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Research Article

Eating Behaviour and Body Mass Index in Children with Attention-Deficit Hyperactivity Disorder

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ABSTRACT

Background: ADHD has been associated with impaired reward processing and self-regulation that can incline the patient to distorted meals and a weighty excess. Data indicate a greater body mass index (BMI) and obesogenic eating in Indian children regarding ADHD, but limited data are available regarding Indian children. We analysed the relationship between eating behaviours and BMI between offspring with ADHD and normally developing peers.

Methods: In a case control study at a Child and Adolescent Guidance Clinic (April 2021 July 2022), 30 drug naive children with ADHD (DSM-5; age 611 years) and 30 age, sex and income matched controls were recruited. They were asked to give their ADHD assessment using Vanderbilt ADHD Parent Rating Scale, the Conner index Parent 10-item Conner and Child Eating behavior Questionnaire (CEBQ). The same standard procedures were used to measure height and weight; BMI was determined (kg/m 2). Comparisons between groups were done using t test/WilcoxonMann Whitney test, Chi-square/Fisher exact test; correlations, using Spearman rho test (PSPP v23; -0.05).

Results: Mean age did not differ (ADHD 8.17±2.21 vs controls 8.16±2.17 years; p=0.870); 83.3% were male. Mean BMI was higher in ADHD (17.02 vs 14.68 kg/m^2; Wilcoxon W=610.5, p=0.018). Weight categories differed (underweight 16.7% vs 40.0%; overweight 23.3% vs 6.7%; obese 16.7% vs 3.3%; Fisher's exact p=0.039). On CEBQ, enjoyment of food (83.3% vs 60.0%; x^2=4.022, p=0.045) and food responsiveness (70.0% vs 43.3%; x^2=4.344, p=0.037) were more frequent in ADHD. Emotional under-eating scores were lower in ADHD (11.93±3.55 vs 14.10±3.97; p=0.030). A moderate, statistically significant correlation was observed between ADHD severity (Conner's score) and emotional overeating (r=0.32). No significant associations were found between eating behaviours and age, sex, family income, or neighbourhood.

Conclusion: Indian children with ADHD show higher BMI and greater prevalence of overweight/obesity than controls, accompanied by increased food responsiveness and enjoyment of food. Emotional overeating correlates with ADHD symptom severity. Routine screening for eating behaviours and weight status should be integrated into ADHD care, with early behavioral and nutritional interventions. Larger, community-based longitudinal studies are warranted.

Keywords: ADHD; children; eating behaviour; BMI; obesity; overweight; CEBQ; Conner's scale; India; case–control study.

INTRODUCTION

The most widespread neurodevelopment disorder of childhood is the attention deficit hyperactivity disorder (ADHD). It is prevalent in children who go to school and it is defined by not having proper attention, hyperactivity owing to impulsiveness. The children experience difficulties solving problems, maintaining attention, minimal control over their impulses, having a low capacity to self-inhibit. 1These symptoms usually lead to functional impairment in many areas of life like those of executive functioning and self-inability to regulate themselves which are dysregulated in obesity and ADHD and depend on systems of motivation.2 Motivational systems are required

for executive functioning and self-regulation, both of them unregulated in ADHD and obesity. Body weight dysregulation is one of the manifestations of such a dysregulation, which is rather similar to the forms of body weight dysregulation in obesity. Additionally, it has been stated that individuals with ADHD exhibit above-average body mass index (BMI) standard deviation scores and that body fat percentage and circumference of the abdomen are significantly higher than the controls.3 Seymour et al believed that there was a significant amount of overlap of the neural circuitry between the two conditions, as well as functional pathology that was present in reward, response inhibition, emotional processing and regulation.4 Dysfunctional executive functioning may cause an inability to control oneself, and in turn, normalized unhealthy eating habits.6 Serhat et al demonstrated The abnormal nonhealthy food/eating following this emotional aberration is seen as an abnormal unhealthy food eating habits and hedonic eating behaviors in an ADHD child.8 An association is seen in the ADHD and obesity where patients with reported symptoms of ADHD are also found having higher hedonic eating habits/patterns and a higher probability of having higher BMIs. The shared pathways of obesity and ADHD include abnormal responses of reward centres, accessibility of dopamine and norepinephrine in presynaptic neurones and resultant changes in impulse control/ executive capability. The inability to plan and disorganization can also affect the success of adhering to particular dietary recommendations (e.g., forgetting to bring a lunch or forgetting to bring healthy snacks outside the house). ADHD may cause an increased risk of obesity possibly because of poor regulation of the dopamine pathway resulting in poor physical activity and active life style.9 And thus they are at risk of developing some common respiratory and gastrointestinal disorders as well as dermatological and neurological symptoms.10

