

REVIEW

The Dynamics of the Relationship between Attention Deficit Hyperactivity Disorder and Alcohol Use Disorder

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Main Points

- The use of alcohol and substances constitutes a significant risk factor for adults diagnosed with attention-deficit hyperactivity disorder (ADHD).
- Despite its high prevalence, adult ADHD often remains undiagnosed, which also impacts patients with alcohol use disorder (AUD).
- The literature examines the relationship between ADHD and AUD from various perspectives, including genetic, neurobiological, behavioral, and psychosocial factors.
- Combining pharmacological and non-pharmacological interventions is crucial for enhancing patients' quality of life and alleviating the impact of comorbid conditions.

Abstract

Attention-deficit hyperactivity disorder is defined as a neurodevelopmental disorder that begins in childhood and persists into adulthood. The use of alcohol and substances is a significant risk factor for adults diagnosed with attention-deficit hyperactivity disorder. The majority of research has demonstrated a high prevalence of attention-deficit hyperactivity disorder symptoms among individuals with alcohol use disorder. The literature examines the relationship between attention-deficit hyperactivity disorder and alcohol use disorder from various perspectives, including genetic, neurobiological, behavioral, and psychosocial factors. Individuals diagnosed with attention-deficit hyperactivity disorder are recognized to be at an increased risk of developing alcohol use disorder, particularly due to challenges related to impulsivity and emotion regulation. Furthermore, environmental influences, such as family dynamics, along with psychosocial elements like traumatic experiences, also emerge as risk factors for both disorders.

The complex relationship between attention-deficit hyperactivity disorder and alcohol use disorder requires a holistic approach to address both conditions properly. In this context, a multimodal strategy that integrates addiction treatment with mental health support is essential. Combining pharmacological and non-pharmacological interventions is crucial for enhancing patients' quality of life and alleviating the impact of comorbid conditions. Early diagnosis and intervention play a pivotal role in the effective management of these disorders.

Consequently, a comprehensive understanding of both diagnoses, along with an awareness of their interactions, is important for developing effective treatment strategies and interventions.

Keywords: Addiction to alcohol, adult ADHD, alcohol use disorder, attention deficit hyperactivity disorder, emotional regulation, impulsivity

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Introduction

Adult attention-deficit hyperactivity disorder (ADHD) is a neurodevelopmental condition that

begins in childhood and may continue into adulthood (Faraone et al., 2006). Childhood ADHD elevates the likelihood of substance use during teenage

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years and into adulthood (van Emmerik-van Oortmerssen et al., 2012). Furthermore, ADHD serves as a risk factor for ongoing heavy alcohol and illicit drug consumption in young adults (Luderer et al., 2020). Similarly, adult ADHD is frequently observed in individuals with substance use disorder (SUD), including alcohol use disorder (AUD).

Individuals diagnosed with ADHD have a higher likelihood of developing AUD (Vogel et al., 2016). Tuithof et al. (2012) found that the lifetime prevalence of AUD among individuals with ADHD can be as high as 43%. Luderer et al. (2020) reported a prevalence rate of 20.5% for ADHD among 415 inpatients with alcohol dependence. Similarly, Daigre et al. (2015) observed an ADHD prevalence of 21.1% in a study involving 355 outpatients with alcohol dependency. Vogel et al. (2016) reported in their study with a group of men with an average age of 20 that individuals with ADHD started using alcohol, drugs, and tobacco at an earlier age than healthy individuals.

Considering this relationship between AUD and ADHD, it is important to understand both diagnoses and the interaction between them. Understanding the complex interaction between ADHD and AUD is crucial for developing effective treatment strategies and improving outcomes for individuals affected by both conditions.

Background on Adult Attention-Deficit Hyperactivity Disorder and Alcohol Use Disorder

Adult Attention-Deficit Hyperactivity Disorder

The fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) describes ADHD as being marked by symptoms such as inattention, hyperactivity, and/or impulsivity. Attention-Deficit Hyperactivity Disorder notably disrupts social, academic, and/or work-related functioning (American Psychiatric Association, 2013). In adults, the presentation of these symptoms often shifts, with inattention and impulsivity becoming more prominent than hyperactivity. This shift can lead to difficulties in diagnosing ADHD in adults, as symptoms may not be as outwardly apparent as they are in children (Faraone et al., 2006).

The global prevalence of ADHD in children is estimated to be around 5% (Asherson, 2024). Studies estimate that the prevalence of ADHD in adults ranges from 2.5% to 4.4% depending on the diagnostic criteria and population studied (Kessler et al., 2006; Simon et al., 2009). The traits of ADHD observed in children often continue into adulthood, although they are frequently underestimated. As a result, the actual prevalence in adults may be higher than currently reported (Katzman et al., 2017).

