

REVIEW ARTICLES

Attention deficit/hyperactivity disorder and eating disorders: a brief review

Perturbação de hiperatividade e défice de atenção e perturbações do comportamento alimentar: breve revisão

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ABSTRACT

Introduction: Attention deficit/hyperactivity disorder (ADHD) is a common neurodevelopmental disorder. The relationship between ADHD and eating disorders (EDs) has been recently often considered. Both conditions tend to have an early age of onset and can become chronic and persist into adulthood.

Objective: This study aimed to elucidate the prevalence and overlap of ADHD and EDs and review the current evidence about an association between both conditions. It also sought to investigate some of the mechanisms potentially underlying these comorbid disorders.

Methods: A brief review of the latest literature was performed on PubMed using the terms “attention deficit hyperactivity disorder”, “ADHD”, “eating disorders”, and “ADHD and ED”.

Results: The prevalence of EDs in individuals with ADHD has been reported across a range up to 12 %. The literature describes an association between childhood ADHD and the development of EDs during adolescence. Conversely, ADHD symptoms have been reported in patients with EDs, more frequently in those with bulimia nervosa and anorexia nervosa purging subtype than with anorexia nervosa restrictive subtype. Impulsive behaviors constitute a core ADHD symptom and deficits in its regulation have been shown in patients with EDs.

Conclusion: Evidence in the literature suggests an overlap between ADHD and EDs. More studies are required to retrieve additional insights into the clinical management of patients with both conditions.

Keywords: anorexia nervosa; attention deficit/hyperactivity disorder; bulimia nervosa; comorbidity; eating disorder

RESUMO

Introdução: A perturbação de hiperatividade e défice de atenção (PHDA) é uma doença comum do neurodesenvolvimento. Recentemente, a relação entre PHDA e perturbações do comportamento alimentar tem sido repetidamente equacionada. Ambas tendem a manifestar-se em idade precoce, podendo tornar-se condições crónicas e persistir na idade adulta.

Objetivos: Este estudo teve como objetivo elucidar a prevalência, sobreposição diagnóstica e semelhanças entre PHDA e perturbações do comportamento alimentar.

Métodos: Foi efetuada uma revisão bibliográfica da literatura na base de dados PubMed utilizando os termos “*attention deficit hyperactive disorder*”, “*ADHD*”, “*eating disorders*” e “*ADHD and ED*”.

Resultados: A maior parte dos estudos sugere uma prevalência de perturbações do comportamento alimentar em doentes com PHDA

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superior a 12%, existindo uma associação entre o diagnóstico de PHDA durante a infância e o desenvolvimento de perturbações do comportamento alimentar durante a adolescência. As perturbações do comportamento alimentar mais frequentemente associadas a PHDA são a perturbação de ingestão alimentar compulsiva e a bulimia nervosa. Por outro lado, a prevalência de PHDA varia entre 1.6–18% em indivíduos com perturbações do comportamento alimentar, sendo mais comum naqueles com anorexia nervosa do tipo purgativo e bulimia nervosa. Doentes com PHDA e perturbações do comportamento alimentar partilham determinadas características, como impulsividade, mecanismos de recompensa alterados, baixa auto-estima, défice de atenção e perturbação de funções executivas, que levam a um controlo motivacional disfuncional.

Discussão: É recomendada a investigação da sintomatologia de PHDA como parte integrante da avaliação das perturbações do comportamento alimentar. A associação entre ambas pode ser explicada pela combinação de mecanismos genéticos relacionados com vias dopaminérgicas ligadas ao processo de recompensa. A presença de sintomas de PHDA correlaciona-se com a gravidade da sintomatologia das perturbações do comportamento alimentar e é preditiva da gravidade da compulsão alimentar e sintomas bulímicos.

Conclusões: Existe uma sobreposição diagnóstica entre PHDA e perturbações do comportamento alimentar. São necessários estudos adicionais para esclarecer as implicações clínicas e terapêuticas da comorbidade destas duas condições.

