

# Adolescent Substance Abuse and Psychiatric Comorbidities

Deborah Deas, M.D., M.P.H.

Substance use disorders have a serious impact on adolescents because these disorders have high prevalence rates and frequent associations with psychiatric disorders. Surveys of adolescent behaviors and substance use show that alcohol is the most common substance abused by adolescents. Despite the high rates of current alcohol use and binge drinking among adolescents, current diagnostic criteria are problematic. Adolescents may have a developing problem with substance dependence but not meet criteria for either substance abuse or dependence. At-risk adolescents, called “diagnostic orphans,” may meet only 1 or 2 criteria for alcohol dependence and no abuse criteria and therefore do not receive an alcohol use disorder diagnosis from the *Diagnostic and Statistical Manual of Mental Disorders*, Fourth Edition, Text Revision. Adolescents with substance use disorders tend to have higher rates of comorbid psychiatric disorders and are more likely to report a history of trauma and physical and/or sexual abuse than adolescents without a substance use disorder. In addition, psychiatric disorders in adolescents often predate the substance use disorder. Once the substance use disorder develops, the psychiatric disorder may be further exacerbated.

(*J Clin Psychiatry* 2006;67[suppl 7]:18–23)

The prevalence rates of adolescent substance use are alarming and further complicated by associated high-risk behaviors and psychiatric comorbidity. Despite high prevalence rates for substance use, adolescents are not always diagnosed with substance abuse or dependence because they may not fully meet current diagnostic criteria from the *Diagnostic and Statistical Manual of Mental Disorders*, Fourth Edition, Text Revision (DSM-IV-TR).<sup>1</sup> Unfortunately, these adolescents may “fall through the cracks” and fail to get warranted early intervention.

## EPIDEMIOLOGY OF SUBSTANCE USE

### Studies of Adolescent Behaviors

To illustrate the epidemiology of substance use, the results of 2 national surveys of adolescent substance use and 1 study of negative and unhealthy behaviors among ado-

lescents will be used. The results of this research show a lifetime prevalence of substance use that is highest for alcohol, followed by nicotine or cigarettes, marijuana, and inhalants.

The Monitoring the Future Survey by Johnston et al.<sup>2</sup> is an annual survey of adolescents in secondary school—specifically, students in 8th, 10th, and 12th grades conducted by the University of Michigan. The results of the survey illustrate trends and prevalence rates in substance use among adolescents and young adults from 1975 to the present.

The 2003 National Survey on Drug Use and Health (herein called the National Household Survey)<sup>3</sup> is an annual survey of youths and young adults aged 12 years and older conducted by the Substance Abuse and Mental Health Services Administration of the U.S. Department of Health and Human Services. The data illustrate rates of usage and prevalence related to illicit drugs, alcohol, and tobacco products.

The 2003 report of Youth Risk Behavior Surveillance (herein called the Youth Risk report)<sup>4</sup> monitored 6 health-risk behaviors among youth and young adults. The behaviors studied were behaviors that contribute to unintentional injuries and violence, tobacco use, alcohol and other drug use, sexual behaviors that contribute to unintended pregnancy and sexually transmitted diseases, unhealthy dietary behaviors, and physical inactivity. Data on youth and young adults were taken from national, state, and local school-based surveys conducted among students in grades 9 through 12 from February to December 2003.

---

From the Department of Psychiatry and Behavioral Sciences, Medical University of South Carolina, Charleston.

This article is derived from the planning teleconference series “The Challenges of Dual Diagnosis: Managing Substance Abuse in Severe Mental Illness,” which was held in December 2005 and supported by an educational grant from AstraZeneca Pharmaceuticals LP.

The author wishes to acknowledge Courtney Merritt, B.S., and Natalie G. Johnson, M.A., for their assistance with manuscript preparation.

Corresponding author and reprints: Deborah Deas, M.D., M.P.H., Department of Psychiatry and Behavioral Sciences, Medical University of South Carolina, 67 President St., Charleston, SC 29417 (e-mail: deasd@musc.edu).

