

# Attention Deficit/Hyperactivity Disorder and Eating Disorders: A Brief Review

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## ABSTRACT

**Objective:** To elucidate the prevalence, overlap and current evidence on the relationship between ADHD (Attention deficit/hyperactivity disorder) and ED (Eating disorders) as well as to clarify some of the possible mechanisms underlying the comorbidity between both disorders.

**Methods:** A brief review of the latest literature was performed on PubMed, from March 2020 to June 2020 using the terms “attention deficit hyperactive disorder”, “ADHD”, “eating disorders”, “ADHD and ED”.

**Results:** The prevalence of ED in ADHD samples has been reported up to 12 %. Considering early development, there is an association described in literature between childhood ADHD and the later development of an ED. On the other hand, ADHD symptoms have been elucidated in samples of ED patients, being more common in the AN purging subtype and BN than in the AN restrictive subtype. Impulsive behaviors constitute a core ADHD symptom and deficits in its regulation have been demonstrated in ED patients, especially in binge eating and purging behaviours.

**Conclusion:** Available studies suggest an overlap between ADHD and ED. More studies are needed in order to gain insight about the clinical management when the diseases are in comorbidity.

**Keywords:** Eating disorders, anorexia nervosa, bulimia nervosa, attention deficit hyperactivity disorder, comorbidity.

## INTRODUCTION

Attention deficit/hyperactivity disorder (ADHD) is a common neurodevelopmental disorder (NDD) and has been estimated to occur in 5 % of children in the United States by the Diagnostic and Statistical Manual-5 (DSM-5).<sup>1,2</sup> Specifically, the prevalence of ADHD is around 5.3% in the pediatric population and 3.4% in the adult population.<sup>3,4</sup> The recognition of its persistence into adulthood is increasing, with data reporting that over half of children diagnosed with ADHD will have symptoms that persist into adult years.<sup>5</sup> It is defined in DSM-5 by symptoms of persistent inattention and/or hyperactivity and impulsivity, beginning prior to 12 years of age, and out of proportion to the degree of inattention/hyperactivity or impulsivity seen in similar aged peers.<sup>1</sup> Recently the relationship between ADHD and eating disorders (ED) has been repeatedly highlighted. Both ADHD and ED tend to begin early in life but can be chronic and persist into adulthood.<sup>6</sup> The ED most frequently described to be associated with ADHD are binge eating disorder (BED) and bulimia nervosa (BN).<sup>7-12</sup> BED is defined by recurrent episodes of binge eating associated with guilt, disgust, and marked distress but without compensatory behavior. BN is characterized by binge eating episodes, in a short

period of time (approximately 2 hours) and inappropriate compensatory behaviors. The diagnostic criteria of Anorexia Nervosa (AN) describes three essential aspects such as persistent restriction of energy intake and/or purging behavior, an intense fear of weight gain, as well as a disturbance in the self-perception of one's body shape.<sup>2</sup> Although the link between AN and ADHD is more controversial, some studies suggest an association between the two.<sup>13,14</sup> DSM-5 also includes other eating and feeding disorders that occur earlier in childhood such as pica, rumination disorder, and avoidant/restrictive food disorder. In contrast to AN and BN, they are not associated with concerns about body weight and shape. AN and BN typically manifest during adolescence, and they are strongly tied to maturation processes during later developmental phases.<sup>1</sup> Patients with ADHD and ED share common features, in terms of impulsive behavior, disturbed reward encoding, low self-esteem and a neuropsychological profile including deficits in attention and executive functions which lead to altered motivational control and attentional biases.<sup>15</sup> Better insight into the comorbidity and overlap between ADHD and ED is of major relevance as may contribute to the understanding of possible pathological mechanisms underlying both disturbances and might have important implications for the management of patients with both ADHD and disordered eating patterns, suggesting common and potentially effective therapeutic strategies for the conditions when they coexist, which seems particularly noteworthy because of the personal and social adverse outcomes.