Palavras-chave: anorexia nervosa; bulimia nervosa; comorbidade; perturbação do comportamento alimentar; perturbação de hiperatividade e défice de atenção

INTRODUCTION

Attention deficit/hyperactivity disorder (ADHD) is a common neurodevelopmental disorder (NDD) that has been estimated to occur in 5% of children in the United States, according to the Diagnostic and Statistical Manual-5 (DSM-5).^(1,2) Specifically, the prevalence of ADHD is around 5.3% in the pediatric population and 3.4% in the adult population.^(3,4) The persistence of the condition into adulthood is increasingly acknowledged, with data reporting that over half of children diagnosed with ADHD have symptoms that persist into adult years.⁽⁵⁾ In DSM-5, ADHD is defined by symptoms of persistent inattention and/or hyperactivity and impulsivity out of proportion to the degree of inattention/hyperactivity or impulsivity seen in similarly-aged peers.⁽¹⁾ The relationship between ADHD and eating disorders (EDs) has been recently repeatedly suggested. Both ADHD and EDs can be chronic and persist into adulthood.⁽⁶⁾ EDs most frequently reported to be associated with ADHD are binge eating disorder (BED) and bulimia nervosa (BN).⁽⁷⁻¹²⁾ 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) followed by inappropriate compensatory behaviors. The diagnostic criteria of anorexia nervosa (AN) includes three essential aspects: persistent restriction of energy intake and/or purging behavior, intense fear of weight gain, and disturbance in the self-perception of one's body shape.⁽²⁾ Although the link between AN and ADHD is controversial, some studies suggest an association between both.^(13,14) DSM-5 also includes other eating and feeding disorders occurring earlier in childhood, such as pica, rumination disorder, and avoidant/restrictive food disorder. In contrast to AN and BN, these

disorders are not associated with concerns about body weight and shape. AN and BN typically manifest during adolescence and are strongly tied to maturation processes during later developmental phases.⁽¹⁾ Patients with ADHD and EDs share common features, such as 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.⁽¹⁵⁾ Additional insights into the comorbidity and overlap between ADHD and EDs is of major relevance, as it may contribute to the understanding of possible pathological mechanisms underlying both conditions and have important implications for the management of patients with comorbid ADHD and disordered eating patterns. Common effective therapeutic strategies may be particularly relevant, given the personal and social adverse outcomes that these comorbidities may elicit.

Given these considerations, the objectives of this study were to critically review the prevalence and overlap of ADHD and EDs, as well as evidence in the literature of an association between both conditions, seeking to clarify some of the possible mechanisms underlying their comorbid relationship.

METHODS

A narrative review was conducted based on studies retrieved from PubMed database using the following combined MeSH terms: "attention deficit hyperactivity disorder" OR "ADHD" AND "eating disorders" OR "anorexia nervosa" OR "bulimia nervosa" OR "binge eating disorder". The "related articles" function of PubMed, bibliography of selected articles, and Google Scholar database were

also used to identify additional studies. Pica, rumination disorder, and avoidant/restrictive food disorder were not object of this review. Inclusion criteria comprised primary sources specifically focusing the association between ADHD and EDs. To enable a comprehensive literature review, no constraints were considered regarding year of publication, language, or methods used in studies.

RESULTS

Based on predefined inclusion criteria, a total of 22 articles were eligible for the review.

Results showed that several studies have focused on the prevalence of EDs in ADHD, with the opposite association also being investigated (**Table 1**). The prevalence of EDs in patients with ADHD has been reported across a range up to 12 %.⁽⁶⁾ The literature describes an association between the development of ADHD during childhood and later development of EDs during adolescence.⁽¹⁶⁾ In a systematic review and meta-analysis, Nazar *et al.* showed that patients with ADHD have a higher risk of comorbidity with EDs, reporting a 3.82 odds ratio of developing EDs in the context of ADHD. People with EDs also have higher levels of comorbidity with ADHD, with an odds ratio of 2.57 of ADHD diagnosis in individuals with EDs.⁽¹⁷⁾ In a study with 4719 subjects, Zibrowski *et al.* reported 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 between lifetime ADHD and EDs were substantially attenuated, with only the association between ADHD and BN remaining statistically significant.⁽¹⁸⁾ Similarly, Surman *et al.* conducted a retrospective systematic analysis to evaluate BN rates among patients with ADHD using data from four case-control studies (two in adults [n=742] and two in children [n=522]). The prevalence of BN in the pediatric ADHD group (n=280) was 1% and in the pediatric control group (n=242) was 0%. Adult women with ADHD had significantly higher rates of BN than those without ADHD: 11.2% (n=124) versus 2.0% (n=191). These findings suggest that patients with ADHD may have a higher risk of developing BN compared to non-ADHD counterparts.⁽¹⁹⁾ Conversely, the prevalence of ADHD symptoms in patients with EDs has been reported to range from 5 to 17%.⁽²⁰⁾ A systematic review reported a prevalence of ADHD in EDs between 1.6 and 18.0%, being more common in the AN purging subtype (AN-BP) and BN than in the AN restrictive subtype (AN-R).⁽²¹⁾ Svedlund *et al.* reinforced these results in a study assessing the prevalence of ADHD in 1165 adults with Eds, which 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.⁽²²⁾ Sala *et al.* assessed 73 females with longstanding history of EDs, 37 of whom with AN-R, 28 with AN-BP, and 8 with BN. A total of 13 patients evidenced comorbidity with ADHD in the three ED subgroups globally:

three in the AN-R, nine in the AN-BP, and one in the BN subgroups. The remaining 60 patients presented only ED diagnosis. Anxiety differed significantly between patients with and without ADHD, with the first showing higher scores. These results suggest that previously observed associations of ADHD with EDs might be due to additional psychiatric disorders that are often in comorbidity with both conditions.^(15,22) The study by Yates and colleagues included a sample of 189 individuals (55 classified as having the AN-R subtype, 97 the AN-BP subtype, and 37 BN) and found that 5.3% of participants met full criteria for ADHD during childhood. Overall, 6.7% of individuals with diagnostic criteria of ADHD belonged to the AN-BP or BN groups and only 1.8% belonged to the AN-R group. Over one-fifth of the participants (21.2%) met criteria for at least six ADHD symptoms in at least one ADHD domain.⁽²⁰⁾ In addition, Seitz *et al.* showed that 21% of patients with BN met clinical criteria for childhood ADHD compared to only 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 only with BN, with the authors suggesting 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. The severity of ED symptoms was better explained by inattentiveness than by impulsivity or hyperactivity.⁽²³⁾ Conversely, a five-year prospective study found that children with ADHD showed higher levels of BN-type eating pathology at follow-up than those without ADHD, with impulsivity being the strongest predictor of ED behaviors.⁽⁸⁾ The literature describes common neurobehavioral circuits between ADHD and binge eating behaviors, such as those involved in response inhibition, emotion regulation, and reward processing.^(15,24,25) 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 as ED and ADHD comorbidities.^(22,26,27) In addition, impulse control problems have been reported in patients with EDs (especially BN and BED) and with ADHD.⁽²³⁾ Alcohol and drug abuse in particular has been observed in patients with EDs and with ADHD.^(28,29)

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 <i>et al.</i>	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).
Zibrowski <i>et al.</i>	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.
Surman <i>et al.</i>	Retrospective case-control	Pediatric ADHD sample (n=280); Pediatric control sample (n = 242); Adult ADHD sample (n = 320); Adult control sample (n=422)	Clinical diagnosis of ADHD and ED	Increased prevalence of BN in females with ADHD.
Nickel <i>et al.</i>	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.
Svedlund <i>et al.</i>	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.
Sala <i>et al.</i>	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.
Yates <i>et al.</i>	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% (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)
Seitz <i>et al.</i>	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.
Mikami <i>et al.</i>	5-year prospective study	ADHD-Combined Type (ADHD-C; n =93), ADHD-Inattentive Type (ADHD-I; n =47), and a comparison group (n =88).	Clinical diagnosis of ADHD and ED	Girls with ADHD-C showed eating disorders to be more prevalent compared to controls; girls with ADHD-I were intermediate between these two groups. Baseline impulsivity symptoms, as opposed to hyperactivity and inattention, best predicted adolescent eating pathology.

