




DEPRESSION IN ADULTS WITH ADHD

 <https://doi.org/10.56238/levv16n46-028>

Submitted on: 02/10/2025

Publication date: 03/10/2025

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ABSTRACT

The article investigates the interaction between depression and ADHD in adults, considering genetic, neurobiological, environmental, and socioeconomic influences. Using a narrative review of the recent literature, the research identifies that difficulties in executive function, low use of coping strategies, and environmental factors, such as reduced social support and insomnia, are associated with increased depressive vulnerability in this population. From a neurobiological point of view, dysfunctions in the dopaminergic, GABAergic, and glutamatergic systems, as well as structural and functional changes in brain networks related to emotional regulation, can contribute to the comorbidity between ADHD and depression. The coexistence of these conditions negatively impacts academic, occupational, and interpersonal functionality, exacerbating symptoms and increasing the risk of suicidal ideation. Treatment requires an integrated approach, including pharmacological interventions, such as stimulants and antidepressants, and non-pharmacological therapies, such as Cognitive Behavioral Therapy (CBT) and psychoeducation. The need for early identification and multidisciplinary intervention to mitigate the impacts of depression in adults with ADHD is emphasized, emphasizing the

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importance of a personalized and multidimensional approach in the clinical management of this population.

Keywords: ADHD. Adults. Depression.

INTRODUCTION

Attention Deficit Hyperactivity Disorder (ADHD) is a highly prevalent neuropsychiatric neurodevelopmental disorder characterized by the presence of symptoms such as inattention, hyperactivity, and impulsivity. Although it was first identified in children, ADHD often persists throughout life, affecting several areas of adult life, including academic performance, work productivity, and interpersonal interactions. The symptoms of ADHD can vary considerably between individuals and are often modulated by environmental factors and the coexistence of other conditions, such as anxiety and depression. Research indicates that ADHD affects between 2.5% and 6.7% of the adult population globally, which suggests not only a significant prevalence but also a possible underdiagnosis of the disorder due to various social and clinical barriers (Banaschewski et al., 2023).

A meta-analysis of population studies revealed a pooled prevalence of approximately 3.10%, reinforcing that ADHD also presents as a disorder with a significant prevalence in the adult population (Ayano et al., 2023).

The interaction between ADHD and other comorbid psychiatric disorders, such as anxiety disorders and mood disorders, makes their epidemiological understanding even more intricate. An example of this is that approximately 54.7% of adults in residential treatment centers dedicated to the treatment of chemical dependency have symptoms compatible with ADHD, which points to a significant comorbidity between this disorder and substance use disorders (McMahon, 2023). In addition, the presence of ADHD can aggravate the course of other psychiatric conditions. In the case of adults living with both ADHD and post-traumatic stress disorder (PTSD), it is observed that these individuals tend to have more intense manifestations of symptoms and a more severe functional impact (Magdi et al., 2025).

The prevalence of depression in adults with ADHD varies significantly among studies, being influenced by factors such as diagnostic criteria, sample characteristics, and methodologies employed. Several studies indicate a significant overlap between these two conditions. Orsolini et al. reported a remarkably high rate of comorbid depressive symptomatology in 64.7% of their sample of adult patients with ADHD (Orsolini et al., 2024), evidencing the great clinical impact of depression in this population. Similarly, Okada et al. found a prevalence of mood disorders (including depression) of 60.9% in their national population study of adults with ADHD in Japan (Okada et al., 2024).

On the other hand, other studies report lower, although still substantial, prevalence rates. A study conducted by Mattos and colleagues in Brazil revealed that adults with ADHD had significantly higher levels of psychiatric symptoms, including depression, anxiety, and

alcohol abuse (Mattos et al., 2024). The discrepancy in prevalence rates between studies highlights the need for standardized diagnostic criteria and larger, more diverse sample sizes to obtain a more accurate estimate of true prevalence. Additionally, these variations may reflect differences in diagnostic practices and access to healthcare services across various geographic regions and populations.