One major problem with this research is that the data collected from self-reporting in the school or home setting may not reflect accurate trends and prevalence rates. Many adolescents who engage in substance use may not participate in the surveys because they are not in school or at home when the surveys are conducted due to truancy, incarceration, or placement in residential or outpatient substance use treatment programs. Because these adolescents are missing from the surveys, the collected data may inaccurately reflect lower prevalence rates of adolescent substance use than would be reported if these adolescents had participated.

### Survey Results on Alcohol Use

Alcohol is the most common substance used by adolescents, according to data from the Monitoring the Future Survey and the National Household Survey. Data from the Monitoring the Future Survey<sup>2</sup> showed a lifetime prevalence of alcohol use among adolescents ranging from 78% in 2000 to 80% in 2003. The 2003 National Household Survey<sup>3</sup> reported a lifetime prevalence of 83.0% for 12th-grade students. However, lifetime prevalence does not necessarily reflect current use or problems related to use. To show current alcohol use, the National Household Survey and Youth Risk report asked students whether alcohol was consumed within 30 days before the time of the survey. Results of the National Household Survey<sup>3</sup> revealed that in 2003, current use increased from 2.9% at age 12 to 70% at ages 21 and 22. The results of the Youth Risk report<sup>4</sup> showed a nationwide prevalence of 44.9%. Results of the Monitoring the Future Survey<sup>2</sup> showed that 78% of 12th-grade students tried alcohol.

### Survey Results on Binge Drinking

Binge drinking may function as a proxy of whether students have problematic drinking. Each survey defined binge drinking similarly but used different terminology. The Monitoring the Future Survey used the term *occasions of heavy drinking* to describe the consumption of 5 or more drinks in a row at least once in the prior 2-week period. The National Household Survey used the term *binge drinking* to describe 5 or more drinks consumed on the same occasion at least once in the past 30 days. The Youth Risk report used the term *episodic heavy drinking* to describe the consumption of more than 5 alcoholic drinks in a row within 30 days before the survey.

Results of the Monitoring the Future Survey<sup>2</sup> revealed that 29% of 12th graders had a higher rate of occasions of heavy drinking than students of other grades, and the National Household Survey<sup>3</sup> showed that 41.6% of young adults between the ages of 18 and 25 had a higher rate of binge drinking than individuals younger than 18 and older than 25. The Youth Risk report<sup>4</sup> showed that 28.3% of students nationwide participated in episodic heavy drinking. Male students used alcohol more frequently and

were more likely to binge drink than female students. Results of the Monitoring the Future Survey<sup>2</sup> showed that males had a higher prevalence rate of binge drinking (34%) than that of females (23%).

The Monitoring the Future Survey and National Household Survey also found that white students had higher rates of binge drinking. The Monitoring the Future Survey<sup>2</sup> revealed prevalence rates of binge drinking of 34% for white students compared with 26% for Hispanic students and 12% for African American students. The National Household Survey<sup>3</sup> showed prevalence rates of binge drinking of 23.6% for white youths, which was lower than the prevalence for Hispanic youths (24.2%) but higher than the prevalence for African American youths (19%).

### Survey Results on Illicit Drug Use

Increased rates of alcohol abuse are associated with the abuse and dependence of illicit drugs such as marijuana. Results of the National Household Survey<sup>3</sup> showed that 64.5% of youths aged 12 to 17 years who were heavy drinkers also used illicit drugs compared with 5.1% of adolescents who were nondrinkers. In addition, 72.4% of adolescents who were both smokers and heavy drinkers also used illicit drugs compared with only 3.7% of youths who did not drink or smoke. However, after reaching prevalence rates close to 50% among adolescents,<sup>2</sup> prevalence rates have begun to decline.

## ASSESSMENT FOR SUBSTANCE USE

### DSM-IV-TR Diagnostic Criteria

The DSM-IV-TR<sup>1</sup> outlines specific diagnostic criteria that individuals must meet in order to be diagnosed with either a substance abuse or dependence disorder. To meet the criteria for substance abuse, an individual must exhibit at least 1 of the 4 following symptoms within the past 12 months: role impairment, hazardous use, legal problems, or social problems. To meet the criteria for substance dependence, an individual must meet 3 of the 7 following symptoms within the past 12 months: tolerance, withdrawal, more or longer use than intended, desire or attempts to quit or cut down, much time using, decreasing in one's activities in order to use, or psychological or physical problems related to the substance.