In light of these considerations, the objectives of this brief review were to critically elucidate the prevalence, overlap and evidence on the relationship between ADHD and ED as well as to clarify some of the possible mechanisms underlying the comorbidity between the disorders.

## METHOD

The literature review was conducted from March 2020 to June 2020 on PubMed database and performed using the terms “attention deficit hyperactive disorder”, “ADHD”, “eating disorders”, “ADHD and ED”.

In this review, we did not focus on pica, rumination disorder, and avoidant/restrictive food disorder. Inclusion criteria were of primary references consisting in articles specifically focused on ADHD and ED. No constraints on the year of publication, language or employed methods were applied in order to allow a complete review of the literature.

## Results:

Several studies have focused on the relationship between ED in ADHD and the opposite statistic relationship has also been considered (see table 1). The prevalence of ED in ADHD samples has been reported across a range up to 12 %.<sup>6</sup> Considering early development, literature described evidence of

an association between childhood ADHD and the later development of an ED.<sup>16</sup> Nazar et al. conducted a systematic review and a meta-analysis and also found that patients with ADHD have a higher risk of comorbidity with an ED, describing an odds ratio of 3.82 of diagnosing any ED in ADHD. People with an ED also have higher levels of comorbidity with ADHD, with an odds ratio of 2.57 of diagnosing ADHD in ED participants.<sup>17</sup> Zibrowski et al., with data from 4719 participants, demonstrated that lifetime ADHD was strongly and significantly associated with lifetime BN, BED and any ED in unadjusted models, but not with AN or subthreshold BED. After adjusting for demographic variables and psychiatric comorbidities, all associations of lifetime ADHD with EDs were substantially attenuated, and only the association of ADHD with BN remained statistically significant.<sup>18</sup> Similarly, Surman et al. conducted a retrospective systematic analysis in order to evaluate BN rates among patients with ADHD with data from four case-control studies (two adult,  $n=742$  and two pediatric,  $n=522$ ). BN prevalence for the pediatric ADHD group ( $n = 280$ ), and for the pediatric control group ( $n = 242$ ) were respectively 1% and 0%. Adult women with ADHD had significantly higher rates of BN than those without ADHD, showing a BN prevalence of 11.2% ( $n = 124$ ) among the ADHD group, and 2.0% ( $n = 191$ ) for the control group. The findings suggested that patients with ADHD might present a higher risk of developing BN.<sup>19</sup> Considering the opposite statistic variables, the prevalence of ADHD symptoms has been reported to be from 5 to 17% in samples of ED patients.<sup>20</sup> Additionally, a systematic review described a prevalence of ADHD in EDs ranging between 1.6% and 18.0%, being more common in the AN purging subtype and BN than in the AN restrictive subtype.<sup>21</sup> Reinforcing this results, Svedlund et al. assessed ADHD in 1165 adults with an ED and also described a higher frequency of ADHD symptoms in patients with binge eating/purging eating disorders suggesting that the frequency of ADHD symptoms in AN purging subtype is as high as in BN.<sup>22</sup> Sala et al. used a sample that consisted of 73 females with longstanding history of ED, 37 patients having AN-R, 28 with AN-BP and 8 with BN. Among the three ED subgroups, 13 patients reported comorbidity with ADHD: three in the AN-R subtype, 9 in the AN-P and 1 in the BN. The remaining 60 patients presented only a diagnosis for ED. Anxiety differed significantly between patients with ADHD and those with non-ADHD, with ADHD patients showing higher scores. These results suggest that previously observed associations of ADHD with EDs might be due to additional psychiatric disorders that are often comorbid with both ADHD and ED.<sup>15,22</sup> In other study, Yates et al. examined a sample size of 189 participants (55 were classified as AN restricting subtype, 97 were classified as AN purge subtype and 37 were classified as BN) and found that 5.3% participants from the study group met full criteria for ADHD during childhood. 6.7% with ADHD came from the AN purge subtype or BN group and only 1.8% of the participants meeting ADHD diagnostic criteria came from the AN restricting