This paper presents a narrative review of the available literature on the significant interaction between depression and ADHD in adults to investigate and analyze the connection between these conditions, emphasizing the underlying mechanisms, the specificities of this comorbid relationship, and the implications for the diagnostic and intervention processes. The study seeks to promote a deeper understanding of this complex relationship, contributing to the dissemination of the importance of an accurate diagnosis and more effective interventions, capable of reducing the adverse impacts faced by adults who have these disorders.

RISK FACTORS FOR DEPRESSION IN ADULTS WITH ADHD

The increased risk of depression in adults with ADHD is likely multifactorial, involving both genetic and environmental influences. Several studies have explored possible risk factors. Broletti et al. identified that difficulties in executive function, more specifically behavioral regulation and metacognition, mediate the relationship between ADHD symptoms and depression and demonstrated a great influence on predicting the intensity of mood disorder (Broletti et al., 2024). These findings suggest that interventions targeting deficits in executive function may be beneficial in preventing or mitigating depressive symptoms.

In addition, Orsolini et al. identified cyclothymic temperament and reduced use of positive attitude-based coping strategies as significant predictors of comorbid depressive symptomatology in their sample of adults with ADHD (Orsolini et al., 2024).

In addition to individual characteristics, socioeconomic and environmental factors also contribute to greater vulnerability to depression in this population. Tilahun and colleagues suggested that several factors, including chronic illness, alcohol consumption, social support, and insomnia, directly impact depressive symptoms in college students with ADHD symptoms. In addition, the study revealed the indirect effects of social support and insomnia on ADHD, illustrating the complex interaction between these factors. These environmental stressors can potentiate already existing vulnerabilities associated with ADHD, increasing the likelihood of developing depression (Tilahun et al., 2023).

Park and Park's study corroborates this perspective by demonstrating that young adults who screened positive for ADHD reported significantly lower levels of life satisfaction, as well as higher levels of loneliness and social isolation compared to their non-ADHD peers (Park and Park, 2024). These findings highlight the importance of considering social context and environmental factors when assessing and managing depression in adults with ADHD.

However, in addition to the environmental factors already described, the study by Riglin et al. set out to investigate a causal relationship between ADHD and depression and, based on a longitudinal design and Mendelian randomization, suggested that childhood ADHD is associated with the development of depression in adulthood, even after controlling for variables such as gender, adversity, education and maternal depression. The study suggests that ADHD may have a causal effect on depression, particularly when ADHD persists into adulthood (Riglin et al., 2020).

NEUROBIOLOGICAL CHANGES

Dopamine, a neurotransmitter directly involved with the reward system, motivation, and executive functions in general, is implicated in both ADHD and depression (MacDonald et al., 2024; Petersson and Uvnäs-Moberg, 2024). The dopaminergic hypothesis of ADHD suggests the existence of a dysfunction in dopaminergic signaling, possibly involving reduced dopamine levels or an alteration in receptor sensitivity (MacDonald et al., 2024). This dopaminergic dysfunction can manifest as attention difficulties, impulsivity, and hyperactivity, factors that can contribute to the development of depressive symptoms (Isaac et al., 2024). In addition, the interaction between dopamine and other neurotransmitters, such as oxytocin, is complex and plays a significant role in emotion regulation and behavioral disorders (Petersson and Uvnäs-Moberg, 2024). Imbalances in this interaction may be especially relevant in the context of depression comorbid with ADHD. Similarly, changes in the levels of GABA and glutamate, the brain's main inhibitory and excitatory neurotransmitters, are observed in several psychiatric disorders, including those with affective components, such as depression (Zhang et al., 2024).

Neuroimaging studies reveal structural and functional differences in the brain networks of individuals with ADHD compared to neurotypical individuals (Vilgis et al., 2022; Hernández et al., 2023). These differences may involve several brain regions, including the prefrontal cortex, the frontoparietal networks, and the cerebellum (Vilgis et al., 2022).

Individuals with ADHD often have lower specificity in neural representations during working memory tasks, suggesting deficits in cognitive processing (Vilgis et al., 2022). In

addition, studies using complexity analysis indicate that neurophysiological signs in adults with ADHD have lower complexity compared to healthy controls, which may be correlated with depressive symptoms (Hernández et al., 2023). These structural and functional abnormalities can compromise neural circuits involved in attention, executive function, and mood regulation, potentially contributing to the development of depression in adults with ADHD. However, the specific relationships between these brain differences and the experience of depression still need further investigation. Additional research is essential to determine whether these differences are causal or merely correlational (He et al., 2023).