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

This study assessed the prevalence of ADHD in EDs and vice-versa. It could be discussed whether ADHD itself can be a predisposing or vulnerability factor for the development of EDs, which mainly occur during adolescence.⁽³⁰⁾ Developmental changes, such as puberty and stressful events, could trigger ED behaviors, especially in patients with ADHD.⁽³¹⁾ In addition, patients with NDDs have an increased risk of other mental disorders beyond those in the ED spectrum.⁽³²⁾ As such, EDs might be regarded as one of several possible progressive and comorbid conditions in patients with NDDs. The literature suggests the potential benefit of screening for ADHD as part of the overall assessment of EDs, in particular BN, BED, and AN-BP.⁽²¹⁾ Impulsive behaviors represent a core ADHD symptom, and deficits in their regulation have been shown in ED patients, especially in those with binge eating and purging behaviors.⁽⁶⁾ The association between ADHD and EDs may also be explained by a combination of genetic mechanisms. Genetic variability in dopaminergic genes related to reward processing has been described in patients with comorbid ADHD and BED.^(33,34) 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.⁽³⁵⁻³⁷⁾ These findings may have important implications for prevention and early intervention programs, which could focus on mood regulation in individuals with ADHD symptoms at risk for developing disordered eating. Future studies should address whether patients with these comorbid conditions have different prognosis, course of disease, and treatment response compared to those with either disorder alone.

CONCLUSION

Only few studies in the literature have addressed a direct causal relationship between ADHD and EDs, suggesting an overlap between both conditions. However, these studies have mostly included small sample sizes and used disparate approaches, which limits the generalization of results. EDs and ADHD share several key features that may explain the overlap of both diagnoses, including attention deficits, impulsive mechanisms, and low self-esteem. Future studies are required to gain additional insights into the association between both disorders and improve the clinical management and treatment of patients with this comorbid association.

AUTHORSHIP

Márcia Rodrigues - Writing – original draft; Writing – review & editing

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REFERENCES

1. Ramos-Quiroga JA, Bosch R, Castells-Cervelló X, Nogueira M, García-Giménez E, Casas M. Attention deficit hyperactivity disorder in adults: a clinical and therapeutic characterization. *Rev Neurol.* 2006; 42:600-606. doi: <https://doi.org/10.33588/rn.4210.2005495>.
2. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders 5.* Washington, DC: The American Psychiatric Association; 2013.
3. Polanczyk G, Rohde LA. Epidemiology of attention-deficit/hyperactivity disorder across the lifespan. *Cur Opin Psych.* 2007; 20(4):386-92. doi: <https://doi.org/10.1097/YCO.0b013e3281568d7a>.
4. Polanczyk G, Lima MS, Horta BL, Biederman J, Rohde LA. The worldwide prevalence of ADHD: a systematic review and metaregression analysis. *Am J Psychiatry.* (6):942-8. doi: <https://doi.org/10.1176/ajp.2007.164.6.942>.
5. Fayyad J, De Graaf R, Kessler R. Cross-national prevalence and correlates of adult attention-deficit hyperactivity disorder. *Br J Psychiatry.* 2007; 190:402-9. doi: <https://doi.org/10.1192/bjp.bp.106.034389>.
6. Shauna P. Reinblatt. Are eating disorders related to attention deficit/hyperactivity disorder? *Curr Treat Options Psych.* 2015; 2(4): 402–12. doi: <https://doi.org/10.1007/s40501-015-0060-7>
7. Cortese S, Bernardina BD, Mouren MC. Attention Deficit/Hyperactivity Disorder (ADHD) and Binge Eating. *International Life Sciences Institute Nutrition Reviews.* 2007; 65(9):404-11. doi: <https://doi.org/10.1111/j.1753-4887.2007.tb00318.x>.
8. Mikami AY, Hinshaw SP, Patterson KA, Lee JC. Eating pathology among adolescent girls with attention- deficit/hyperactivity disorder. *J Abnorm Psychol.* 2008; 117(1):225-35. doi: <https://doi.org/10.1037/0021-843X.117.1.225>.
9. Nazar BP, Pinna CM, Coutinho G, Segenreich D, Duchesne M, Appolinario JC, *et al.* Review of literature of attention-deficit/hyperactivity disorder with comorbid eating disorders. *Rev Bras Psiquiatr.* 2008; 30(4):384-9. doi: <https://doi.org/10.1590/s1516-44462008000400014>.
10. Biederman J, Ball SW, Monuteaux MC, Surman CB, Johnson JL, Zeitlin S. Are girls with ADHD at risk for eating disorders? Results from a controlled, five-year prospective study. *J Dev Behav Pediatr.* 2007; 28(4):302-7. doi: <https://doi.org/10.1097/DBP.0b013e3180327917>.
11. Surman CB, Randall ET, Biederman J. Association between attention-deficit/ hyperactivity disorder and bulimia nervosa: analysis of 4 case-control studies. *J Clin Psychiatry.* 2006; 67(3):351-4. doi: <https://doi.org/10.4088/jcp.v67n0303>.
12. Quinn PO. Attention-deficit/hyperactivity disorder and its comorbidities in women and girls: an evolving picture. *Curr Psychiatry Rep.* 2008; 10(5):419-23. doi: <https://doi.org/10.1007/s11920-008-0067-5>.