The same can be said of disorganization and loss of planning which can affect successful adherence to given dietary suggestions (e.g. forgetting to bring a lunch or forgetting to bring healthy snacks out of the house). Research has also shown that children with ADHD may be dysregulated in weights with the trend being more towards the overweight body mass index range which could be due to poor eating habits in children with ADHD.11,13,14 Obesity and overweight cases were prevalent with a statistically significant increase in the ADHD group, whereas underweight cases were less common in the ADHD group. The results of the study by Aykutlu were presented as evidence that newly diagnosed children with ADHD might have affected eating habits, a high ratio of obesity and overweight.12 A cross-sectional study of the study conducted by Serhat et al. that involved 300 treatment-naive children with ADHD and 75 controls in terms of ADHD diagnosis but otherwise healthy aged 7-17 years found that prevalence of being overweight or obese was higher in the group with ADHD. In the study, cognitive problem, that is, inattentive and oppositional sub-scores in Conner parent rating scale were positively related to BMI percentage points and the duration of breast-feeding was negatively related to BMI percentage points. The results came to the conclusion that, inattention and oppositional behavior were positively correlated with overweight and obesity, whereas time of breast-feeding was inversely associated with overweight and obesity among children and adolescents persons with ADHD.7 All this knowledge is however limited to the western subcontinent with very little being known as regards the prevalence of obesity and overweight with respect to Indian children with ADHD. In addition, the connection between weight, type and severity of ADHD and eating behavior is not determined. With the above in mind, it was intended that the present study be carried out to identify a relationship between the eating behavior and BMI as well as to compare the eating behavior and the BMIs of children with ADHD with those of the normally developing children.

MATERIALS & METHODS

Study Design and Setting

This case–control study was conducted at the Child and Adolescent Guidance Clinic. Data collection took place from April 2021 through July 2022.

Participants

Cases

Thirty treatment-naïve children aged 6–11 years with a Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) diagnosis of attention-deficit/hyperactivity disorder (ADHD) were recruited using purposive sampling.

Exclusion Criteria (Cases): cerebral palsy, physical disability, intellectual disability, chronic medical illness, or adherence to a prescribed therapeutic diet.

Controls

Thirty typically developing children matched to cases on age, sex, and household income served as controls.

Exclusion criteria (controls): identical to those for the case group.

Consent and Assent

Written informed consent was obtained from parents/guardians, and assent was obtained from participating children. Parents currently experiencing an active mental health condition were not enrolled.

Ethical Approval

The study protocol received approval from the Institutional Biomedical Research Ethics Committee prior to initiation.

Measures

Socio-demographic and Clinical Proforma

A structured proforma captured participant demographics and clinical history.

Vanderbilt ADHD Parent Rating Scale (VADPRS)

The VADPRS is a 47-item parent-report measure covering all 18 DSM-5 ADHD symptoms and related disruptive behaviors. Items are scored on a 4-point scale (never, occasionally, often, very often). The instrument yields symptom scores and impairment ratings across home, school, and social domains.

Conners Parent 10-Item Abbreviated Index

This abbreviated parent-rated index derives from the Conners Parent Rating Scale (CPRS). Items are rated 0–3 (0 = not at all, 1 = just a little, 2 = pretty much, 3 = very much), producing a total score ranging from 0 to 30.

Child Eating Behavior Questionnaire (CEBQ)

The CEBQ comprises 35 parent-reported items assessing eight eating-style dimensions. Food-approach dimensions include food responsiveness, enjoyment of food, emotional overeating, and desire to drink. Food-avoidant dimensions include slowness in eating, food fussiness, emotional undereating, and satiety responsiveness. Responses use a 5-point Likert format (1 = never to 5 = always).