IMPACT OF THE ASSOCIATION BETWEEN DEPRESSION AND ADHD

The presence of depression can significantly aggravate the core symptoms of ADHD in adults. Studies show that individuals with ADHD and depression have greater severity in inattention, hyperactivity, and impulsivity when compared to those with ADHD alone (Schein et al., 2024). This worsening of symptoms can lead to greater difficulties in everyday life, impacting academic performance, occupational functionality, and interpersonal relationships (Palmini, 2024). The inability to effectively manage ADHD symptoms, further complicated by the presence of depressive symptoms, can create a vicious cycle of negative reinforcement (Tamura et al., 2025). For example, difficulties with concentration and organization, already present in ADHD, can be intensified by depressive fatigue and lack of motivation, leading to reduced productivity and increased feelings of failure (Mierau, 2025).

The prospective study by Powell et al. assessed that, in a sample of 148 women diagnosed with depressive episodes over 13 years, 12.8% had ADHD symptoms, and 3.4% met the criteria for the diagnosis of this disorder. The study suggested that ADHD is not often identified in clinical settings, especially in adults, which can make it difficult to manage depression. The evaluation in the study suggested that the presence of ADHD symptoms is associated with earlier-onset depression, greater functional impairment, and recurrence of depressive episodes, in addition to higher levels of the risk of self-harm and suicide attempt (Powell et al., 2021).

Cognitive function is significantly affected by the simultaneous presence of ADHD and depression. Executive functions, such as working memory, planning, and inhibitory control, which are already compromised in ADHD, are even more aggravated when the person also has a depressive condition. Depression further aggravates cognitive difficulties, resulting in impaired concentration, memory, and processing speed (Xiang et al., 2024). This combination of cognitive impairments can have significant consequences on academic and occupational performance (Xiang et al., 2024). The reduction in cognitive flexibility and

the increase in mental fatigue, characteristic of both conditions, make it more difficult to acquire new skills, adapt to changing situations, and perform complex tasks. This can lead to feelings of inadequacy and frustration, further contributing to depressive symptoms (Xiang et al., 2024).

Adults with ADHD and comorbid depression are at significantly increased risk for suicidal ideation and suicidal behaviors (Austgulen et al., 2024; Fatani et al., 2024). The combination of persistent symptoms, challenges in everyday life, and feelings of hopelessness associated with both conditions can considerably increase the risk of self-injury and suicide attempts (Austgulen et al., 2024). This underscores the critical need for comprehensive evaluation and treatment of both ADHD and depression in this population (Austgulen et al., 2024). Early identification and intervention are key to mitigating this risk and offering adequate support to individuals facing suicidal thoughts (Fatani et al., 2024). The presence of other comorbidities, such as anxiety disorders or substance abuse, may further increase this risk (Austgulen et al., 2024; Fatani et al., 2024).

Sleep disorders are common in both ADHD and depression. Adults with both conditions often experience insomnia, characterized by difficulties falling asleep and staying asleep or by non-restorative sleep (van der Ham et al., 2024). Sleep deprivation further aggravates ADHD and depression symptoms, creating an inadequate sleep cycle that leads to worsening mood and cognitive impairment (Uygur, 2025). This can result in a further decline in functionality and quality of life (van der Ham et al., 2024). Dysregulation of circadian rhythms, a common phenomenon in ADHD, often intensifies due to sleep disturbances associated with depression (Uygur, 2025). Thus, the treatment of sleep-related issues becomes an essential aspect in the management of comorbidity between ADHD and depression (van der Ham et al., 2024).