Attention-Deficit Hyperactivity Disorder is a neurobiologically based diagnosis involving the interaction of cognitive and emotional processes. Adults with ADHD often struggle with low frustration tolerance, emotional instability, and difficulty managing intense emotions (Nigg et al., 2006). These individuals may experience a persistent sense of restlessness, challenges with relaxation, and mood fluctuations, including episodes of depression and irritability. Attention deficits remain a significant issue, leading to problems with focus, memory, and organization. Impulsivity also

poses challenges, affecting personal relationships and decision-making (Asherson, 2024).

Additionally, many adults with ADHD may have co-occurring psychiatric disorders, such as anxiety, depression, and SUDs, which further complicate the clinical picture and require careful management (Sobanski et al., 2007). The presence of ADHD appears to be a contributing factor that increases alcohol and substance use (Asherson, 2024).

Alcohol Use Disorder

Alcohol use disorder is clinically defined by an inability to control alcohol intake, strong cravings, engaging in hazardous drinking patterns, persistent consumption despite adverse outcomes, difficulties in social functioning, and the development of physical dependence (American Psychiatric Association, 2013). According to the World Health Organization (WHO) data, in 2016, the prevalence of AUD among the population aged 15 and over was estimated to be 5.1% (World Health Organization, 2018). Based on data from the Substance Abuse and Mental Health Services Administration, 10.2% of individuals aged 12 and older experienced an AUD in the past year (Substance Abuse and Mental Health Services Administration, 2024).

Alcohol use disorder presents through multiple symptoms, including physical dependence characterized by tolerance and withdrawal. It also involves behavioral signs, such as prioritizing alcohol over other activities and experiencing conflicts in relationships due to drinking (American Psychiatric Association, 2013). Moreover, individuals with AUD often exhibit high levels of psychiatric comorbidity (Roncero et al., 2019). Research has confirmed a high prevalence of ADHD symptoms among AUD patients undergoing treatment (Bolstad et al., 2021). The prevalence of adult ADHD in patients with AUD is estimated to be between 19.9% and 33% (van Emmerik-van Oortmerssen et al., 2012).

Research has consistently shown that ADHD is a risk factor for continued heavy alcohol and illicit drug use in young adults (Vogel et al., 2016). The relationship between ADHD and AUD is significant, as individuals with ADHD are at a higher risk of developing AUD due to their difficulties with impulse control and emotional regulation, which can exacerbate problematic drinking behaviors (Wilens, 2004). Given this strong overlap, it is crucial to explore the relationship between ADHD and AUD to effectively address the co-occurrence and treatment of these two conditions.

The Intersection of ADHD and Alcohol Addiction

Increased impulsivity, altered neuroplasticity, and dysregulated reward processing mechanisms are among the common features of addiction and ADHD (Karaca et al., 2017). Hyperactivity, one of the main symptoms of ADHD in childhood, causes internal restlessness in adulthood. The individual may begin to use alcohol to calm this internal restlessness (Luderer et al., 2020). Additionally, numerous individuals with ADHD work to manage their negative emotions. They can become easily angered, frustrated, and exhibit heightened emotional responses. The emotional dysregulation associated with ADHD can elevate the likelihood of alcohol and substance use (Evren et al., 2016).

There are controversial studies regarding the relationship between ADHD symptoms, particularly attention deficit and hyperactivity, and alcohol use. Some studies suggest that attention deficit may be associated with increased alcohol consumption, while hyperactivity is not related to alcohol use and its effects (Mesman, 2015). Conversely, other studies argue that the presence of hyperactivity may lead to stimulant and positive alcohol expectancies for alcohol use (Tuithof et al., 2012). Impulsivity and the resulting risk-taking behaviors are linked to both ADHD and AUD. They may play a key role in starting and sustaining alcohol consumption. Research has consistently shown that individuals with AUD exhibit higher levels of impulsivity (Bozkurt et al., 2016). Dinesh et al. (2022) found in their study that individuals with AUD have impaired decision-making and impulsivity characteristics independent of ADHD. Therefore, impulsivity and risk-taking behavior in individuals with AUD cause deterioration in quality of life together with ADHD (Dinesh et al., 2022).