Physical Assessments

- **Body Weight:** measured on a calibrated clinical scale with participants in light indoor clothing and without shoes.
- **Height:** measured barefoot using a wall-mounted stadiometer; the head was positioned in the horizontal Frankfurt plane.
- **Body mass index (BMI):** calculated as weight (kg) divided by height squared (m^2).

Statistical Analysis

Data were analyzed using IBM SPSS Statistics, version 23. Statistical significance was set at **$p < 0.05$** (two-tailed). Descriptive statistics (means, standard deviations, and frequencies/percentages) summarized sample characteristics. Group comparisons for categorical variables employed the chi-square test; Fisher's exact test was used when expected cell counts were small.

RESULTS

The mean ages of the case and control groups were 8.17 ± 2.21 and 8.16 ± 2.17 years, respectively (range: 6–11 years), with no significant between-group difference ($p = 0.870$). The sample showed a male predominance, with 83.3% of participants being boys. Table 1 summarizes between-group comparisons of mean height, weight, and BMI. Table 2 presents the comparison of overall CEBQ scores, and Table 3 details differences across CEBQ subscale scores. As depicted in Table 4 and Figure 1, ADHD severity (Conners score) demonstrated a moderate, statistically significant positive correlation with emotional overeating on the CEBQ ($r = 0.32$, $p < 0.05$), indicating that higher symptom severity was associated with greater emotional overeating.

Spearman analyses did not identify significant case–control differences by neighborhood or by background variables (age, sex, family income). Furthermore, age, sex, and family income showed no significant correlations with any CEBQ subscales.

Table 1. Comparison of Mean Height, Weight, and Bmi in Study Groups

Variable	Group		t-test		Wilcoxon-Mann-Whitney U Test		Fischer exact	
	Case	Control	t	p value	W	p value	X^2	P value
Mean height (in cm)	125.93	126.37	-0.126	0.90	-	-	-	-

Variable	Group		t-test		Wilcoxon-Mann-Whitney U Test		Fischer exact	
	Case	Control	t	p value	W	p value	X^2	P value
Mean weight (in Kg))	27.67	23.38	-	-	561.50	0.10	-	-
Mean BMI (in Kg/m²)	17.02	14.68	-	-	610.50	0.01	-	-
Underweight	5(16.7%)	12(40.0%)	-	-	-	-	8.47	0.03
Normal	13(43.3%)	15(50.0%)	-	-	-	-		
Overweight	7(23.3%)	2(6.7%)	-	-	-	-		
Obese	5(16.7%)	1(3.3%)	-	-	-	-		

Table 2. Comparison of Eating Behavior in the Two Study Groups

CEBQ	**Groups**	**n**	**Frequency**	**Percentage**	**Chi-Squared Test**	
					$\chi 2$	p value
Enjoyment of food	case	30	25	83.3%	4.022	0.045
	control	30	18	60.0%		
Emotional overeating	case	30	7	23.3%	3.268	0.145
	control	30	2	6.7%		
Satiety responsiveness	case	30	23	76.7%	0.089	0.766
	control	30	22	73.3%		
Slowness in eating	case	30	18	60.0%	0.069	0.793
	control	30	17	56.7%		
Desire to drink	case	30	13	43.3%	2.411	0.121
	control	30	19	63.3%		
Food fussiness	case	30	27	90.0%	0.218	1.00
	control	30	28	93.3%		
Emotional under-eating	case	30	22	73.3%	2.783	0.095
	control	30	27	90.0%		
Food responsiveness	case	30	21	70.0%	4.344	0.037
	Control	30	13	43.3%		

Table 3. Comparison of Cebq* Sub-Scale Scores In Two Study Groups

CEBQ	**Group (Mean**		**Wilcoxon-Mann-Whitney U Test**	
	ADHD	Control	W	p value
Enjoyment of food	14.60 ± 4.67	12.37 ± 5.02	537.000	0.069
Emotional overeating	8.23 ± 2.58	7.03 ± 2.01	580.000	0.053
Satiety responsiveness	15.97 ± 3.78	16.00 ± 4.30	-0.032	0.975
Slowness in eating	10.47 ± 2.49	10.77 ± 2.94	444.000	0.934
Desire to drink	8.63 ± 3.62	9.90 ± 3.68	377.000	0.280

