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Alcohol use and depression during adolescence and young adulthood: a summary and interpretation of mixed findings

P Pedrelli[1,2], **B Shapero**[1,2], **A Archibald**[1], and **C Dale**[1]

[1]Massachusetts General Hospital

[2]Harvard Medical School

Abstract

Alcohol Use Disorder (AUD) and alcohol misuse are common among adolescents and young adults and are associated with significant personal and societal problems. Similarly, Major Depressive Disorder (MDD) and depressive symptoms are prevalent in this population and when they co-occur with alcohol misuse lead to even more severe consequences. Numerous studies have investigated the association between depressive symptoms, AUD and various drinking behaviors presenting an unclear picture. In this review we summarize studies among adolescents and young adults that have examined these relationships. From this review it emerges that several factors affect results, including study design (cross-sectional vs longitudinal), participants' age (adolescents vs young adults), severity of problems considered (AUD vs heavy drinking; MDD vs depressive symptoms), and gender. Adolescents with AUD are at higher risk for MDD in particular at a younger age. During adolescence, several drinking behaviors, including weekly alcohol use and heavy drinking, increase the risk for depressive symptoms and MDD, while during young adulthood primarily AUD, but not other drinking behaviors, is associated with increased risk for MDD. Gender may have an effect on the association between depression and drinking behaviors but its role is still unclear. Some evidence suggests that the association between AUD and MDD is bidirectional such that mood problems contribute to the onset of alcohol problems and vice-versa. More longitudinal studies are needed to examine these associations in young adults and to clarify the effect of gender on these associations. To date, findings suggest the critical need to reduce any alcohol use at a young age and to treat both depressive symptoms and AUD to prevent the occurrence of comorbid disorders.

Corresponding author: Paola Pedrelli, One Bowdoin Square 6th Floor, Boston, MA 02114, ppedrelli@mgh.harvard.edu; phone: 617-724-3678, fax: 617-724-3028.

Pedrelli Paola, Ph.D., One Bowdoin Square 6th Floor, Boston, MA 02114, ppedrelli@mgh.harvard.edu, phone: 617-724-3678, fax: 617-724-3028

Shapero Ben, Ph.D., One Bowdoin Square 6th Floor, Boston, MA 02114, bshapero@mgh.harvard.edu, phone: 617-724-3678, fax: 617-724-3028

Archibald A, BA, One Bowdoin Square 6th Floor, Boston, MA 02114, aarchibald@mgh.harvard.edu, phone: 617-724-3222, fax: 617-724-3028

Dale Chelsea, BA, One Bowdoin Square 6th Floor, Boston, MA 02114, cfdale@mgh.harvard.edu, phone: 617-724-2936, fax: 617-724-3028

Compliance with Ethics Guidelines

Human and Animal Rights and Informed Consent

This article does not contain any studies with human or animal subjects performed by any of the authors.

Conflict of Interest

Paola Pedrelli, Ben Shapero, Abigail Archibald and Chelsea Dale declare that they have no conflict of interest.

Keywords

Alcohol Use Disorder; heavy drinking; Major Depressive Disorder; depressive symptoms; adolescence; young adulthood

Introduction

Most mental health disorders have their onset during young adulthood[1] (Pedrelli et al 2015). It has been reported that two thirds of individuals who will experience a mental health disorder experience their first onset by age 25[2]. Two of the most common conditions present among adolescents and young adults are problematic alcohol use and depressive symptoms.

Problematic alcohol use increases progressively during adolescence and young adulthood[3]. In 2014, 2.7% of 12–17 year-old adolescents and 12.3% of young adults 18–25 years old met criteria for an Alcohol Use Disorder (AUD) in the previous year[3]. Heavy episodic drinking has been defined as consuming 4 standard drinks for women and 5 for men[4] and "binge drinking" constitutes this level of consumption within a 2-hour period [5]. In 2014 6.1% of adolescents 12 to 17 years old and approximately 37% of young adults 18–25 years old engaged in past month heavy episodic drinking[3]. Heavy alcohol consumption in youth is associated with severe problems including suicide, motor vehicle accidents, accidental injuries, sexual transmitted diseases, sexual assaults, as well as impairments in prefrontal cortex functions such as memory and attention [6–9]. Furthermore, many adolescents and young adults who are heavy drinkers continue to exhibit alcohol-related problems in adulthood[10,11] and later develop an AUD[12]. Underage drinking costs $27 billion per year and a significant portion of these costs are due to lost productivity, youth violence (suicide, homicide, aggravated assault) and premature death[13].