Genetic and Neurobiological Factors

Numerous familial and genetic studies have indicated that hereditary factors play a significant role in the development of ADHD and alcohol dependence (Eme, 2017; Faraone et al., 2006). Various genetic studies have identified candidate genes linked to alcohol dependence (Dick & Foroud, 2003). Among these genes are the dopamine type 2 receptor gene, the aldehyde dehydrogenase type 2 gene, the serotonin transporter gene (5-HTT), the serotonin 1B receptor gene, and the catechol-O-methyltransferase gene. Notably, many of these genes are also considered candidate genes for ADHD (Bobb et al., 2005). Numerous studies have shown that ADHD, now recognized as a genetically influenced disorder affecting the dopamine and noradrenergic catecholamine systems, is indeed a risk factor for worsening addictive disorders (Volkow et al., 2009; Wilens, 2004).

Brain imaging research has demonstrated that the dopamine neurotransmitter in the brain is disrupted in ADHD, and these disruptions might contribute to the fundamental symptoms of inattention and impulsivity (Volkow et al., 2009). The dopamine hypothesis of ADHD and the role of the medial forebrain dopamine system in the development of AUDs are of interest. The dopamine system is also thought to mediate certain effects of alcohol on the brain, potentially influencing the development of AUDs. As a result, disruptions in the dopamine system might contribute to both ADHD and AUDs, thereby linking the two conditions (Tuithof et al., 2012).

The common aspect of the neurobiology of ADHD and addiction is the impairment in the mesolimbic and mesocortical dopamine systems. This impairment is a neurodevelopmental problem underlying ADHD, while in addiction it is related to alcohol/substance use (Eme, 2017). Low dopamine transmission observed in ADHD has also been linked to a higher risk of addiction (Volkow et al., 2009). Thus, disruptions in the dopamine system could be a common factor in both ADHD and AUDs, potentially explaining the link between the two conditions.

To understand the connection between ADHD and alcohol, it is important to consider the neuropsychological impact. Research shows that heavy alcohol abuse during adolescence is linked to declines in various cognitive functions, such as attention, intelligence, processing and motor speed, visuospatial skills, memory,

and executive functions (Lees et al., 2020). Certain research indicates that college students with ADHD tend to struggle with working memory tasks, continuous performance tasks, and different areas of self-reported executive functioning (Weyandt et al., 2017). Individuals with ADHD often exhibit deficits in executive functions, which include working memory, impulse control, and decision-making abilities. These deficits can make them more susceptible to developing SUDs, including alcohol dependence (Wilens, 2006).

Neuropsychological research indicates that individuals with ADHD may have a heightened sensitivity to rewards (Luman et al., 2012). This increased reward-seeking behavior can contribute to the propensity for alcohol use, as they may be more likely to consume alcohol in social situations where it is available, seeking the pleasurable effects it provides (Wilens, 2006).

In conclusion, the neuropsychological factors influencing alcohol dependence in individuals with ADHD are multifaceted and involve cognitive deficits, impulsivity, reward sensitivity, and neurobiological changes. Understanding these interactions is essential for developing effective interventions and treatment strategies for individuals grappling with both conditions (Biederman et al., 2006; Wilens, 2006).

Behavioral Pathways and Mechanisms

The link between ADHD and AUD is intricate and can be described through various behavioral processes. Here are some key behavioral pathways and mechanisms that illustrate the connection between these two conditions.

Impulsivity and Self-Regulation

Impulsivity is a complex concept that includes various behavioral components, such as trouble with inhibiting responses, challenges in postponing gratification, difficulties in estimating time, and a greater propensity for risk-taking (Whiteside & Lynam, 2003). Conversely, self-regulation refers to the capacity to govern one's emotions, thoughts, and actions in the quest for long-term objectives (Müller et al., 2023). Mastering self-regulation is essential for managing impulses effectively.

Impulsivity is a complicated and multifaceted concept, with dysfunction in various personality traits and cognitive processes potentially leading to impulsive behaviors (Whiteside & Lynam, 2003). It is crucial to determine which specific aspects of impulsivity increase the risk of substance or alcohol use among adults exhibiting ADHD symptoms. Adults with ADHD and those struggling with substance or alcohol dependency often share several impulsivity-related characteristics. These include diminished inhibitory control, increased sensation-seeking tendencies, and a propensity to act impulsively in response to intense emotions (Roberts et al., 2014). Research has shown that people with ADHD have a much higher chance of developing problems with alcohol use (Wilens, 2004). Studies have demonstrated a connection between impulsivity and alcohol use in both humans and animals, showing a bidirectional relationship: alcohol intake heightens impulsive behaviors, and organisms with varying levels of impulsivity also show differences in alcohol consumption (Dick & Foroud, 2003). This increased risk is believed to be related to the shared traits of impulsivity and poor self-control found in both ADHD and AUDs. Additionally, the brain

processes involved in both conditions may be interconnected. For example, issues with the dopamine system are commonly seen in ADHD and are also linked to addiction (Volkow et al., 2009). This connection indicates that treatments aimed at enhancing self-control and minimizing impulsivity might help those who are dealing with both ADHD and alcohol addiction (Faraone et al., 2006).