Food fussiness	18.47 ± 3.33	18.20 ± 2.40	486.000	0.595
Emotional under-eating	11.93 3.55	14.10 3.97	-2.228	**0.030**
Food responsiveness	17.13	13.60	578.500	0.057

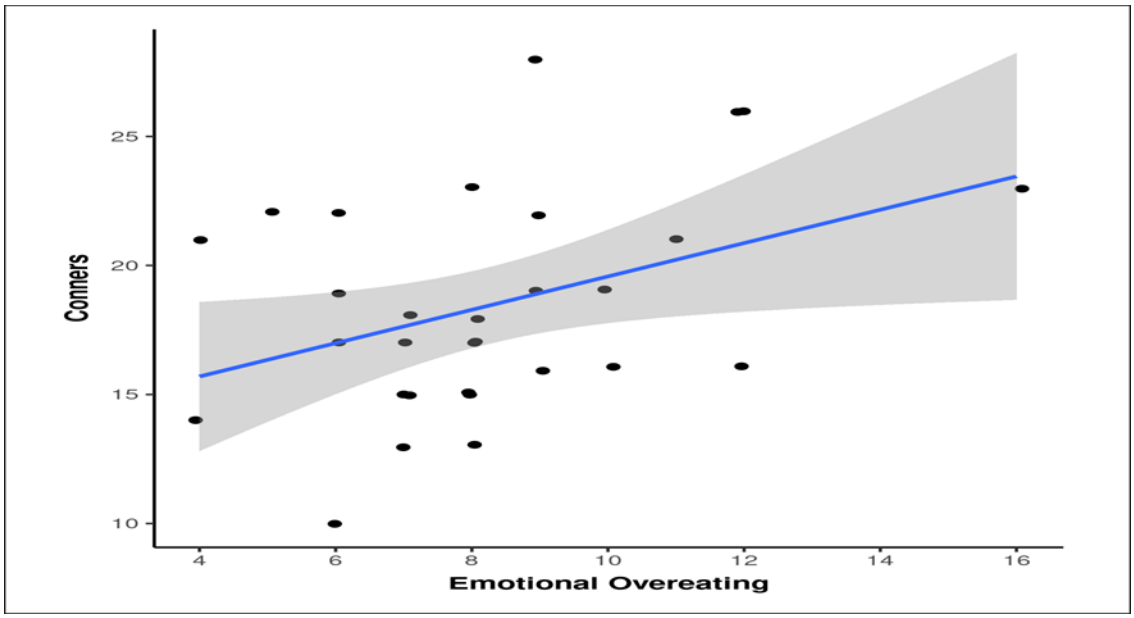

Figure 1: Correlation between severity of ADHD (Conners) and emotional overeating (CEBQ)

DISCUSSION

This case–control study shows that Indian, drug-naïve children with ADHD have a higher BMI and greater prevalence of overweight/obesity than age-, sex-, and income-matched typically developing peers, adding region-specific evidence to a literature largely derived from Western cohorts. Groups were well matched by age (mean ~8.2 years), and the marked male predominance (5:1) mirrors prior reports that ADHD is diagnosed more often in boys, likely reflecting greater externalizing symptoms and sociocultural referral patterns (12,21,18–20,22). Diagnosis clustered in the first school years, consistent with epidemiology in school-aged children (18). Children with ADHD were shorter on average yet heavier, yielding higher BMI; pooled underweight was lower and overweight/obesity higher than in controls, converging with meta-analytic and cohort data that link ADHD to excess adiposity (26) and with Turkish and other clinical samples reporting elevated overweight/obesity in ADHD (12,28). Mechanistically, our findings align with models implicating executive dysfunction and impulsivity, aberrant reward processing, and reduced opportunities for structured physical activity—factors that can bias energy intake upward and expenditure downward (24,25,27,29–31). On the CEBQ, enjoyment of food and food responsiveness were more frequent in ADHD, phenotypes previously associated with higher adiposity (33), while emotional under-eating scores were lower, suggesting a tilt toward hedonic and externally cued intake. Notably, emotional overeating correlated moderately with ADHD severity (r=0.32), reinforcing observations that symptom burden tracks with obesogenic eating tendencies (34,11,12). We observed no associations with age, sex, income, or neighborhood; however, higher BMI among children from nuclear families in our sample, contrasted with Chinese data linking grandparental care to obesity (23), underscores how family structure and caregiving context may shape routines, activity opportunities, and food environments differently across settings. Strengths include the focus on a drug-naïve clinical cohort, standardized phenotyping, and direct anthropometry. Limitations—small sample, cross-sectional, hospital-based design, and unmeasured parental and home-environment factors—temper generalizability and preclude causal inference. Clinically, routine screening of eating behaviors and growth in ADHD care, coupled with early behavioral/nutritional counseling and family-centered activity planning, appears warranted. Larger community-based longitudinal studies should clarify trajectories of eating profiles and BMI with symptom evolution and treatment exposure and test whether targeted