Physicians should use caution when employing DSM-IV-TR criteria to diagnose a substance use disorder in adolescents. Adolescents may not meet all DSM-IV-TR diagnostic criteria for either substance abuse or dependence but nevertheless may have a developing problem with substance dependence. It is particularly important to identify adolescent substance use early because its course may be temporally impacted. Grant et al.<sup>5</sup> found that individuals who initiated substance use during adolescence were likely to develop dependence more quickly than if they

**Table 1. Prevalence of Substance Abuse and Dependence Diagnostic Categories Among Substance Users in a Survey of 9th and 12th Graders<sup>a</sup>**

Diagnostic Category	9th Graders (N = 23,544)	12th Graders (N = 21,057)
Substance use with no symptoms, %	64.9	56.8
1 or 2 dependence symptoms; no diagnosis, %	13.0	9.9
Substance abuse diagnosis, %	13.8	22.7
Substance dependence diagnosis, %	8.2	10.5

<sup>a</sup>Reprinted with permission from Harrison et al.<sup>8</sup>

had initiated substance use later in life. Adolescents with only 2 symptoms of substance dependence may not meet full DSM-IV-TR diagnostic criteria for dependence, but based on findings from Grant et al.,<sup>5</sup> these adolescents may have a high probability of meeting further criteria as the course of their substance use continues and worsens with age.

### Diagnostic Orphans

Pollock and Martin<sup>6</sup> suggested labeling adolescents who meet some of the criteria for alcohol dependence and who are, therefore, at increased risk for developing alcohol dependence as “diagnostic orphans.” Included in the study were 372 regular drinkers between the ages of 13 and 19 who had 1 or 2 DSM-IV-TR symptoms for alcohol dependence but who did not meet the full DSM-IV-TR criteria for either alcohol abuse or alcohol dependence disorders. High prevalence rates for substance abuse were found. Of the 127 drinkers without an alcohol abuse or dependence disorder, 39 (31%) met the criteria for diagnostic orphans. In addition, compared with other drinkers, diagnostic orphans had a greater number of average drinks per occasion (6.8 compared with 3.6), more drinking occasions per month (4.5 compared with 2.4), and a greater number of drinks in the previous year (465 compared with 249).

Research by Lewinsohn et al.<sup>7</sup> in 1,507 adolescents between the ages of 14 and 18 years also found that a high number of adolescents surveyed met Pollock and Martin’s diagnostic orphan criteria. Although only 6% of the total subjects met full DSM-IV-TR criteria for a diagnosis, approximately 17% had at least one alcohol abuse or dependence symptom. Further, research from Harrison et al.<sup>8</sup> (Table 1), based on results from a statewide survey of 74,008 students in Minnesota, found a high number of diagnostic orphans. Of 23,544 students in the 9th grade, 13% had 1 or 2 symptoms for dependence but no diagnosis while, of 21,057 students in the 12th grade, 9.9% had 1 or 2 symptoms for dependence but no diagnosis. Although these percentages may not seem high, it is noteworthy that the percentages match those of students who met criteria for diagnoses (13.8% of 9th-grade students and 22.7% of 12th-grade students had a diagnosis of substance abuse).

Adolescents should be carefully assessed for substance use disorders. Assessments should not specifically be based on DSM-IV-TR criteria without considering the diagnosis of an alcohol use disorder not otherwise specified or substance use disorder not otherwise specified.