subtype group. Over one-fifth of the participants (21.2%) met criteria for at least six ADHD symptoms in at least one ADHD domain.<sup>20</sup> In addition to the above mentioned studies, Seitz et al., verified that 21% of patients with BN met the clinical cut-off for previous childhood ADHD compared to 2.5% of healthy controls. Adult ADHD was also more prevalent in patients with BN, with an odds ratio of 4.2. Patients with BN and previous childhood ADHD were more impulsive and inattentive than patients with BN alone and the authors suggest that there is an additive effect regarding impulsivity with the occurrence of depression and anxiety causing more emotional stress, which would worsen both ADHD and BN symptoms. These patients also displayed more severely disordered eating patterns and more general psychopathological symptoms compared with those without ADHD. Severity of eating disorder symptoms was better explained by inattentiveness than by either impulsivity or hyperactivity.<sup>23</sup> Conversely, in another perspective, a 5-year prospective study found that children with ADHD demonstrated more BN-type eating pathology at follow-up than those without ADHD, with impulsivity being the strongest predictor of eating disorder behavior examined.<sup>8</sup> Literature describes common neurobehavioral circuits between ADHD and binge eating behaviors, such as those involved in response inhibition, emotion regulation and reward processing.<sup>15,24,25</sup> When analyzing shared traits it should be considered that additional similar comorbidities might result in clinical and symptomatic overlap. For example, anxiety disorders and mood disorders are frequently reported comorbidities of EDs and ADHD.<sup>22,26,27</sup> In addition, impulse control problems were reported in patients with ED (especially BN and BED) and patients with ADHD.<sup>23</sup> In particular, alcohol and drug abuse, have been observed in ED patients as well as in ADHD.<sup>28,29</sup>

Table 1 – Brief description of some of the studies found in patients with EDs (AN, BN, BED) and ADHD, and vice-versa.

Authors	Type of study	Sample size	Diagnosis	Results
Nazar et al.	Systematic review and meta-analysis	20 studies investigating ED in ADHD and 5 exploring ADHD in ED	ED in ADHD and ADHD in ED	The pooled odds ratio of diagnosing any ED in ADHD was increased significantly, 3.82 (95% CI:2.34–6.24). A similar level of risk was found across all

				ED syndromes. The pooled odds ratio of diagnosing ADHD in participants with ED was significantly increased, 2.57 (95% CI:1.30–5.11).			ADHD sample (n = 320); Adult control sample (n=422)		
Zibrowski et al.	Coorte	4719 participants	ADHD in ED	Lifetime ADHD was strongly and significantly associated with lifetime BN, BED, and any ED in unadjusted models, but not with AN or subthreshold BED. After adjusting for demographic variables and psychiatric comorbidities, only the association of ADHD with BN remained statistically significant.	Nickel et al.	Systematic review	26 studies	ADHD in ED and vice-versa	The prevalence of ADHD in EDs ranged between 1.6% and 18%. Comorbid ADHD was more often reported in the AN-purging subtype and BN than in the AN restrictive subtype. The prevalence of EDs in ADHD ranged between no association and a lifetime prevalence of 21.8% of developing an ED in women with ADHD.
Surman et al.	Retrospective case-control	Pediatric ADHD sample (n=280); Pediatric control sample (n = 242); Adult	Clinical diagnosis of ADHD and ED	Increased prevalence of BN in females with ADHD.	Svedlund et al.	Cross-sectional	1165 adults	ADHD in ED	31.3% of the patients scored above the screening cut off indicating a possible ADHD. The highest prevalence rates (35–37 %) were

