Neuropsychiatr Invest. 2025;63:1-7

Original Article
10.5152/NeuropsychiatricInvest.2025.25031

Comparative Analysis of Irritable Bowel Syndrome Symptom Severity in Adults With Attention-Deficit/Hyperactivity Disorder and Healthy Controls: A Case-Control Study

Tarık Sağlam, Uğur Takım

Department of Psychiatry, University of Health Sciences Erzurum Faculty of Medicine, Erzurum, Türkiye

WHAT IS ALREADY KNOWN ON THIS TOPIC?

- *Adults with ADHD frequently experience comorbid GI symptoms.*
- *Irritable bowel syndrome involves disturbances in the gut–brain axis and is sensitive to stress and autonomic dysregulation.*

WHAT THIS STUDY ADDS ON THIS TOPIC?

- *Adults with ADHD have significantly greater IBS symptom severity compared to healthy controls.*
- *This study found a strong correlation between ADHD symptom severity and IBS symptom severity, suggesting a potential association that should be explored in future research.*
- *This study emphasizes the importance of screening for IBS symptoms in adults diagnosed with ADHD.*

ABSTRACT

Objective: The aim is to assess the severity of irritable bowel syndrome (IBS) symptoms in adults with attention-deficit/hyperactivity disorder (ADHD) in comparison to a control group and to examine the relationship between the symptom severities of adults with ADHD and IBS.

Methods: This cross-sectional study included 40 adults with ADHD and 40 matched healthy controls. Adults with ADHD was diagnosed using the Structured Clinical Interview for DSM-5 Disorders, and symptom severity was assessed with the Adult ADHD Self-Report Scale. Irritable bowel syndrome severity was determined using Irritable Bowel Syndrome Severity Scoring System. Major psychiatric disorders, chronic gastrointestinal (GI) diseases, and recent use of GI medications were among the exclusion criteria. Statistical analyses used *t*-tests, chi-square tests, and Pearson's correlation ($P < .05$).

Results: The group with ADHD showed significantly higher IBS symptom severity scores (114.73 ± 125.16) than the control group (55.82 ± 85.51) ($t = 2.167$, $P = .016$). A strong positive correlation was observed between ADHD symptom severity and IBS symptom severity ($r = 0.689$, $P < .001$).

Conclusion: Individuals with ADHD experience more severe IBS symptoms than healthy controls. The positive correlation between the severity of ADHD symptoms and IBS suggests a potential link requiring further investigation.

Keywords Attention-deficit/hyperactivity disorder, irritable bowel syndrome, hyperactivity, impulsivity, gut–brain axis, symptom severity

Corresponding author:
Tarık Sağlam

E-mail:
tariksglm@gmail.com

Received: May 5, 2025
Revision Requested: May 26, 2025
Last Revision Received: June 16, 2025
Accepted: June 21, 2025
Publication Date: August 13, 2025

INTRODUCTION

Attention-deficit/hyperactivity disorder (ADHD) is a neurodevelopmental disorder that is characterized by persistent inattention, hyperactivity, and impulsivity, and often results in considerable challenges across academic, occupational, and social domains.[1,2] Although ADHD is primarily diagnosed in childhood, longitudinal studies suggest that symptoms can frequently persist into adulthood, with an estimated prevalence of 3.4% among individuals aged 18-44 years.[3] Attention-deficit/hyperactivity disorder is thought to involve alterations in the fronto-subcortical neural circuits along with dysregulation of dopaminergic and noradrenergic pathways, which are believed to contribute to deficits

Cite this article as: Sağlam T, Takım U. Comparative analysis of irritable bowel syndrome symptom severity in adults with attention-deficit/hyperactivity disorder and healthy controls: A case-control study. *Neuropsychiatr Invest.* 2025, 63, 0031, doi:10.5152/NeuropsychiatricInvest.2025.25031.