## COMORBIDITY

Comorbid psychiatric disorders are common among adolescents with substance use disorders. Adolescents who have a history of anxiety and depressive disorders have been shown to have twice the risk for later developing substance use.<sup>9</sup> Furthermore, individuals with the onset of substance use disorders during adolescence are more likely to experience depressive symptoms as well as attempt suicide than those individuals that have a later onset of their substance use.<sup>10</sup>

### Relationship of Psychiatric Disorders and Substance Use

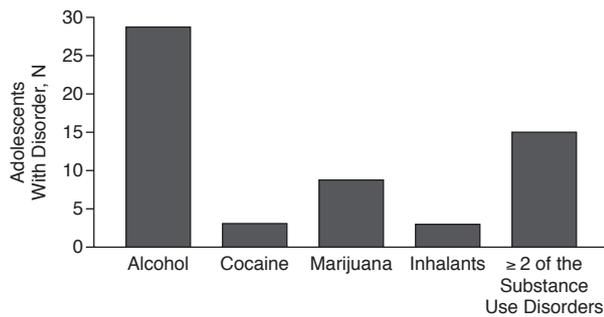
The Methods for the Epidemiology of Child and Adolescent Mental Disorders study<sup>11</sup> revealed higher rates of mood and disruptive disorders among adolescents with current substance use disorders than among those without substance use disorders. Of the 401 adolescents enrolled in this study, 25 (6.2%) had a substance use disorder diagnosis. Of these, 76% had an anxiety, mood, or disruptive disorder compared with 24.5% of the adolescents without a substance use disorder diagnosis.

Disruptive disorders in adolescents with a substance use disorder may be associated with poor prognosis and treatment outcome. Kaminer and Burleson<sup>12</sup> showed that among treatment-seeking adolescents who used substances, those with an affective or adjustment disorder had a better prognosis for completing treatment than those with a disruptive disorder, such as conduct disorder.

### Frequency of Psychiatric Diagnoses in Patients With Substance Use

Deas-Nesmith et al.<sup>13</sup> conducted a survey to explore substance use among adolescents consecutively admitted to a psychiatric treatment facility. The adolescents were admitted primarily for psychiatric reasons and not for substance use, and any current substance use was not regularly assessed. Results of the study showed that 33 of the 100 consecutively admitted adolescents disclosed substance use and that many adolescents met criteria for a substance abuse or dependence disorder (Figure 1), including 29 adolescents who met criteria for an alcohol use disorder. Adolescents with a substance use disorder were more likely to report a history of trauma and physical and/or sexual abuse than adolescents without a substance use disorder, which coincides with the findings of other studies of trauma and substance use disorders.<sup>14-17</sup> Of the 33 adolescents who reported substance use, 25 (75.8%) reported a history of

Figure 1. Substance Use Disorders Among 100 Adolescents Consecutively Admitted for Psychiatric Treatment<sup>a</sup>



<sup>a</sup>Data from Deas-Nesmith et al.<sup>13</sup>

trauma. Of the 67 adolescents who reported no substance use, 37 (55.2%) reported a history of trauma.<sup>13</sup>

Interestingly, more adolescents without a substance use disorder reported having past hospitalization or past family history of a medical problem than those with a substance use disorder. Of the 33 adolescents who reported substance use, 10 (30.3%) reported past medical hospitalization and 8 (24.2%) reported past family medical problems. Of the 67 adolescents who reported no substance use, 35 (52.2%) reported past medical hospitalizations and 31 (46.3%) reported past family medical problems. These findings suggest that the presence of a medical problem may hinder or impede having or initiating substance use.

### Comorbid Disorders

Comorbidity is very common among individuals with substance use disorders, and oftentimes it is difficult to distinguish which disorder comes first, the psychiatric or the substance use.

**Depression.** Among adolescents, depression commonly coexists with substance use disorder. Up to 35% of depressed adolescents develop substance use disorder.<sup>18</sup> In addition, dysthymia is as prevalent as major depression in adolescents, and, as shown with adult depression, secondary depression is not as likely to remit after the treatment of substance use. Substance use disorders comorbid with depression contribute to increased rates of adolescent suicide. Further, adolescents who attempt suicide are more likely to have the psychosocial stressors of recent interpersonal separation and a history of family dysfunction, especially if they have alcohol abuse plus depression instead of depression alone. For example, adolescents' complaints of interpersonal separation from a boyfriend or a girlfriend may be considered insignificant, but these adolescents are at high risk for suicidal ideation and suicide attempt, especially when alcohol or another substance is involved.