Major Depressive Disorder (MDD) is a common, recurrent, and debilitating disorder that impacts individuals and society as a whole[14–16]. MDD is the fourth leading cause of disability and premature death worldwide[17] and leads to greater impairment and work functioning than any other individual chronic medical conditions[18]. The one-year prevalence rates of depression are relatively low in childhood but dramatically surge, as much as six-fold, from early to late adolescence[16,19]. Over half of all cases of depression have a first onset during childhood, adolescence or young adulthood[20]. In 2014, approximately 11.7% of adolescents between 12 and 17 years old and approximately 10% of young adults between 18–25 years old had a Major Depressive Episode in the previous year[3]. Moreover, approximately 30% of young adults report that at least once in the previous year they felt so sad that they were unable to function[21]. Adolescence is a developmental period with a number of important transitions including puberty, shifting parental and peer support, dating, self-identity, and cognitive maturation[22]. Similarly, young adulthood represents a critical period of role transition and adjustment that is characterized by a new level of independence and increased pressures and responsibilities[23]. The increase in stressful life[24] events may contribute to the high onset of MDD in youth[25,26].

Given the high prevalence of mood disturbances and alcohol use during adolescence (12–17) and young adulthood (18–25) these conditions often co-occur in this population and it has

been hypothesized that they may be associated[27]. While numerous studies have been conducted in this area the nature of their association is still unclear. Here we will briefly summarize findings on the relationship between mood and drinking behaviors among adolescents and young adults, and we will differentiate the types of condition examined as it may have an effect on outcome (i.e. MDD vs depressive symptoms, AUD vs heavy drinking) and the design used (longitudinal vs cross-sectional). Gender may also have an effect on the relationship between mood and drinking behaviors. Higher numbers of adolescent and young adult men meet criteria for AUD, and engage in heavy drinking[28,29]. Furthermore, women and men metabolize alcohol differently, which may influence the degree of intoxication (e.g., blood alcohol content) resulting from consuming the same amount of alcohol[30]. However, more women experience depressive symptoms than men[27,31]. By age 14, girls experience depression at two and three times the rate of boys [32]. Thus, we will also summarize studies that examined the effect of gender on the association between mood and drinking behaviors.

Depression and drinking behaviors

Prospective studies of alcohol or AUD predicting MDD or depressive symptoms

One longitudinal study that focused only on the adolescent years found that higher frequency of alcohol use during early adolescence was associated with MDD during late adolescence [33]. Several studies including assessments from adolescence until young adulthood have consistently shown that AUD and sub-threshold AUD during adolescence predicts MDD during adolescence and during early adulthood [34–37]. Specifically, adolescents with AUD are twice as likely as those with sub-threshold AUD and non-problematic alcohol use to have a mood disorder during young adulthood. Adolescents with sub-threshold AUD are 1.5 more likely to have a mood disorder than those with non-problematic alcohol use[37]. Moreover, adolescents with subthreshold AUD are also at higher risk for subthreshold MDD during young adulthood[37].

There is minimal support for an increased risk for MDD in the presence of heavy drinking. One longitudinal study spanning from adolescence to young adulthood found heavy drinking at age 16 to predict presence of MDD during young adulthood[38]. However, the size of the association was small and heavy drinking at 18 did not predict MDD during young adulthood. Similarly, another longitudinal study did not find that a heavy drinking trajectory from adolescence to young adulthood predicted MDD during young adulthood[39]. Thus, further studies are needed to evaluate the increased risk for MDD among heavy drinking adolescents.

A recent meta-analysis[40] summarized most of the longitudinal studies examining the effect of alcohol use and of frequency of alcohol use on depressive symptoms and MDD during adolescence and young adulthood. A small but significant mean effect size was found for the association between more frequent alcohol use and higher levels of depression. High heterogeneity among studies and greater mean effect size for senior adolescents (16–18 years) relative to junior adolescents (12–15 years) were also found. Higher alcohol consumption was also associated with higher levels of depression with a small but significant mean effect size. Consistently, another study that was not included in the meta-

analyses found a small effect size for an increased risk for depressive symptoms during adolescence and young adulthood among those who consumed alcohol during adolescence[41]. Thus, higher alcohol consumption and alcohol frequency increase the risk for the occurrence of depression, although the increased risk may be small in magnitude. Moreover, heterogeneity among studies suggest the existence of moderators including age.