Emotional Regulation

Individuals with ADHD frequently face challenges related to emotional regulation. Research conducted by Barkley (2015) suggests that they often exhibit heightened emotional reactions and find it difficult to manage these feelings appropriately (Barkley, 2015). Furthermore, emotional dysregulation in individuals with ADHD is associated with a greater risk of developing co-occurring disorders, such as anxiety and depression (Biederman et al., 2006). Conversely, alcohol addiction can serve as a maladaptive way for those struggling with emotional management to cope. Cooney et al. (2007) indicate that many individuals with AUD turn to alcohol as a means of alleviating negative emotions like anxiety, sadness, or stress (Cooney et al., 2007). Additional studies reveal that the combination of ADHD symptoms—especially impulsivity and emotional dysregulation—heightens the risk of engaging in risky behaviors, such as excessive alcohol consumption (Wilens, 2004). In a study, it was found that the tendency to avoid emotional experiences might play a role in the impact of ADHD symptoms on alcohol use. Therefore, it can be suggested that the effect of ADHD symptoms on alcohol and substance use may be related to more complex psychological processes (Bradley et al., 2024). This intersection points to a shared vulnerability between the two conditions, complicating the challenge of effective emotional regulation even further.

Attention and Concentration Difficulties

Attention deficit, one of the core symptoms of ADHD, is seen in AUD. Research indicates that chronic alcohol consumption affects brain regions responsible for executive functions, including the prefrontal cortex and the cerebellum (Brennan et al., 2020). Barkley et al. (2015) reported that individuals with ADHD have deficiencies in executive functions and that these deficiencies cause attention and concentration difficulties (Barkley, 2015). The attentional difficulties linked to increased impulsivity have been proposed to play a role in the development of alcohol abuse (Blume et al., 2005).

Cognitive Deficits

Individuals with ADHD experience moderate challenges across nearly all executive functions (Willcutt et al., 2005). Those with weakened executive functions may demonstrate impulsivity, struggle to maintain focus, and have trouble finishing tasks (Tuğlu & Öztürk Şahin, 2010). Key areas affected by executive dysfunction in ADHD include response inhibition, hyperarousal, spatial working memory, and planning abilities (Willcutt et al., 2005). Studies show that individuals with executive function deficits are at risk for developing AUDs/SUDs (Day et al., 2015). In research carried out by Nigg et al. (2006), a connection was identified between inadequate response inhibition and issues related to alcohol, the variety of illegal substances consumed, as well as the occurrence of both AUDs and SUDs (Nigg et al., 2006).

Comorbid Disorders

Adults with ADHD frequently present with additional psychiatric disorders, with up to 80% having at least one comorbid condition (Sobanski et al., 2007). In clinical samples of adults with ADHD, the most frequently occurring comorbid disorders include AUD/SUD, mood disorders, anxiety disorders, and antisocial personality disorder (Plowden et al., 2022). For instance, it was found that 38.7% of individuals diagnosed with bipolar disorder also fulfilled the criteria for ADHD, while 23.3% received a diagnosis of adult ADHD (Karaahmet et al., 2013).

Attention-Deficit Hyperactivity Disorder frequently co-occurs with alcohol abuse and the use of illegal drugs. Clinical observations indicate that these individuals often report an improvement in their ADHD symptoms when using substances like cannabis and cocaine (Ohlmeier et al., 2008). Biederman et al. (1995) found that cannabis was the most frequently used substance among individuals with ADHD, significantly more so than amphetamines, cocaine, and hallucinogens, while opioids were less favored.

Post Traumatic Stress Disorder (PTSD) is frequently seen in individuals with AUD, and it is even more prevalent among those who have both AUD and ADHD, with rates of 65% in AUD alone compared to 88% in those with both conditions (Luderer et al., 2020). This occurs because individuals not only use alcohol to manage their PTSD symptoms but also experience increased cravings for alcohol due to the symptoms of PTSD. A study on inpatients undergoing treatment for AUD revealed that PTSD diagnoses were more prevalent among those with elevated ADHD symptoms (Bolstad et al., 2021).