13. Wentz E, Lacey JH, Waller G, Råstam M, Turk J, Gillberg C. Childhood onset neuropsychiatric disorders in adult eating disorder patients. A pilot study. *Eur Child Adolesc Psychiatry*. 2005; 14(8):431-7. doi: <https://doi.org/10.1007/s00787-005-0494-3>.
14. Marucci S, Ragione LD, DeLaco G, Mococchi T, Vicini M, Guastamacchia E, *et al.* Anorexia Nervosa and Comorbid Psychopathology. *Endocrin, Metabolic & Immune disorders - Drug targets*. 2018;18(4):316-324. <http://doi.org/10.2174/1871530318666180213111637>.
15. Sala L, Martinotti G, Carenti ML, Romo L, Oumaya M, Pham-Scott A, *et al.* Attention-deficit/hyperactivity disorder symptoms and psychological comorbidity in eating disorder patients. *Eat Weight Disord*. 2017; 23(4):513-9. doi: <https://doi.org/10.1007/s40519-017-0395-8>.
16. Levin RL, Rawana JS. Attention-deficit/hyperactivity disorder and eating disorders across the lifespan: a systematic review of the literature. *Clin Psychol Rev*. 2016; 50:22-36. doi: <https://doi.org/10.1016/j.cpr.2016.09.010>.
17. Nazar BP, Bernardes C, Peachey G, Sergeant J, Mattos P, Treasure J. The Risk of Eating Disorders Comorbid with Attention-Deficit/Hyperactivity Disorder: A Systematic Review and Meta-Analysis. *International Journal of Eating Disorders*. 2016; 49(12):1045-57. <https://doi.org/doi:10.1002/eat.22643>.
18. Ziobrowski H, Brewerton RD, Duncan AE. Associations between ADHD and eating disorders in relation to comorbid psychiatric disorders in a nationally representative sample. *Psychiatry Res*. 2018; 260:53-9. doi: <https://doi.org/10.1016/j.psychres.2017.11.026>.
19. Surman CB, Randall ET, Biederman J. Association between attention deficit/ hyperactivity disorder and bulimia nervosa: analysis of 4 case-control studies. *J Clin Psychiatry*. 2006; 67(3):351-4. doi: <https://doi.org/10.4088/jcp.v67n0303>.
20. Yates WR, Lund BC, Johnson C, Mitchell J, McKee P. Attention-Deficit Hyperactivity Symptoms and Disorder in Eating Disorder Inpatients. *Int J Eat Disord*. 2009; 42(4):375-8. doi: <https://doi.org/10.1002/eat.20627>.
21. Nickel K, Maier S, Endres D, Joos A, Maier V, van Elst LT, Zeeck A. Systematic Review: Overlap Between Eating, Autism Spectrum, and Attention-Deficit/Hyperactivity Disorder. *Front Psychiatry*. 2019; 10:708. doi: <https://doi.org/10.3389/fpsy.2019.00708>.
22. Svedlund NE, Norring C, Ginsberg Y, von Hausswolff-Juhlin Y. Symptoms of Attention Deficit Hyperactivity Disorder (ADHD) among adult eating disorder patients. *BMC Psychiatry*. 2017; 17:19. doi: <https://doi.org/10.1186/s12888-016-1093-1>.
23. Seitz J, Kahraman-Lanzerath B, Legenbauer T, Sarrar L, Herpertz S, Salbach-Andrae H, *et al.* The role of impulsivity, inattention and comorbid ADHD in patients with bulimia nervosa. *PLoS One*. 2013; doi: <https://doi.org/10.1371/journal.pone.0063891>.
24. Blinder BJ, Cumella EJ, Sanathara VA. Psychiatric comorbidities of female inpatients with eating disorders. *Psychosom Med*. 2006; 68(3):454-62. doi: <https://doi.org/10.1097/01.psy.0000221254.77675.f5>.