**Anxiety disorder.** Like depression, anxiety disorders commonly coexist with substance use disorder among ado-

lescents. Anxiety symptoms usually precede the onset of substance use in adolescents by approximately 2 years.<sup>19</sup> Anxiety disorders were also found to commonly coexist with substance use disorders among adolescents who had increased rates of anxiety or substance use disorders. Of 90 surveyed adolescents from 3 different inpatient treatment facilities, 40 adolescents (44%) had both anxiety and substance use disorders.<sup>19</sup> In addition, the origin of both disorders may be twofold: adolescents with anxiety disorders may use substances to self-medicate their anxiety or affective disorder, and adolescents vulnerable to anxiety disorders may unmask or cause the disorder to become clinically evident through substance use.

**Bipolar disorder and conduct disorder.** Adolescent-onset bipolar disorder is a substantial risk factor for substance use disorder independent of whether or not the adolescent has conduct disorder.<sup>20</sup> Adolescents with substance use disorder are more likely to have bipolar disorder than adolescents without substance use disorder.<sup>21</sup> Risk factors associated with having comorbid substance use and bipolar disorder include early age at onset for bipolar disorder, male sex, family history of substance use, as well as presence of mixed mania.<sup>22</sup>

The prevalence of conduct disorder plus a substance use disorder among adolescents has been found to be approximately 60%.<sup>23</sup> Having early-onset conduct disorder or juvenile delinquency will strongly predispose an adolescent to developing substance use disorder.<sup>24</sup> Among adolescents, conduct disorder usually precedes the development of the substance use disorder. Juvenile offenders with a substance use disorder have greater additional psychopathology than juvenile offenders without substance use disorder.<sup>25</sup> Female adolescents with conduct disorder have a worse course of substance use than males, as well as progress more quickly to substance use than male adolescents.<sup>26</sup>

The treatment of bipolar with comorbid substance use reduces impairment in both the bipolar disorder and the substance use disorder.<sup>27</sup> In a double-blind trial by Geller et al.,<sup>27</sup> 25 adolescents with bipolar disorder and substance use disorder were randomly assigned to lithium, active medication, or placebo. Adolescents who received lithium had fewer positive drug screens and higher clinical Global Assessment Scale ratings.

**Attention-deficit/hyperactivity disorder.** Attention-deficit/hyperactivity disorder (ADHD) is frequently associated with substance use, but whether ADHD itself predisposes an individual to substance use or whether being treated with medications for ADHD predisposes individuals to substance use is a question that continues to be explored by researchers. A study of alcohol and drug use disorders by Biederman et al.<sup>28</sup> found that adolescents with and without ADHD developed alcohol or drug use disorders at the same rate, suggesting that ADHD alone does not predispose one to a substance use disorder. The study

did find that substance use was predicted by the presence of conduct disorder and bipolar disorder. In addition, Wilens et al.<sup>29</sup> found that ADHD did not predict substance use; however, an adolescent with ADHD who was unmedicated or undertreated was more likely to abuse substances, which underscores the necessity of treating patients with ADHD to full remission.

Another study<sup>30</sup> of 34 treatment-seeking, alcohol-dependent adolescents assessed for a comorbid psychiatric disorder further emphasizes the importance of treating ADHD to full remission. The study found that compared with adolescents without ADHD, adolescents with alcohol use disorder and ADHD reported more drinks per drinking day, had a lower percentage of abstinent days, and reported a greater percentage of heavy drinking days.

### OUTCOME

The presence of a substance use disorder has a substantial effect on psychopathology. Mixed comorbidity (i.e., the presence of both internalizing and externalizing disorders) has been found to be associated with higher levels of substance-related problems and poorer outcomes,<sup>31</sup> and child or adolescent psychopathology, particularly conduct disorder, has been found to be associated with an early age at onset of substance use.<sup>32</sup> A study by Tomlinson et al.<sup>33</sup> that compared adolescents with comorbid substance use and an Axis I psychiatric disorder with adolescents with substance use disorder but without an Axis I psychiatric disorder found that adolescents with the comorbidity received more treatment during the outcome period and were much more likely to use substances following treatment.

