unmarried men and those reporting Christian religion were

more likely to report adolescent drinking onset. However, there was no association between education and adolescent drinking. After adjusting for age and area of residence, adolescent drinking onset was only associated with Standard of Living Index (SLI) and Christian religion. Thus, men with a lower SLI and those reporting Christian religion were about three times and one and a half times more likely to report adolescent drinking onset respectively.

Adverse adult outcomes associated with adolescent drinking onset (Table 2)

Adolescent drinking onset was associated with hazardous or harmful alcohol use, HED, alcohol dependence, and alcohol related injuries during the past 12 months (and on a lifetime basis). After adjusting for age, area of residence, SLI and lifetime duration of alcohol use, adolescent drinking onset was associated with a number of negative outcomes: psychological distress (OR 2.82; 95% CI 1.41–5.63), alcohol dependence (OR 2.56; 95% CI 1.79–3.68), lifetime history of alcohol related injuries (OR 3.07; 95% CI 1.16–8.14), *alcohol related injuries in the past 12 months* (OR 3.04; 95% CI 1.35–6.81) and current hazardous or harmful drinking (OR 1.9; 95% CI 1.17–3.08).

Discussion

To our knowledge, this is the first population based study from India to describe the rates of adolescent drinking onset and its trend among men, and examine the association between adolescent drinking onset and subsequent alcohol related outcomes in adults. This study identifies several original findings. First, there has been a significant increase in adolescent drinking onset among men in Goa, India. The proportion of men reporting adolescent drinking onset has increased more than three-fold between men born between 1956 and 1960 and men born between 1981 and 1985. Second, men from urban areas and those with lower standard of living are more likely to report regular drinking in adolescence. Finally, similar to studies in high-income countries, this study has found that adolescent drinking onset was associated with increased likelihood of experiencing lifetime alcohol dependence, hazardous or harmful alcohol use, alcohol related injuries (life time and past year), and psychological distress.

An earlier report from India demonstrated that the average age of onset of regular use of alcohol among men decreased from 25 years to 23 years between 1989 and 1998¹⁶. A recent study from north east India also reported that more than half of the men started drinking alcohol before the age of 21 years¹⁷. Our study confirms these findings and reveals a dramatic increase in adolescent drinking onset. This remarkable increase in adolescent drinking onset can only be explained by environmental factors. Reports from India describe a concerted effort by the alcohol industry to promote alcohol use among youth via lifestyle advertising and the introduction of flavored alcoholic drinks¹³³³. Alcohol marketing techniques have been particularly successful, as the settings in India have few alcohol control policies and little or no monitoring or enforcement of existing laws¹⁵, including laws on minimum age for alcohol purchase or consumption. Consistent with this, a recent study examining associations of various alcohol policies with drinking levels in LAMI countries found that alcohol policies to reduce the physical availability, and restrict advertising of alcohol were associated with lower consumption³⁴. Alcohol outlets are increasingly

common in Goa, and minimum legal drinking age laws, also found in that study to be inversely associated with consumption, are seldom enforced there. The increasing trend in adolescent drinking onset could also be linked to increasing economic prosperity³⁵. The influence of globalization and economic liberalization (rapid socio-economic transition, growing disposable incomes and exposure to satellite television) may also have encouraged widespread greater acceptance of alcohol use¹³, including early use.

As expected, adolescent drinking onset was more prevalent in urban areas, most likely due to ease of access, perceived anonymity in purchasing alcohol, and tolerance towards alcohol use in cities. Socioeconomically disadvantaged men (indicated by the lower standard of living) were more likely to report early onset drinking, which suggests that social and contextual factors are associated with early onset. This association may be explained by the impact of adolescent alcohol use on standard of living in adults. Consistent with the bulk of evidence from high-income countries, our analyses found that drinking onset during adolescence predicts hazardous and harmful alcohol use and alcohol dependence in adults after adjusting for lifetime duration of alcohol use and socio-demographic factors. Adolescent drinking onset also heightens the risk of psychological distress and alcohol related injuries.

Several issues need to be considered in interpreting these results. This cross-sectional study asked current drinkers and past drinkers to recall their drinking onset. While anecdotal evidence supports a secular decline in age of drinking onset in India, the possibility of a maturation bias, that older individuals are 'forgetting' earlier drinking, cannot be ruled out. In order to confirm the role of socioeconomic factors in adolescence drinking onset, evidence from longitudinal cohort studies measuring SES prior to the onset of alcohol use is required. Another limitation is the assessment of most adverse outcomes only for the past year and therefore only for those who drank in the last 12 months. Men who drank prior to the past year might experience different adverse outcomes, something our study did not capture. Other unmeasured, potentially confounding variables may influence the observed relationship between adolescent drinking onset and adverse outcomes. These include disinhibitory personality traits, childhood conduct problems and antisocial behavior, family circumstances and adverse childhood events, and family history of alcohol abuse documented to influence early drinking onset as well as adult alcohol use patterns and development of AUDs^{1036–38}. These confounders have been shown to have an independent role in associations between early drinking onset and adult AUD in some studies. Other studies, however, have found the association insignificant after adjusting for delinquency, antisocial behaviors, personality disorders, and parental alcoholism³⁶³⁹. While some of these factors may partly explain the association of early age drinking onset with AUD later in life, the substantial effect size we observed along with evidence from longitudinal studies^{40–42} from other settings support the independent effect of early drinking onset on both future alcohol consumption and the development of alcohol-related problems.