In conclusion, the presence of AUD exacerbates psychiatric comorbidities, as anxiety disorders, depression, and personality disorders are commonly observed in both AUD and ADHD (Roncero et al., 2019). Due to the complexity of ADHD and potential comorbid disorders, properly validated tools should be used for each condition, and a personalized treatment plan should be created to address each issue (Plowden et al., 2022).

Treatment and Intervention Strategies

The primary aim of treating adults with ADHD is to alleviate distressing symptoms and enhance their performance in both work and social settings (Plowden et al., 2022). In ADHD intervention, the Canadian ADHD Resource Alliance (CADDRA) has established five core principles. Canadian ADHD Resource Alliance's five core principles for ADHD intervention are as follows: First, provide comprehensive psychoeducation to patients and their families, covering support, treatments, management, and accommodations. Second, focus on behavioral and/or occupational interventions to develop better habits and coping strategies, emphasizing the importance of a positive therapeutic alliance. Third, address the impact of ADHD on self-esteem and family well-being through individual and family support, counseling, and cognitive behavioral therapy. Fourth, ensure access to educational accommodations and advocate for legislation that protects educational rights for ADHD patients. Finally, offer individualized medical management with the best available medications, starting with low doses and adjusting as needed (Canadian ADHD Resource Alliance, 2011).

Medication

Medication should be initiated by a healthcare professional experienced in ADHD and integrated into a comprehensive treatment plan (Asherson, 2024). Physicians should be attentive to ADHD symptoms in patients with a long-standing history of attention problems, restlessness, or impulsive behavior. These difficulties may become noticeable during routine health checks. Alcohol use disorder is also an important indicator of the presence of ADHD (Canadian ADHD Resource Alliance, 2011).

A study verified that adult ADHD affects multiple dimensions of daily life and is manageable. It also revealed that most adults with ADHD experienced better functioning when taking psychotropic medication (Sandhu et al., 2021). When examining treatments for ADHD and SUD, it has been observed that the use of methylphenidate in children does not increase the risk of SUD in later years. Moreover, some studies suggest that methylphenidate may help reduce substance use and misuse during adolescence and adulthood. In adults with both ADHD and SUD, methylphenidate can be effective in reducing ADHD symptoms, but its effects on SUD are not well-established and remain a topic of ongoing debate (Klassen et al., 2012).

Adults with signs of ADHD, regardless of whether they were diagnosed during childhood, should be referred to a mental health professional experienced in diagnosing and treating ADHD for evaluation (Asherson, 2024).

Psychotherapy and Education

Both pharmacological and non-pharmacological approaches have proven effective in treating adult ADHD (Plowden et al., 2022). Attention-Deficit Hyperactivity Disorder-focused cognitive-behavioral therapy (CBT) is an effective complementary treatment for addressing adult impairments following pharmacological interventions (Asherson, 2024). Studies demonstrate the effectiveness of CBTs in helping individuals with ADHD to recognize, manage, and cope with negative emotional states (Mongia & Hechtman, 2012). Another study demonstrates that mindfulness-based approaches can also reduce ADHD symptoms, leading to an overall improvement in quality of life (Hoxhaj et al., 2018).

Education plays a crucial role at the individual, community, and systemic levels in promoting more effective outcomes (Plowden et al., 2022). Psycho-education and environmental adaptations are recommended for all age groups (Asherson, 2024). Research emphasizes the importance of time management, organization, planning, problem-solving, motivation, and emotion regulation in adults with ADHD (Mongia & Hechtman, 2012). Education should promote the engagement of primary care providers and individuals diagnosed with ADHD. A study found that educating primary care providers about adult ADHD improved their knowledge of ADHD management. Those who received this education were observed to make more referrals for suspected ADHD cases (Olufs et al., 2016).

In conclusion, the complex relationship between ADHD and AUD requires a holistic approach to address both conditions. Combining pharmacological and non-pharmacological interventions is crucial for improving patients' quality of life and reducing the impact of comorbid conditions. Early diagnosis and

treatment play a key role in managing these disorders effectively (Canadian ADHD Resource Alliance, 2011).

Conclusion

The connection between ADHD and AUD can be understood from genetic, neurobiological, behavioral, and psychosocial perspectives. However, further research is needed to elucidate the underlying mechanisms of this relationship and to develop effective interventions.

Despite its high prevalence, adult ADHD often remains undiagnosed, which also impacts patients with AUD. Early identification and management of ADHD symptoms play a crucial role in reducing the risk of AUD. Therefore, treatments should be tailored to the individual to effectively address both conditions simultaneously.

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