Tomlinson et al.<sup>33</sup> also found that adolescents with an internalizing disorder were less likely to use substances posttreatment and adolescents with an externalizing disorder returned to substance use more rapidly. These findings coincide with the results of Kaminer and Burleson et al.,<sup>12</sup> who also found that adolescents with an internalizing disorder (e.g., an affective or adjustment disorder) were more likely to complete treatment than adolescents with an externalizing disorder (e.g., conduct disorder). In addition, Grant et al.<sup>5</sup> assessed the relationship between age at drinking onset and development of alcohol abuse and dependence and found that the longer an adolescent can delay initiating drinking, the better the prognosis.

### CONCLUSION

Substance use remains a public health problem among adolescents. Comorbidity is the rule rather than the exception, and psychiatric disorders often predate substance use disorder. However, treatment can alleviate impairment caused by comorbid psychiatric and substance use

disorders. The earlier the treatment of these adolescents is initiated, the better the outcome. The longer time an adolescent spends in treatment, the better the prognosis.

*Drug name:* lithium (Eskalith, Lithobid, and others).

*Disclosure of off-label usage:* The author has determined that, to the best of her knowledge, no investigational information about pharmaceutical agents that is outside U.S. Food and Drug Administration–approved labeling has been presented in this article.

### REFERENCES

1. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision. Washington, DC: American Psychiatric Association; 2000
2. Johnston LD, O'Malley PM, Bachman JG, et al. Monitoring the Future. National Results on Adolescent Drug Use: Overview of Key Findings, 2003. Bethesda, Md: National Institute on Drug Abuse; 2004. NIH Publication No. 04-5506. Available at: <http://monitoringthefuture.org/pubs/monographs/overview2003.pdf>. Accessed April 14, 2004
3. US Department of Health & Human Services, Substance Abuse and Mental Health Services Administration, Office of Applied Studies. 2003 National Survey on Drug Use and Health: National Findings. Rockville, Md: US Department of Health & Human Services; 2004. NSDUH Series H-25, DHHS publication No. SMA-04-3964. Available at: <http://oas.samhsa.gov/nhsda/2k3nsduh/2k3results.htm>. Accessed March 2, 2006
4. Grunbaum JA, Kann L, Kinchen S, et al. Youth Risk Behavior Surveillance—United States, 2003. MMWR Surveill Summ 2004; 53:1–96. Available at: <http://www.cdc.gov/mmwr/PDF/ss/ss5302.pdf>. Accessed Jan 18, 2006
5. Grant BF, Stinson FS, Harford TC. Age at onset of alcohol use and DSM-IV alcohol abuse and dependence: a 12-year follow-up. J Subst Abuse 2001;13:493–504
6. Pollock NK, Martin CS. Diagnostic orphans: adolescents with alcohol symptom who do not qualify for DSM-IV abuse or dependence diagnoses. Am J Psychiatry 1999;156:897–901
7. Lewinsohn PM, Rohde P, Seeley JR. Alcohol consumption in high school adolescents: frequency of use and dimensional structure of associated problems. Addiction 1996;91:375–390
8. Harrison PA, Fulkerson JA, Beebe TJ. DSM-IV substance use disorder criteria for adolescents: a critical examination based on a statewide school survey. Am J Psychiatry 1998;155:486–492
9. Christie KA, Burke JD, Regier DA, et al. Epidemiologic evidence for early onset of mental disorders and higher risk of drug abuse in young adults. Am J Psychiatry 1988;145:971–975
10. Buckstein OG, Brent DA, Perper JA, et al. Risk factors for completed suicide among adolescents with a lifetime history of substance abuse: a case-control study. Acta Psychiatr Scand 1993;88:403–408
11. Kandel DB, Johnson JG, Bird HR, et al. Psychiatric comorbidity among adolescents with substance use disorders: findings from the MECA Study. J Am Acad Child Adolesc Psychiatry 1999;38:693–699
12. Kaminer Y, Burleson JA. Psychotherapies for adolescent substance abusers: 15-month follow-up of a pilot study. Am J Addict 1999;8:114–119
13. Deas-Nesmith D, Campbell S, Brady KT. Substance use disorders in an adolescent inpatient psychiatric population. J Natl Med Assoc 1998; 90:233–238
14. Cohen FS, Densen-Gerber J. A study of the relationship between child abuse and drug addiction in 178 patients: preliminary results. Child Abuse Negl 1982;6:383–387
15. Harrison PA, Hoffmann NG, Edwall GE. Differential drug use patterns among sexually abused adolescent girls in treatment for chemical dependency. Int J Addict 1989;24:499–514
16. Resnick HS, Kilpatrick DG, Dansky BS, et al. Prevalence of civilian trauma and posttraumatic stress disorder in a representative national sample of women. J Consult Clin Psychol 1993;61:984–991
17. Grice DE, Brady KT, Dustan LR, et al. Sexual and physical assault history and posttraumatic stress disorder in substance-dependent individuals. Am J Addict 1995;4:297–305
18. Rao U, Ryan ND, Dahl RE, et al. Factors associated with the develop-

