

EDITORIAL

Attention deficit hyperactivity disorder and eating disorders: an overlooked comorbidity?

Trastorno por déficit de atención e hiperactividad y trastorno alimentario: ¿una comorbilidad pasada por alto?

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Dear Editor,

A recent cross-sectional study carried out at an outpatient Eating Disorders program in San Sebastian (Guipúzcoa, Spain), consisting of 108 adult patients diagnosed with Eating Disorders (ED), found a disproportionately elevated rate of Attention Deficit Hyperactivity disorder (ADHD) diagnosis when using the Adult ADHD Self-Report Scale (ASRS-v1.1)¹. Ruiz Feliu from the Donostia-Amara Mental Health Center, in collaboration with colleagues from the University of Navarra Clinic, *Hospital Universitario Donostia* and Ansoain Mental Health Center, discovered high ASRS scores in 42.6% of the patients¹, which is a rate about 17 times higher than the expected rate of ADHD diagnosis in the general adult population (2.5%)². They also observed a higher correlation of ADHD and ED in binge-purge types of eating disorder, those most commonly associated with greater impulsivity.

ADHD is the most commonly diagnosed neurodevelopmental disorder in childhood, with a prevalence of 5.9% in childhood and 2.2% in adults, with no significant differences in prevalence between North America, Europe, Asia, Africa, South America, and Oceania².

Several large epidemiologic studies show that ADHD often co-occurs with other psychiatric disorders, such as depression, bipolar disorder, autism spectrum disorders, anxiety disorders, oppositional defiant disorder, conduct disorder, eating disorders, and substance use disorders².

When disorder A and disorder B co-occur more frequently than expected by chance, scientists can consider or propose several hypotheses^{3,4}:

- Common etiological mechanism, of either a common genetic vulnerability or common environmental factors between the two disorders.
- Disorder A is a risk factor for disorder B, either because some symptoms of disorder A can produce disorder B (decreased sleep can produce fatigue and poor concentration), or because disorder A, if untreated, is a risk factor for disorder B (as diabetes and retinopathy or, as we found in a recent meta-analysis, ADHD was associated with elevated risk of unintentional injuries and accidental poisoning⁵).

Another possibility is that the treatment of disorder A may produce symptoms of disorder B. This may be the case in treatment of

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ADHD with stimulants, which can occasionally induce mood swings, mania and bipolar disorder⁴. That could explain some cases of extreme decreased appetite (and weight) in children with ADHD treated with stimulants that can resemble *anorexia nervosa*, but that does not seem to be the case in the paper we are commenting on¹.

- c) Symptom overlap may generate the diagnosis of both disorders (probably not the case in ED and ADHD).

So, what is the evidence of the association of ADHD and ED?

The recent World Federation of ADHD Consensus statement² only mentions that obesity, if you consider it an ED, is elevated in children with ADHD. They cite three studies:

- 1) A Swedish national register study of >2.5 million people found ADHD patients had a three-fold greater risk of obesity relative to their non-ADHD siblings and cousins. It also found a familial co-aggregation of ADHD and clinical obesity, the strength of which varied directly with the degree of genetic relatedness⁶.
- 2) A meta-analysis observed that, when compared with typically developing subjects children and adolescents with unmedicated ADHD were about 20% more likely to be overweight or obese (fifteen studies, >400,000 participants), and adults with unmedicated ADHD were almost 50% more likely to be overweight or obese (nine studies, over >45,000 participants)⁷.
- 3) A meta-analysis of twelve studies (>180,000 participants) found that people with unmedicated ADHD were about 40% more likely to be obese, whereas those who were medicated were indistinguishable from typically developing subjects⁸.

We also found recent meta-analysis on the bidirectional association of ADHD and ED:

- 1) A 2016 meta-analysis⁹ of twelve studies investigating ED in patients with ADHD (ADHD=4,013; controls=29,404), and five exploring ADHD in patients with ED (ED=1,044; controls=11,292).

The pooled odds ratio (OR) of diagnosing any ED in patients with ADHD was significantly increased (OR=3.82; 95% CI: 2.34-6.24). A similar level of risk was found across all ED

syndromes (*anorexia nervosa* (AN): OR=4.28; 95%CI: 2.24-8.16); *bulimia nervosa* (BN): OR=5.71; 95% CI: 3.56-9.16; and binge eating disorder (BED): OR=4.13; 95%CI: 3-5.67). The prevalence of ED in patients with ADHD was 1% in those with AN, 9-11% in BN and 9.3-11.4% in BED.

The pooled OR of ADHD in patients with ED was significantly increased (OR=2.57; 95% CI: 1.30-5.11), being higher in cohorts with binge eating disorder (OR=5.77; 95% CI: 2.35-14.18).

The prevalence of ADHD in patients with ED was 3-16.2% in those with AN, 9-34.9% in BN, and 19.8% in BED.

The number of ADHD symptoms correlated with ED symptom severity in all binge/purge ED subtypes. ADHD symptoms were found to predict binge eating severity and bulimic symptoms even after controlling for anxiety and depression⁹.

- 2) A systematic review¹⁰ found 26 studies out of 37 that supported evidence of association between ADHD and ED or disordered eating. Children with ADHD were at risk for disordered eating, while adolescents, emerging adults, and adults were at risk for both ED and disordered eating. Similar findings to those presented in another review of 75 studies that found moderate strength of evidence for a positive association between ADHD and disordered eating and with specific types of disordered-eating behavior, in particular, overeating behaviour¹¹.
- 3) Another recent literature review found prevalence of ADHD in patients with ED ranging 1.6-18%; again, more in binge-purge AN and in BN, than in AN restrictive¹².

To summarize, there is an elevated risk of ADHD in patients with ED (pooled OR=2.57), higher in patients with binge eating disorder (OR=5.77)⁹. The rates of ADHD diagnosis in patients with AN are 3-16.2%⁹, in BN 9-34.9%⁹, and in BED patients 19.18%¹².

Most studies indicate higher rates of ADHD in patients with AN binge-purge type¹², BN¹² or BED⁹.

There is also increased risk of ED in patients with ADHD, with pooled OR of 3.82⁹, and elevated rates of obesity in children, adolescents and adults with ADHD^{2,6-8}

Although the mechanism of this bidirectional overlap needs to be further studied, at this state we can consider at least four hypotheses:

- 1) The dysfunction of the prefrontal cortex executive function in ADHD, coupled with limbic dysfunction in reward circuits are implicated in the delay of reward and impulsivity. This could explain the higher rates of ED in patients with ADHD.
- 2) It is possible that a disordered eating pattern and neuroendocrine deficiencies in metabolism and nutrition, secondary to severe and prolonged ED, may have a negative effect on attentional circuits in the brain, thus causing ADHD symptoms or the full-blown disorder. However, if this was true, ADHD would be more frequent in restrictive AN, but it seems to be more frequent in patients with BED, BN and binge-purge AN. This suggests an underlying mechanism possibly based on impulse control, delayed aversion, and reward processing, rather than on poor nutrition that may cause inattention.
- 3) Mediating and moderating factors may increase the risk of one disorder in the presence of the other.
- 4) Other possibilities include deeper mechanisms of mood, self-esteem/self-image and appetite regulation that may underlie ED and ADHD, and may be playing an important role in this case.

Finally, the study by Ruiz Feliu et al¹ is highly relevant and is an example of an integrative approach across different levels and systems (academic and clinical activity, public and private centers, located in two different autonomous communities in Spain). Thus, more collaborative research is needed to benefit patients.

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