25. Seymour KE, ReinBlatt SP, Benson L, Carnell S. Overlapping neurobehavioral circuits in ADHD, obesity, and binge eating: Evidence from Neuroimaging Research. *CNS Spectr*. 2015; 20(4):401–11. doi: <https://doi.org/10.1017/S1092852915000383>.
26. Kaye WH, Bulik CM, Thornton L, Barbarich N, Masters K. Comorbidity of Anxiety Disorders With Anorexia and Bulimia Nervosa. *Am J Psychiatry*. 2004; 161(12):2215-21. doi: <https://doi.org/10.1176/appi.ajp.161.12.2215>.
27. Quinn PO. Attention-deficit/hyperactivity disorder and its comorbidities in women and girls: an evolving picture. *Curr Psychiatry Rep*. 2008; 10(5):419-23. doi: <https://doi.org/10.1007/s11920-008-0067-5>.
28. Gadalla T, Piran N. Co-occurrence of eating disorders and alcohol use disorders in women: a meta analysis. *Arch Womens Ment Health*. 2007; 10(4):133-40. doi: <https://doi.org/10.1007/s00737-007-0184-x>.
29. Calero-Elvira A, Krug I, Davis K, López C, Fernández-Aranda F, Treasure J. Meta-analysis on drugs in people with eating disorders. *Eur Eat Disord Rev J Eat Disord Assoc*. 2009; 17(4):243-59. doi: <https://doi.org/10.1002/erv.936>.
30. Herpertz-Dahlmann B. Adolescent eating disorders: update on definitions, symptomatology, epidemiology, and comorbidity. *Child Adolesc Psychiatr Clin N Am*. 2015; 24(1):177-96. doi: <https://doi.org/10.1016/j.chc.2014.08.003>.
31. Treasure J, Claudino AM, Zucker N. Eating disorders. *Lancet Lond Engl*. 2010; doi: [https://doi.org/10.1016/S0140-6736\(09\)61748-7](https://doi.org/10.1016/S0140-6736(09)61748-7).
32. Biederman J, Newcorn J, Sprich S. Comorbidity of attention deficit hyperactivity disorder with conduct, depressive, anxiety, and other disorders. *Am J Psychiatry*. 1991; 148(5):564-77. doi: <https://doi.org/10.1176/ajp.148.5.564>.
33. Porfirio MC, Lo-Castro A, Giana G, Giovinazzo S, Ouakil DP, Galasso C. Attention-deficit hyperactivity disorder and binge eating disorder in a patient with 2q21.1–q22.2 deletion. *Psychiatr Genet*. 2012; doi: <https://doi.org/10.1002/eat.22643>.
34. Steadman KM, Knouse LE. Is the Relationship Between ADHD Symptoms and Binge Eating Mediated by Impulsivity? *J Atten Disord*. 2014; 20(11):907-12. doi: <https://doi.org/10.1177/1087054714530779>.
35. Cortese S, Isnard P, Frelut ML, Michel G, Quantin L, Guedeney A, *et al.* Association between symptoms of attention-deficit/hyperactivity disorder and bulimic behaviors in a clinical sample of severely obese adolescents. *Int J Obes*. 2007.
36. Nazar BP, Suwvan R, de Sousa Pinna CM, Duchesne M, Freitas SR, Sergeant J, *et al.* Influence of attention-deficit/hyperactivity disorder on binge eating behaviors and psychiatric comorbidity profile of obese women. *Compr Psychiatry*. 2014; 55(3):572-8. doi: <https://doi.org/10.1016/j.comppsy.2013.09.015>.
37. Fernández-Aranda F, Agüera Z, Castro R, Jiménez-Murcia S,

Ramos-Quiroga JA, Bosch R, et al. ADHD symptomatology in eating disorders: a secondary psychopathological measure of severity? *BMC Psychiatry*. 2013; 13:166. doi: <https://doi.org/1471-244X/13/166>.

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