Prospective studies of MDD or depressive symptoms predicting AUD or drinking

While limited information is available about the risk for developing AUD among adolescents with MDD, several longitudinal studies following participants from childhood or adolescence to young adulthood have examined depressive symptoms and a number of drinking behaviors. One prospective study found that childhood depression did not predict earlier development of alcohol abuse during young adulthood and that depression during adolescence was not associated with later alcohol use during young adulthood[42]. Conversely, several longitudinal studies show that depressed mood during childhood and adolescence is associated with a number of drinking behaviors. For example, depressive symptoms during adolescence are prospectively associated with higher and more frequent alcohol use during adolescence[41,43,44] and with hazardous alcohol use during young adulthood[34]. Moreover, children and adolescents with worse depressive symptoms are at higher risk to report alcohol intoxication during adolescence and have a two-fold increase in risk of alcohol dependence in young adulthood[42]. Thus, depressive symptoms during childhood or adolescence increase the risk for alcohol dependence and for earlier onset of alcohol use and higher alcohol consumptions.

Cross-sectional studies on MDD, depressive symptoms, AUD and drinking during adolescence

Several cross-sectional studies have examined the associations among MDD, depressive symptoms, AUD and drinking during adolescence. One study found that in adolescents MDD and AUD are correlated[35] and a number of studies suggest an association between depressive symptoms and drinking behaviors including higher alcohol consumption and higher frequency of alcohol use and binge drinking[45–47]. Some of these studies have found differences across genders that we will illustrate in a later section.

Cross-sectional studies on MDD, depressive symptoms, AUD and drinking during young adulthood

Cross-sectional studies examining MDD and AUD among young adults present mixed findings. One study found a correlation between MDD and AUD among young adults[35]. Similarly, another study found an association between past year MDD and AUD in young adults not attending college but not among those in college[48]. However, one study based on a large national sample did not find a cross-sectional association between past month MDD and AUD during young adulthood[49]. The mixed findings may be due to the fact that the three studies varied in sample size, participants' characteristics (college students vs general population) and age considered (different ages during young adulthood).

The association between MDD and heavy drinking among young adults needs to be further examined. A study on college students found that MDD was associated with less frequent

heavy drinking and that the effect was driven by males, as they found that the risk for heavy drinking among those with MDD was significantly lower for males compared to females[50]. However, the study included both graduate and undergraduate students and while most people in college are young adults it is not known whether participants were all young adults and the inclusion of graduate students who tend to drink heavily less may have affected the results.

Cross-sectional studies among young adults that have examined the association between depressive symptoms and drinking behaviors not classified as AUD have included primarily college students and present a complex picture. In this population, depressive symptoms have been found to be associated with ever engaging in binge drinking[51], problematic alcohol use[52] and higher daily alcohol use in male but not in female young adults[53]. Conversely, associations have not been found between depressive symptoms and past month drinking days[54], drinks per month[55], weekly drinks[56] and frequent binge drinking [54,57]. The studies with positive results have tended to include large sample sizes[50,52], while those with negative results had small sample sizes[54–56]. Positive studies have found associations of small magnitude between depressive symptoms and drinking behaviors and thus studies with small samples may not have the power to identify them. Moreover, the effect of gender was not systematically examined which may have contribute to the mixed findings.

Inconsistent findings may be also due to the fact that as adolescents enter young adulthood, a stage where alcohol use is highly prevalent, they may consume alcohol for reasons other than negative mood. Thus, the contribution of mood on drinking may become smaller, in particular with regard to drinking behaviors such as daily alcohol use, and binge drinking. Consistently, the association between mood and drinking behaviors in youth changes over time. Several studies have observed that while depressive symptoms effect alcohol use and frequency during adolescence, its effect lessens over time[44, 58].

Gender and the relationship between MDD, depressive symptoms, AUD and drinking

Inconsistent gender differences in the relationship between depressive symptoms and drinking behaviors have been reported. For example, a number of studies found stronger associations between drinking behaviors in females relative to males and that depression predicted alcohol use even when controlling for other variables in females but not in males. A longitudinal study found that the association between depression during early adolescence and hazardous alcohol use (i.e., higher scores on the Alcohol Use Disorders Identification Test[59]) during young adulthood[34] was stronger in females than in males and that in males the association was reduced substantially in a multivariate analysis including conduct disorders and cannabis use[34]. A large cross-sectional study found that depression was more prevalent among adolescents with high alcohol consumption than among those with no alcohol use[46]. However, in a multivariate analyses including substance use, the association between high alcohol use and depression continued to be present in females but not in males. In a longitudinal study, worse depressive symptoms during adolescence were associated with later higher frequency of alcohol use among female but not male adolescents. However, the latter study did not include variables on substance use in the analyses. Conversely, one prospective study showed that the association between depressed mood during early

adolescence and higher alcohol use during late adolescence was stronger in boys than girls[41] and a cross-sectional study found that depressive symptoms were associated with higher daily alcohol use in male but not in female young adults in college[53]. However, these latter two studies did not examine substance use.