				found in BN and AN purging subtype. Psychiatric comorbidity correlated to ADHD symptoms without explaining the differences between eating disorder diagnoses.					(95% CI: 2.6%–9.5%). Most current ADHD inattentive symptoms appeared after childhood suggesting late-onset non-ADHD origins. 10 ED cases (5.3%) met criteria for ADHD diagnosis (1 AN-R, 9 AN-P subtype,d or BN)
Sala et al.	Cross-sectional	73 women	ADHD in ED (AN-R; AN-P, BN)	Among the three ED subgroups, 13 patients reported comorbidity with ADHD; 3 in the AN-R subtype, 9 in the AN-BP and 1 in the BN. The remaining 60 patients (n = 34 AN-R; n = 19 AN-P; n = 7 BN) presented only a diagnosis of ED.	Seitz et al.	Cross-sectional study	57 female patients and 40 healthy controls	ADHD in BN	21% of patients with BN met the clinical cut-off for previous childhood ADHD compared to 2.5% of healthy controls. Adult ADHD was also more prevalent in patients with BN, with an odds ratio of 4.2.
Yates et al.	Cross-sectional study	189 women	ADHD in ED	21% of the sample reported at least six ADHD symptoms; the estimated prevalence rate of ADHD in this population was 5.8%	Mikami et al.	5-year prospective study	ADHD-Combined Type (ADHD-C; n =93), ADHD-Inattentive Type (ADHD-I; n =47),	Clinical diagnosis of ADHD and ED	Girls with ADHD-C showed eating disorders to be more prevalent compared to controls; girls with

		and a comparison group (n = 88).		ADHD-I were intermediate between these two groups. Baseline impulsivity symptoms, as opposed to hyperactivity and inattention, best predicted adolescent eating pathology.
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ADHD (Attention deficit/hyperactivity disorder), ED (Eating disorders), BED (Binge eating disorder), BN (Bulimia nervosa), AN-R (Anorexia nervosa- restrictive subtype), AN-P (Anorexia nervosa – purging subtype).

#### Discussion:

Regarding the prevalence of ADHD in ED and vice-versa, it could be discussed whether ADHD itself might be a predisposing or vulnerability factor for the development of ED, which mainly occur during adolescence.<sup>30</sup> Developmental changes, such as puberty and stressful events could trigger ED behaviors, especially in patients with ADHD.<sup>31</sup> In addition, patients with a NDD have an elevated risk for other mental disorders beyond the ED spectrum.<sup>32</sup> As such, ED might be regarded one of many possible progressive and comorbid diagnosis of NDD. Literature suggest a possible benefit of screening for ADHD as part of the overall evaluation of ED, in particular BN, BED and AN purging subtype.<sup>21</sup> As seen, ED and ADHD share several key features that may explain the overlap of both diagnosis, including attention deficits, impulsive mechanisms and low self-esteem.<sup>23</sup> Impulsive behaviors constitute a core ADHD symptom and deficits in its regulation have been demonstrated in ED patients, especially in binge eating and purging behaviours.<sup>6</sup> The link mediating the association of ADHD and ED may also be explained by a combination of genetic mechanisms. Genetic variability in dopaminergic genes related to reward processing have been described in a patient with comorbid ADHD and BED.<sup>33</sup> On the other hand, the number of ADHD symptoms correlate with ED symptom severity in all binge/purge ED subtypes and ADHD symptoms have been found to predict binge eating severity and bulimic symptoms.<sup>34,36</sup> These findings could have important implications for prevention and early intervention programs, which might usefully focus on mood regulation in individuals with ADHD symptoms at risk for developing disordered eating. Future studies should be able to

find if patients with this comorbidity have a different prognosis, course and treatment response when compared to patients with either disorder alone.

#### Conclusion:

Available studies suggest an overlap between ADHD and ED. However, there are only a few studies addressing this theme, considering a direct and causal statistical relation, with most of them with small sample sizes and different approaches, which might limit the generalizability of the results. Future studies are needed in order to gain insight and evaluate the association between ADHD and ED, as well as its clinical management when in comorbidity and therapeutic implications.

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