in executive functioning and self-regulation.[4,5] While its psychiatric comorbidities including anxiety, depression, and substance use disorders are well-documented, research on the association of ADHD with somatic conditions remains relatively limited. Emerging evidence suggests that ADHD is associated with various somatic health conditions, including sleep disorders, asthma, otitis media, allergic rhinitis, motor dysfunction, urinary irregularities, premature ejaculation, migraine, obesity, and celiac disease.[6-12] However, despite its relatively high prevalence and clinical burden, ADHD in adults often remains under-recognized, resulting in potential gaps in diagnosis and treatment. This highlights the need for interdisciplinary research that examines the broader health implications of ADHD.

Among the somatic conditions that may be associated with ADHD, irritable bowel syndrome (IBS) has gained increasing attention. IBS is recognized as a prevalent and persistent disorder affecting gastrointestinal (GI) function. Studies report a prevalence between 2.4% and 31% among the general population. It is generally manifested through symptoms including recurrent abdominal pain, sensations of bloating, and deviations in bowel patterns.[13,14] Although IBS has traditionally been classified as a GI disorder, accumulating evidence suggests that its pathophysiology can extend beyond the gut and involve dysregulation of the gut–brain axis and autonomic nervous system, along with microbiome alterations and heightened stress reactivity.[15-19] Given that ADHD is also associated with similar neurobiological dysfunctions particularly those involving stress regulation, autonomic nervous system activity, and hypothalamic–pituitary–adrenal (HPA) axis dysregulation, an exploration the potential relationship between ADHD and IBS appears to be warranted.[15,19]

Epidemiological evidence suggests that individuals diagnosed with ADHD may have a higher likelihood of developing IBS relative to the general population.[20,21] Notably, a Taiwanese nationwide cohort study identified a statistically meaningful link between ADHD and IBS, which persisted even after controlling for co-occurring psychiatric conditions.[20] Agenome-wide pleiotropic association study identified genetic overlaps between ADHD and functional GI disorders including IBS, suggesting the possibility of a shared genetic basis that may contribute to the co-occurrence of these conditions.[22] Several mechanisms have been proposed to explain this potential comorbidity, including increased gut permeability, altered neurotransmitter signaling, and heightened stress reactivity; factors that are commonly believed to contribute to the pathophysiology of both ADHD and IBS.[23-26] Furthermore, behavioral patterns frequently observed in individuals with ADHD such as impulsivity, poor dietary habits, irregular eating patterns, and heightened physiological stress responses may contribute to the exacerbation of IBS symptoms.

Studies focusing on children with ADHD have produced results that corroborate the aforementioned findings. Several studies have highlighted a notably higher incidence of ADHD in children who exhibit various GI disturbances. Specifically, conditions such as encopresis, functional constipation, chronic diarrhea, and IBS appear to be more prevalent among this group. These findings suggest a potential link between neurodevelopmental disorders and GI dysregulation during childhood, pointing to the importance of a multidisciplinary approach when evaluating children with overlapping behavioral and somatic symptoms.[25,27] Moreover, higher rates of abdominal distention, recurrent abdominal pain, being overweight, and food allergies have been documented in children with ADHD, suggesting a broader disruption of gut physiology in affected individuals.[28-30] However, the outcomes of not all studies are consistent. Some studies have failed to establish a significant association between ADHD and GI symptoms or body mass index (BMI), highlighting the complexity of this relationship.[31] These disparities highlight the need for further empirical work to establish whether ADHD contributes causally to the manifestation and progression of IBS, or whether both disorders co-occur due to overlapping etiological influences.

Despite increasing evidence suggesting a potential association between ADHD and IBS, very few studies have examined whether ADHD influences symptom severity in IBS.[20] Factors such as psychological stress, autonomic dysregulation, and maladaptive coping strategies linked to ADHD may worsen IBS symptoms; however, it remains unclear whether these effects are driven by neurobiological mechanisms or behavioral factors.[13] The current study aimed to compare the symptom severity of IBS among individuals with ADHD and healthy controls while also exploring whether ADHD symptom severity was related to IBS severity within the ADHD group. This investigation may contribute to a better understanding of the clinical burden of IBS in adults with ADHD and highlight the need for future research into the mechanisms underlying this association.