In conclusion, this study suggests an alarming trend of drinking at an early age in India, while showing findings consistent with those from high-income countries of adverse effects from adolescent drinking across the life-course. Although prospective studies are needed in LAMI countries to assess the causal role in these different cultural settings, screening for

alcohol use among adolescents may help to identify those at increased risk for future alcohol abuse. Prospective studies of youth in the US have estimated that the odds of alcohol dependence can be reduced by 10% for each year of postponed drinking in adolescence⁴³. Studies from high income countries have also shown that establishing minimum drinking age to 21 years and enforcing drinking age laws have widespread effects on youth drinking and alcohol-related harm, especially road traffic accidents, often for years after young people reach the minimum legal drinking age^{44,45}. The study reported here highlights the importance of generating public awareness about hazards of early onset alcohol use, and enforcing regulations designed to limit underage drinking in India.

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What is already known on this subject?

Studies from high-income countries have demonstrated that early age drinking onset is a consistent predictor of alcohol-related harm across the life-course. Little is known about this relationship in low and middle-income countries (LAMIC) such as India.

To date, no population studies on adolescent drinking onset and its trend have been reported from India.

What this study adds?

Proportion of men reporting adolescent drinking onset has increased three-fold between men born between 1956 and 1960 and men born between 1981 and 1985 in Goa India.

Similar to studies in high-income countries, this study has found that adolescent drinking onset was associated with increased likelihood of experiencing lifetime alcohol dependence, current alcohol use disorder, alcohol related injuries, and psychological distress.

This study highlights the importance of generating public awareness about hazards of early onset alcohol use, and enforcing regulations designed to limit underage drinking in India

Figure 1.

Table 1

Factors associated with adolescent drinking onset among men in Goa, India (n=802)

	20 years n (Weighted %)	19 years n (Weighted %)	OR (95% CI)	Adj. OR (Adjusted for age & area)
Age				
20–29	128 (43.3)	139 (56.8)	1	1
30–39	251 (74.2)	74 (25.8)	0.26 (0.17–0.41)	0.26 (0.16–0.42)
40–49	539 (66.3)	50 (19.8)	0.18 (0.11–0.32)	0.19 (0.10–0.35) *
Area of residence				
Rural	270 (72.9)	102 (27.1)	1	1
Urban	269 (61.9)	161 (38.1)	1.66 (1.17–2.35) *	1.7 (1.23–2.35) *
Ethnicity				
Goan	424 (66.2)	224 (33.8)	1	1
Non-Goan	115 (66.7)	41 (33.3)	0.98 (0.53–1.8)	1.04 (0.49–2.22)
Religion				
Hindus & others	448 (68)	201 (32)	1	1
Muslim	26 (80.9)	9 (19.1)	0.50 (0.25–0.98) *	0.53 (0.28–1.01)
Christian	65 (52.4)	53 (47.7)	1.18 (1.19–3.15) *	1.5 (1.02–2.20) *
Education				
No high school	180 (66.9)	84 (33.1)	1	1
High School & above	359 (66)	179 (34)	1.04 (0.49–2.24)	0.69 (0.34–1.42)
Marital status				
Married	377 (74.3)	124 (25.7)	1	1
Separated	7 (85)	2 (15)	0.51 (0.09–2.84)	0.52 (0.08–3.25)
Never married	155 (51.2)	137 (48.8)	2.76 (1.84–4.14)	1.00 (0.60–1.64)
Employment				
Employed	517 (66.5)	247 (33.5)	1	1
Unemployed	22 (62.4)	16 (37.6)	1.19 (0.45–3.16)	1.00 (0.45–2.20)
Standard of Living Index				
Rich (upper 1/3)	122 (68.4)	64 (31.6)	1	1
Middle	328 (66.1)	150 (33.9)	1.11 (0.83–1.48)	1.27 (0.79–2.05)
Poor (Lower 1/3 rd)	89 (66.3)	49 (33.7)	1.26 (0.79–2.03)	2.78 (1.53–5.05) *

*
P<0.05

Note: Standard error estimates were corrected for design effects by Taylor series linearization

Table 2

Age of drinking onset and adverse adult outcome among men in Goa, India (n=722)

Age of drinking onset	AUDIT 8 Hazardous/harmful alcohol use (Weighted %)	Binge drinking (weekly or more frequently) (Weighted %)	Injury-ever (self/others under the influence) (Weighted %)	Injury-12months (self/others under the influence) (Weighted %)	Psychological distress (GHQ +) (Weighted %)	DSM-IV Alcohol dependence (Weighted %)
20 years	155 (32)	86 (17.8)	22 (4.4)	8 (1.46)	42 (8.0)	42 (7.7)
19 years	105 (45.6)	65 (28.2)	24 (11)	13 (4.9)	27 (12)	45 (18.8)
	OR	OR	OR	OR	OR	OR
	1.78 (1.33–2.37)*	1.81 (1.22–2.69)*	2.71 (1.49–4.93)*	3.47 (1.52–7.92)*	1.57 (0.85–2.9)	2.77 (1.94–3.96)*
	Adj: OR	Adj: OR	Adj: OR	Adj: OR	Adj: OR	Adj: OR
	1.9 (1.17–3.08)*	1.44 (0.95–2.18)	3.07 (1.16–8.14)*	3.04 (1.35–6.81)*	2.82 (1.41–5.63)*	2.56 (1.79–3.68)*

Adjusted for age, area, Standard of Living Index (SLI) & life time duration of alcohol use

* P<0.05