- ment of substance use disorder in depressed adolescents. *J Am Acad Child Adolesc Psychiatry* 1999;38:1109–1117
19. Deas-Nesmith D, Brady K, Campbell S. Comorbid substance use and anxiety disorders in adolescents. *J Psychopathol Behav Assess* 1998;20:139–148
  20. Wilens TE, Biederman J, Kwon A, et al. Risk of substance use disorders in adolescents with bipolar disorder. *J Am Acad Child Adolesc Psychiatry* 2004;43:1380–1386
  21. Wilens TE, Biederman J, Abrantes A, et al. Clinical characteristics of psychiatrically referred adolescent outpatients with substance use disorder. *J Am Acad Child Adolesc Psychiatry* 1997;36:941–947
  22. Tohen M, Greenfield SF, Weiss RD, et al. The effect of comorbid substance use disorders on the course of bipolar disorder: a review. *Harv Rev Psychiatry* 1998;6:133–141
  23. Armstrong TD, Costello EJ. Community studies on adolescent substance use, abuse, or dependence and psychiatric comorbidity. *J Consult Clin Psychol* 2002;70:1224–1239
  24. Crowley T, Mikulich S, Ehlers K, et al. Validity of structured clinical evaluations in adolescents with conduct and substance problems. *J Am Acad Child Adolesc Psychiatry* 2001;40:265–273
  25. Milin R, Halikas JA, Meller JE, et al. Psychopathology among substance abusing juvenile offenders. *J Am Acad Child Adolesc Psychiatry* 1991;30:569–574
  26. Mezzich A, Moss H, Tarter R, et al. Gender differences in the pattern and progression of substance use in conduct disordered adolescents. *Am J Addict* 1994;3:289–295
  27. Geller B, Cooper TB, Sun K, et al. Double-blind and placebo-controlled study of lithium for adolescent bipolar disorders with secondary substance dependency. *J Am Acad Child Adolesc Psychiatry* 1998;37:171–178
  28. Biederman J, Wilens T, Mick E, et al. Is ADHD a risk factor for psychoactive substance use disorders? findings from a four-year prospective follow-up study. *J Am Acad Child Adolesc Psychiatry* 1997;36:21–29
  29. Wilens TE, Faraone SV, Biederman J, et al. Does stimulant therapy of attention-deficit/hyperactivity disorder beget later substance abuse? a meta-analytic review of the literature. *Pediatrics* 2003;111:179–185
  30. Deas D, Friendly RW, Vo K, et al. Dual diagnosis and drinking behaviors in an outpatient treatment seeking sample of adolescents with alcohol use disorders. *J Dual Diagnosis* 2006;2:45–55
  31. Shane PA, Jasiukaitus P, Green RS. Treatment outcomes among adolescents with substance abuse problems: the relationship between comorbidities and post-treatment substance involvement. *Eval Program Plann* 2003;26:393–402
  32. Armstrong TD, Costello EJ. Community studies on adolescent substance use, abuse, or dependence and psychiatric comorbidity. *J Consult Clin Psychol* 2002;70:1224–1239
  33. Tomlinson KL, Brown SA, Abrantes A. Psychiatric comorbidity and substance use treatment outcomes of adolescents. *Psychol Addict Behav* 2004;18:160–169