MATERIAL AND METHODS

Participants and Procedure

This cross-sectional study was carried out at Erzurum City Hospital between March 2024 and December 2024 to evaluate the severity of IBS symptoms among adults diagnosed with ADHD and to explore any potential link between the symptom severities of ADHD and IBS. The participants were adults aged 18-60 years who were examined at the psychiatry outpatient clinic during this period. Initially, 51 individuals diagnosed with ADHD were assessed. However, 7 of these patients were excluded due to the presence of additional psychiatric disorders, and 4 others were excluded because of chronic GI diseases unrelated to IBS. The final study population consisted of 40 ADHD patients, of whom 3 already had a diagnosis of IBS. A control group comprising 40 healthy participants, matched for age and sex, was included in the study. None of the participants in the control group had a prior clinical diagnosis of IBS.

Participants in the ADHD group were individuals with a confirmed clinical diagnosis, verified through a detailed psychiatric assessment conducted by a qualified psychiatrist. Diagnostic confirmation was established using the Structured Clinical Interview for DSM-5 Disorders–Clinician Version (SCID-5-CV), a structured clinical interview known for its validity and reliability in psychiatric settings. To quantify ADHD symptom severity, participants completed the ADHD self-report scale (ASRS), a widely used self-report instrument that evaluates both the frequency and intensity of core symptoms, offering insight into the functional impact of the condition.

In parallel, the severity of IBS symptoms was systematically evaluated across all participants using the Irritable Bowel Syndrome Severity Scoring System (IBS-SSS). This widely accepted and psychometrically sound instrument captures multiple dimensions of IBS symptomatology, including the frequency, intensity, and perceived burden of GI symptoms. Moreover, it offers insight into how these symptoms interfere with the individual's quality of life and daily activities, thereby serving as a comprehensive measure of IBS severity.

Both groups were carefully screened to ensure the accuracy of the study findings. Participants were excluded if they had significant health issues such as cardiovascular disorders, cancer, neurological

conditions or endocrine disorders like diabetes or pancreatitis. Other exclusion criteria applied to both groups included the presence of current major psychiatric disorders (such as schizophrenia, bipolar disorder, generalized anxiety disorder, and panic disorder), as assessed using the SCID-5-CV. Additional exclusion criteria were chronic GI diseases other than IBS (e.g., inflammatory bowel disease or celiac disease), and recent use of medications that could affect GI motility or function. The control group was specifically selected from age- and sex-matched healthy adult hospital staff members, none of whom had a history of ADHD, other neurodevelopmental disorders, psychiatric conditions, or GI issues. Pregnant or breastfeeding individuals were also excluded to ensure valid and reliable comparisons.

Importantly, having a known diagnosis of IBS was not used as a criterion to disqualify participants from either group, as the primary aim of this study was to compare the severity of IBS symptoms between individuals with ADHD and healthy controls. This careful selection process aimed to provide a reliable basis for comparing IBS symptom severity and to investigate whether ADHD symptom severity, as measured by the ASRS, was associated with the severity of IBS symptoms within the ADHD group.

Prior to participation, all individuals who agreed to take part in the study were provided with detailed information regarding the aims, procedures, potential risks, and benefits of the research. Following this process, written informed consent was obtained from each participant, in accordance with ethical standards outlined in the Declaration of Helsinki and institutional guidelines for human research ethics. The study protocol underwent ethical evaluation and received official approval from Ataturk University Faculty of Medicine Research Hospitala non-interventional clinical research ethics committee (Approval Date: February 28, 2024; Approval Number: B.30.21 .ATA.0.01.00/104). No data collection or research activities were initiated until all participants had formally consented in writing, ensuring that ethical compliance and participant autonomy were upheld throughout the research process.