Interpersonal relationships are another point that comorbid ADHD with depression in adults can bring to life. The impulsivity, emotional dysregulation, and communication difficulties associated with ADHD can generate tensions in relationships with family, friends, and partners, and depressive symptoms, such as social withdrawal, irritability, and low self-esteem, further aggravate these problems (Taubin et al., 2024). This can result in feelings of isolation and loneliness, exacerbating depressive symptoms in a vicious feedback loop (Taubin et al., 2024). The impact on partners and family members should not be underestimated: Companions of individuals with ADHD and depression may experience increased stress, emotional overload, and even challenges in their mental health (Taubin et al., 2024).

Occupational functioning is significantly affected by the comorbidity between ADHD and depression. Difficulties with concentration, organization and time management, characteristics of ADHD, can lead to reduced productivity, missed deadlines and difficulties in keeping a job, and depressive symptoms, such as fatigue, lack of motivation and low self-esteem, further compromise professional performance and can result in job loss, which as a consequence can lead to financial instability, increased stress and aggravate depressive symptoms (Adamis et al., 2024). The stigma associated with both ADHD and depression can also create additional challenges in the workplace (Adamis et al., 2024).

Adults with ADHD and depression often experience social isolation and loneliness. Difficulties in social interaction, communication, and emotional regulation can lead to withdrawal from social activities and reduced participation in social events, which can further aggravate depressive symptoms and generate feelings of hopelessness (Park and Park, 2024).

Adults with ADHD and depression have an increased risk of developing substance use disorders. Alcohol or drug use can be a dysfunctional coping strategy to cope with the symptoms of both conditions (Vaziri-Harami et al., 2024).

SPECIFICITIES OF THE TREATMENT

The most effective treatment for depression in adults with ADHD often involves a strategy that integrates pharmacological and non-pharmacological interventions (Young et al., 2020; Wakelin et al., 2023). This approach recognizes the complex interplay between the factors that contribute to ADHD and depression, seeking to address them comprehensively. For example, medication can be used for the management of core ADHD symptoms and mood enhancement, while CBT assists individuals in developing skills to cope with their thoughts, emotions, and behaviors. Psychoeducation can contribute to a better understanding of both conditions and treatment adherence. The specific combination of treatments should be adjusted according to the patient's individual needs and preferences, and continuous monitoring is essential to assess response to treatment and make adjustments when necessary.

Several medications are used in the treatment of Attention Deficit Hyperactivity Disorder (ADHD) and depression, often concomitantly. The choice of drug depends on several factors, including the severity of symptoms, the presence of other comorbidities, individual patient characteristics, and possible side effects (Kasahara et al., 2024). The most commonly involved medications are stimulants and antidepressants.

Methylphenidate is one of the most commonly prescribed stimulants for the treatment of ADHD (Kasahara et al., 2024; Wakelin et al., 2023). Although it is primarily used for the management of ADHD symptoms, methylphenidate may also contribute to improved mood and reduced depressive symptoms in some individuals (Wakelin et al., 2023). However, its efficacy in treating depression in patients with ADHD is not consistently demonstrated across studies, and its potential for abuse and dependence requires careful evaluation, especially in individuals with a history of substance use disorders (Chamakalayil et al., 2021). A case study conducted by Kasahara et al. demonstrated that while methylphenidate alone was not sufficient to improve symptoms in a patient with ADHD, comorbid depression, and chronic pain, the addition of venlafaxine, an antidepressant, led to significant improvement in all areas (Kasahara et al., 2024). This specific formulation requires special vigilance for cardiac symptoms, but it can potentially help patients in this comorbid relationship.

Atomoxetine, a norepinephrine reuptake inhibitor, is a non-stimulant option commonly used in the treatment of ADHD, and like methylphenidate, it may exhibit mood-stabilizing effects and relieve depressive symptoms in some individuals with ADHD (Wakelin et al., 2023). However, the evidence on the direct efficacy of atomoxetine in the treatment of depression in adults with ADHD is not yet as robust as that of other antidepressants. Viloxazine, another selective norepinephrine reuptake inhibitor, has also demonstrated efficacy in the treatment of ADHD (Robinson et al., 2022) and may have a role in the management of comorbid depressive symptoms.