interventions can mitigate cardiometabolic risk in this vulnerable group.

REFERENCES

1. Kaplan and Sadock's. Attention Deficit Disorders. In: Sadock BJ, Sadock VA, editors. Comprehensive Textbook of Psychiatry. 9th edition. Philadelphia: Wolters Kulwer. 2009;3560-1.
2. Barkley RA, Cunningham CE. The effects of methylphenidate on the mother-child interactions of hyperactive children. Arch Gen Psychiatry. 1979;36:201-8.
3. Choudhry Z, Sengupta SM, Grizenko N, Harvey WJ, Fortier MÈ, Schmitz N, Joober R. Body weight and ADHD: examining the role of self-regulation. PLoS One. 2013;8:e55351.
4. Seymour KE, Reinblatt SP, Benson L, Carnell S. Overlapping neurobehavioral circuits in ADHD, obesity, and binge eating: evidence from neuroimaging research. CNS Spectr. 2015 Aug;20(4):401-11.
5. Chen AY, Kim SE, Houtrow AJ, Newacheck PW. Prevalence of obesity among children with chronic conditions. Obesity. 2010;18:210-3.
6. Yang Y, Shields GS, Guo C, et al. Executive function performance in obesity and overweight individuals: a meta-analysis and review. Neurosci Biobehav Rev. 2018;84:225-44. https://doi.org/10.1016/j.neubiorev.2017.11.020.
7. Türkoğlu S, Bilgiç A, Akça Ö. ADHD symptoms, breast-feeding and obesity in children and adolescents. Pediatr Int.. 2015;57(4):546-51.
8. Valera EM, Faraone SV, Murray KE, Seidman LJ. Meta-analysis of structural imaging findings in attention deficit hyperactivity disorder. Biol Psychiatry. 2007;61:1361-9.
9. Berthoud HR, Münzberg H, Morrison CD. Blaming the brain for obesity: integration of hedonic and homeostatic mechanisms. Gastroenterology. 2017;152(7):1728–38.
10. Brooks SJ, Cedernaes J, Schiöth HB. Increased prefrontal and parahippocampal activation with reduced dorsolateral prefrontal and insular cortex activation to food images in obesity: a meta- analysis of fMRI studies.
11. Hanć T, Słopień A, Wolańczyk T et al. Attention-deficit/hyperactivity disorder is related to decreased weight in the preschool period and to increased rate of overweight in school-age boys. J Child Adolesc Psychopharmacol. 2015 Nov;25(9):691-700.
12. Aykutlu HC, Gorker I. Disturbed eating behavior and obesity in drug naïve children diagnosed with attention deficit hyperactivity disorder. Alpha Psychiatry. 2019;20:659-66.
13. Shahrbabaki ME, Khatibi M, Sanjari M, et al. Comparing the dietary behaviors of hyperactive-attention deficit children with healthy children and its relationship with weight indices in both groups. J Child Adolesc Behav. 2018;6:375.
14. Tong L, Shi H, Li X. Associations among ADHD, abnormal eating and overweight in a non-clinical sample of Asian children. Scientific reports. 2017 Jun 6;7(1):1-8.
15. Wolraich ML, Lambert W, Doffing MA, Bickman L, Simmons T, Worley K. Psychometric Properties of the Vanderbilt ADHD Diagnostic Parent Rating Scale in a referred population. J Paediatr Psychol. 2003;8:559-68.
16. Wardle J, Guthrie CA, Sanderson S, Rapoport L .Development of the Children"s eating behaviour questionnaire. J Child Psychol Psychiatry. 2001;42:963-70.
17. Goyette CH, Conners CK, Ulrich RF. Normative dataon revised Conner's parent and teacher rating scales. J Abnorm Child psychol. 1978;2(2):221-36.
18. Polanczyk GV, Willcutt EG, Salum GA, Kieling C, Rohde LA: ADHD prevalence estimates across three decades: an updated systematic review and meta-regression analysis. Int J Epidemiol. 2014;43:434-42.
19. Bailey J, Barton B, Vignola A. Coping with children with ADHD: Coping styles of mothers with children with ADHD or challenging behaviours. Early Dev Care. 2006;148:145-57
20. Wolraich M, Hannah J, Pinnock T, Baumgaertel A, Brown J. Comparison of diagnostic criteria for attention deficit hyper-activity disorder in a country wide sample. J Am Acad Child Adolesc Pschiatry.1996;35:319-24.
21. O'Leary C, Bourke A, Ansell D: Comparing the influence of month of birth and gender in two academic years on attention deficit hyperactivity disorder diagnoses (ADHD) among children in the