Measures

All assessments—including the ASRS, IBS-SSS, and the sociodemographic and clinical data forms—were administered during a single session following a standardized administration sequence.

Semi-Structured Form for Sociodemographic and Clinical Variables

To gather relevant demographic and clinical information, participants completed a semi-structured data form designed for this study. The form included items assessing demographic variables (e.g., age, sex, height, and weight) alongside clinical parameters related to the participants' general health and medical background.

Adult Attention-Deficit/Hyperactivity Disorder Self-Report Scale

The ASRS is a self-administered instrument developed to assess symptoms of ADHD in adults, consisting of 18 items rated on a 5-point Likert scale (0-4). The cumulative score, known as ASRS-T, spans from 0 to 72, with elevated scores on both subscales and the overall measure reflecting increased symptom severity. In the Turkish adaptation, psychometric evaluation demonstrated high internal consistency, with Cronbach's alpha values of 0.88 for the total scale, 0.82 for the inattention subscale, and 0.78 for the hyperactivity/impulsivity subscale.[32,33]

The Irritable Bowel Syndrome Severity Scoring System

The severity of IBS symptoms was assessed using the IBS-SSS, which includes 5 items, each rated on a 0-100 scale. The instrument evaluates abdominal pain intensity (Item 1), pain frequency (Item 2), bloating severity (Item 3), satisfaction with bowel habits (Item 4), and the overall impact on quality of life (Item 5). The total score ranges from 0 to 500, with higher scores indicating more severe symptomatology.[34] Although a formal Turkish validation of the IBS-SSS has not been published, the scale was administered using a forward-translation method conducted by the authors in accordance with standard procedures in symptom-based clinical research.

Statistical Analysis

Statistical procedures were performed using the SPSS software package version 25.0 (IBM SPSS Corp.; Armonk, NY, USA). Continuous variables were summarized using means and standard deviations, whereas categorical variables were described through frequencies and percentages. Between-group comparisons for continuous measures were conducted using Student's *t*-test, while categorical data were analyzed with the chi-square test. Fisher's exact test was employed when the expected frequency in any cell was below 5. The association between IBS severity and ASRS total scores was examined using Pearson's correlation coefficient. A 2-tailed *P* -value below .05 was considered indicative of statistical significance. Prior to conducting parametric tests, the assumptions of normality and homogeneity of variance were examined using the Shapiro-Wilk test and Levene's test, respectively. All assumptions were met.

RESULTS

As presented in Table 1, there were no statistically meaningful differences between the adult ADHD and healthy control groups in terms of age ($P=.323$), sex distribution ($P=.818$), educational attainment ($P=.131$), employment status ($P=.115$), or marital status ($P=.602$). In contrast, smoking rates differed significantly ($P=.043$), with the ADHD group exhibiting a higher proportion of smokers (20.0%) compared to controls (5.0%). Alcohol consumption ($P=.396$) and substance use ($P=.314$) showed no statistically significant variation between the groups. Clinical characteristics, including the use of psychiatric medication in the last 3 months ($P=.116$), the presence of existing medical conditions ($P=.494$), and history of suicide attempt ($P=.093$), also did not show any significant differences between the 2 groups.

The comparison of IBS symptom severity and ASRS scores between the groups (Table 2) indicated significantly higher IBS symptom severity scores (114.73 ± 125.16) in the adult ADHD group compared to the healthy control group (55.82 ± 85.51) ($t=2.167$, Cohen's $d=0.549$, $P=.016$). Due to the constraints of the study design, the ASRS scores were assessed only in the Adult ADHD group. The mean ASRS Part A score was 20.25 ± 5.77, ASRS Part B score was 28.53 ± 8.83, and ASRS total score was 49.03 ± 10.60.