Gender differences in the associations between depressive symptoms and drinking behaviors may be due to differences among studies in participants' age, instruments used to assess depression and alcohol use, sample size, and study design (cross-sectional vs longitudinal; inclusion in the analyses of substance use or conduct disorders). Preliminary information suggests that in male youths co-occurring substance use may influence the association between drinking behaviors and depression. However, given that the co-occurrence among alcohol use and substance use is more prevalent in male than female youth[60] and that depression is less prevalent in men than women[27,31], future studies should further clarify these associations.

Direction of the association between AUD and MDD

Most studies have examined whether depressive symptoms predict alcohol problems or vice versa but it is also critical to determine which condition is most likely to occur first and whether the association between these problems is bidirectional. One longitudinal study with data spanning from adolescence to young adulthood compared three models: one where MDD led to AUD, one where AUD led to MDD and one including a bidirectional relationship between the two disorders. Results showed that the best fitting model was one in which there was a unidirectional association between AUD to MDD but not a reverse effect from MDD to AUD[61]. Another study examined the prospective associations between MDD and AUD from adolescence to young adulthood and found that the presence of AUD during adolescence predicted early adulthood MDD, and early adulthood MDD predicted adult AUD suggesting a bidirectional influence[34]. Moreover, they examined temporal ordering of MDD and AUD in individuals with cumulative comorbidity by age 30 and noted that MDD occurred before AUD in 57% of individuals, AUD occurred first in 41% of cases, suggesting that MDD tends to occur before AUD. A third study examined retrospectively correlates of MDD among 424 college students and noted that in their sample, alcohol abuse developed subsequent to the onset of MDD[62]. Finally, a prospective study of depressive symptoms and heavy episodic drinking over 4 weeks documented that depressive symptoms increased the risk for heavy episodic drinking but heavy episodic drinking did not predict depressive symptoms[63]. In aggregate these findings suggest an association between MDD and AUD and that in many cases MDD precedes AUD.

Conclusion

Together these findings suggest the presence, among adolescents and young adults, of a relationship between alcohol use and depression that depends on various factors including severity of the problems examined (AUD, alcohol consumption, heavy drinking, MDD, depressive symptoms), and participants' developmental phase (adolescence vs young adulthood) and gender. Among adolescents with AUD, there is a strong support for a higher risk for developing MDD during adolescence or young adulthood. Similarly, alcohol use and

alcohol frequency increases the risk for MDD and depressive symptoms prospectively, although the effect sizes are small. Less clear is whether adolescents with MDD are at higher risk to develop AUD during young adulthood. Moreover, among young adults with AUD the risk for a co-occurring MDD may be higher among those not in college than among those in college. Similarly, heavy drinking may not increase the risk for MDD among young adults. Mixed findings on the effect of gender on the association between depressive symptoms and drinking behaviors underline the importance to continue to examine gender differences.

The direction of the association between mood and alcohol problems is unclear. It has not been determined if in adolescence and young adulthood mood disorders lead to AUD, if AUD leads to mood disorders or if the two conditions have a bi-directional association. Current knowledge suggests that all three scenarios may be true. The presence of a bidirectional association where both MDD and AUD may trigger a cycle of co-occurring problems is concerning. While it has been found retrospectively that MDD is reported to occur prior to an AUD episode there is limited longitudinal support for MDD increasing the risk for the onset of AUD.

The association between MDD and AUD may be explained by both environmental and biological causes. The presence of AUD or drinking in general at an early age may lead to environmental stressors (i.e. poor academic performance, poor relationship with parents, legal problems)[64–66], which in turn may lead to MDD. Moreover, AUD and drinking may lead to biological changes that may lead to increased vulnerability to MDD[67]. Adolescents may be vulnerable to developing mood disorders when they engage in a variety of drinking behaviors, even without an AUD, both because their brain is still developing[69] and because of a higher risk for environmental stressors associated with consuming alcohol at a young age. Alcohol use may have a stronger effect on the brain of adolescents[69,70] than on that of adults, thus increasing the risk for mood problems. As such, evidence is accumulating that heavy drinking during youth has a negative effect on the brain[71]. Alternatively, the presence of MDD following AUD or of depressive symptoms and alcohol could be explained by drinking to cope with negative mood or “self-medication”[72].

An important developmental finding to highlight is that the association between mood and drinking behaviors changes over time. As such different patterns of findings were found among adolescents and young adults. Longitudinal studies ought to further examine the association between mood and alcohol at different developmental stages and consider the effect of gender on these associations. This brief summary suggests that AUD and any alcohol use may put this population at higher risk for developing mood problems. Thus, prevention programs should address and reduce any alcohol involvement among adolescents. Moreover, prevention programs ought to carefully screen adolescents and young adults to identify mood problems that should be treated promptly.

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