Several antidepressants are used for the treatment of depression in adults with ADHD, both as monotherapy and in combination with ADHD medications. Some studies suggest that selective serotonin reuptake inhibitors (SSRIs) may be less effective for depression in individuals with ADHD compared to other antidepressants (Manter et al., 2025). Other antidepressants, such as bupropion (a norepinephrine and dopamine reuptake inhibitor), duloxetine (a serotonin and norepinephrine reuptake inhibitor), mirtazapine (a specific noradrenergic and serotonergic antidepressant), and venlafaxine (a serotonin and norepinephrine reuptake inhibitor), are also used (Kasahara et al., 2024; Manter et al., 2025).

Nonpharmacologic interventions play a key role in the comprehensive management of depression and ADHD. These approaches often target underlying cognitive, behavioral, and emotional factors that contribute to both conditions. Cognitive Behavioral Therapy (CBT) is widely considered the most effective psychological intervention for ADHD, and it

demonstrates significant efficacy in reducing depressive symptoms in adults with ADHD (Corrales et al., 2024).

In addition, Corrales et al. demonstrated the long-term efficacy of CBT, showing that both 6-session and 12-session programs resulted in significant improvements in ADHD severity, anxiety, and depressive symptoms (Corrales et al., 2024).

Other non-pharmacological approaches, such as psychoeducation (Young et al., 2020; Wakelin et al., 2023), mindfulness-based practices (Wakelin et al., 2023), and dialectical behavior therapy, may also be beneficial in managing the symptoms of ADHD and comorbid depression (Wakelin et al., 2023). These interventions often focus on improving self-awareness, coping skills, and emotional regulation.

In addition, the practice of physical exercise has shown potential in reducing depressive symptoms (Wolf et al., 2020; Yagang et al., 2025) and may be a useful complementary option for adults with ADHD and depression. A meta-analysis by Song et al. indicated that physical exercise has a positive impact on anxiety, depression, and emotion regulation in children with ADHD (Yagang et al., 2025). Although this study focused on the child population, the possible benefits of physical activity for comorbid depression with ADHD probably extend to the adult population as well.

CONCLUSION

The relationship between Attention Deficit Hyperactivity Disorder (ADHD) and depression involves interactions between genetic, neurobiological, and environmental factors. The reviewed evidence demonstrates that the prevalence of depressive symptoms is significantly high among adult individuals with ADHD, suggesting an increased vulnerability of this population to the development of mood disorders. Factors such as deficits in executive function, emotional difficulties, social isolation, and environmental stressors are important mediators of this relationship, intensifying the functional and emotional impact of symptoms.

From a neurobiological point of view, dopaminergic dysfunctions and alterations in other neurotransmitter pathways, such as those related to GABA and glutamate, seem to play a crucial role in both ADHD and depression, which reinforces the interconnection between these conditions. In addition, neuroimaging studies point to structural and functional differences in brain regions associated with emotion regulation, attentional control, and motivation, suggesting that these changes may contribute to greater susceptibility to depression in individuals with ADHD.

The clinical implications of this comorbidity are profound since the coexistence of both disorders is associated with greater functional impairment, worsening quality of life, and increased risk of suicidal ideation and behavior. This symptomatic overlap makes it essential to adopt accurate diagnoses and integrated, personalized therapeutic interventions.

The clinical management of depression in adults with ADHD requires a diverse approach, which encompasses pharmacological and non-pharmacological interventions. Cognitive-behavioral therapy (CBT) is an effective alternative to assist in the development of coping skills and cognitive restructuring, while pharmacological treatment, including stimulants and antidepressants, must be carefully adjusted to the patient's individual needs. In addition, strategies that promote social support and adaptation to the work and academic environment can contribute to the improvement of the global functioning of these individuals.

Given this evidence, it is believed that it is important for health professionals (not just mental health professionals), researchers, and even health policy makers to promote greater awareness of the intersection between ADHD and depression in the adult population. Early recognition of this comorbidity, combined with appropriate treatment, can significantly reduce the negative impacts on the lives of affected individuals, promoting a more favorable prognosis and a better quality of life. Thus, it is important to continue investing in future research that explores neurobiological and social aspects that are still poorly understood, in addition to promoting policies that support the training of health professionals and resources for patients.

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