health improvement network (THIN) UK data. Value Health 2014;17:A209.

22. Biederman J, Mick E, Faraone SV, Braaten E, Doyle A, Spencer T: Influence of gender on attention deficit hyperactivity disorder in children referred to a psychiatric clinic. Am J Psychiatry. 2002;159:36-42.
23. Zong XN, Li H, Zhang YQ. Family-related risk factors of obesity among preschool children: results from a series of national epidemiological surveys in China. BMC Paediatr. 2015;15:927.
24. Hanc´ T, Brzezin´ska A: Intensity of ADHD symptoms and subjective feeling of competence in school age children. School Psychol Int. 2009;30:491-506.
25. Curtin C, Bandini LG, Perrin EC et al. Prevalence of overweight in children and adolescents with attention deficit hyperactivity disorder and autism spectrum disorders: A chart review. BMC Paediatr . 2005;5:48.
26. Cortese S, Moreira-Maia CR, St Fleur D, Morcillo-Peñalver C, Rohde LA, Faraone SV. Association Between ADHD and Obesity: A Systematic Review and Meta-Analysis. Am J Psychiatry. 2016 Jan;173(1):34-43.
27. Cortese S, Castellanos FX: The relationship between ADHD and obesity: implications for therapy. Expert Rev Neurother. 2014;14:473-4.
28. Gungor S, Celiloglu OS, Raif SG, Ozcan OO, Selimoglu MA. Malnutrition and obesity in children With ADHD. J Atten Disord. 2016; 20(8):647-652.
29. Guerrieri R, Nederkoorn C, Schrooten M, Martijn C, & Jansen A: Inducing impulsivity leads high and low restrained eaters into overeating, whereas current dieters stick to their diet. Appetite. 2009;53:93-100.
30. Dubnov-Raz G, Perry A, & Berger I: Body mass index of children with attention-deficit/hyperactivity disorder. Journal of Child Neurology. 2011;26:302-8.
31. Porrino LJ, Rapoport JL, Behar D, et al. A naturalistic assessment of the motor activity of hyperactive boys: I. Comparison with normal controls. Arch Gen Psychiatry. 1983;40:681-7.
32. Kim J, Mutyala B, Agiovlasitis S Health behaviors and obesity among US children with attention deficit hyperactivity disorder by gender and medication use. Prev Med. 2011;52:218-22.
33. Santos JL, Ho-Urriola JA, González A, Smalley SV, Domínguez-Vásquez P, et al. Association between eating behavior scores and obesity in Chilean children. Nutr J. 2011;10:108.
34. Leventakou V, Herle M, Kampouri M et al. The longitudinal association of eating behaviour and ADHD symptoms in school age children: A follow-up study in the Rhea cohort. Eur Child Adolesc Psychiatry. 2021;31(3):511