Table 3 presents the correlation analyses, which were conducted only in the adult ADHD group. Pearson's correlation analysis revealed a significant and strong positive correlation between IBS symptom severity and ASRS total scores ($r=0.689$, $P<.001$).

DISCUSSION

The current study aimed to investigate whether adults diagnosed with ADHD exhibited greater IBS symptom severity compared to

Table 1. Comparison of Sociodemographic and Clinical Characteristics Between Adult Attention Deficit Hyperactivity Disorder and Healthy Control Groups

Variables	Adult ADHD (n = 40)	Healthy Control (n = 40)	Z/χ2	P
Age, mean ± SD, years	22.93 ± 4.58	23.80 ± 3.16	−0.996	.323
Sex			0.0530	.818
Male	16 (40.0%)	15 (37.5%)		
Female	24 (60.0%)	25 (62.5%)		
Education level, n (%)				
Middle school graduate	3 (7.5%)	0 (0.0%)	4.060	.131
High school graduate	21 (52.5%)	27 (67.5%)		
University graduate	16 (40.0%)	13 (32.5%)		
Employment status, n (%)			4.319	.115
Employed	14 (35.0%)	6 (15.0%)		
Unemployed	26 (65.0%)	34 (85.0%)		
Marital status, n (%)			1.015	.602
Single	32 (80.0%)	33 (82.5%)		
Married (living together)	8 (20.0%)	7 (17.5%)		
Smoking status, n (%)			4.114	.043
Non-smoker	32 (80.0%)	38 (95.0%)		
Smoker	8 (20.0%)	2 (5.0%)		
Alcohol consumption, n (%)			0.721	.396
Non-regular	36 (90.0%)	38 (95.0%)		
Regular	4 (10.0%)	2 (5.0%)		
Substance use, n (%)			1.013	.314
Non-user	39 (97.5%)	40 (100.0%)		
Current user	1 (2.5%)	0 (0.0%)		
Psychiatric medication use (last 3 Months), n (%)			5.756	.116*
No	40 (100.0%)	36 (90.0%)		
Yes	0 (0.0%)	4 (10.0%)		
Existing medical conditions, n (%)			2.824	.494*
No	40 (100.0%)	38 (95.0%)		
Yes	0 (0.0%)	2 (5.0%)		
Suicide attempt history, n (%)			2.051	.093*
No	38 (95.0%)	40 (100.0%)		
Yes	2 (5.0%)	0 (0.0%)		

P < .05 was considered as statistically significant. Student's t-test was used for continuous variables, and the chi-square test was used for categorical variables. ADHD, attention deficit hyperactivity disorder. *Fisher's exact test was used when expected cell counts were below 5.

healthy controls and to examine the association between ADHD and IBS symptom severities within the ADHD group. The authors' results indicated significantly higher IBS symptom severity among individuals with ADHD compared to controls (Table 2), consistent with recent epidemiological studies that reported elevated rates of gastrointestinal symptoms among adults with ADHD. Moreover, a strong positive correlation was observed between ADHD and IBS symptom severities within the ADHD group (Table 3). These findings are in line

Table 2. Comparison of Irritable Bowel Syndrome Symptom Severity Between Adult Attention Deficit Hyperactivity Disorder and Healthy Control Groups

Variables	Adult ADHD (n = 40)	Healthy Control (n = 40)	t/Cohen's d	P
Irritable bowel severity scoring system, mean ± SD	114.73 ± 125.16	55.82 ± 85.51	2.547/0.549	.016
ASRS part A (mean ± SD)	20.25 ± 5.77	N/A	N/A	N/A
ASRS part B (mean ± SD)	28.53 ± 8.83	N/A	N/A	N/A
ASRS total (mean ± SD)	49.03 ± 10.60	N/A	N/A	N/A

P < .05 was considered as statistically significant. Student's *t*-test was used. ADHD, attention deficit hyperactivity disorder; ASRS, attention deficit hyperactivity disorder self-report scale, N/A, not available.

Table 3. Correlation Between Irritable Bowel Severity Scoring System and Aattention-Deficit/Hyperactivity Disorder Self-Report Scale Total Scores

		Adult Attention Deficit Hyperactivity Disorder Self-Report
Irritable bowel severity scoring system	Pearson correlation	.689**
	Sig. (2-tailed)	<.001
	N	40

**Correlation was significant at the 0.01 level (2-tailed). ASRS, adult attention deficit hyperactivity disorder self-report scale.

with Yeh et al,[21] who reported increased prevalence of ADHD among the offspring of individuals with IBS, pointing toward a potential bidirectional relationship or shared underlying pathophysiological mechanisms. The observational nature of this study, however, precludes any definitive conclusions regarding causality and highlights the need for further prospective and mechanistic studies to better clarify these associations.

The findings indicate a significant association between the symptom severities of ADHD and IBS, supporting the hypothesis that the presence of ADHD may be related to greater severity in functional gastrointestinal symptoms. Kedem et al[20] have previously reported a higher prevalence of IBS among individuals with ADHD; the authors' results also support a quantifiable relationship between the severity of ADHD and IBS symptoms. Furthermore, the authors' findings are consistent with Yeh et al,[21] and highlights that such an association can also be observed in adult ADHD patients beyond familial associations alone. Gong et al[22] conducted a genome-wide pleiotropic association analysis that revealed shared genetic components between psychiatric and gastrointestinal disorders, lending further support to the gut–brain axis (GBA) as a common etiological pathway in these conditions.

The mechanisms underlying the association between ADHD and IBS may involve multiple biological pathways. Checa-Ros et al[19] indicated a role of the microbiome–gut–brain axis in ADHD. In particular, these authors suggested that changes in the microbiota composition can affect the balance of neurotransmitters and the development of inflammation. Similarly, IBS pathophysiology includes gut microbiota dysbiosis, increased intestinal permeability, and altered neurotransmitter metabolism. Gong et al[22] further underlined a critical role of immune pathways, specifically TH17 cell differentiation on gut inflammation and central nervous system function, indicating a broader integrative biological mechanism linking ADHD and IBS. Additionally, broader medical comorbidities associated with ADHD such as depression, anxiety, and asthma, may compound gastrointestinal symptoms, all of which increase healthcare burden and costs.[35] Overall, these findings collectively support a multifaceted model with an interaction between genetic, neurobiological, immunological, and behavioral factors, all of which contribute to the co-occurrence and symptom severity of ADHD and IBS.

The sociodemographic characteristics of the participants in this study revealed no significant differences in age, sex, education level, employment status, or marital status between the study and control groups. These findings suggest that ADHD-related gastrointestinal symptoms occur independently of major demographic factors. However, a notable finding was the higher prevalence of smoking in the adult ADHD group compared to healthy controls, consistent with prior studies suggesting an increased tendency for substance use, particularly nicotine, among ADHD populations.[20,35] Although alcohol consumption, substance use, and psychiatric medication usage did not differ significantly between groups, the increased prevalence of smoking may reflect stress-driven coping strategies, which are frequently linked to individuals with ADHD. Further investigation into lifestyle behaviors, particularly smoking, could enhance the authors' understanding of their role in exacerbating IBS symptoms among individuals with ADHD.

Given the authors' findings, further prospective longitudinal studies are warranted to clarify causality between ADHD and IBS symptom severities. Additionally, research incorporating biological markers focused on the gut–brain axis in larger, diverse populations would significantly advance the authors' understanding of the underlying mechanisms. An investigation of the effects of various ADHD treatment modalities, including pharmacological and psychological interventions, on IBS symptom severity could also provide important insights into the clinical management of these comorbid conditions. Such research may substantially contribute to improved patient outcomes and targeted therapeutic strategies.

Limitations

Several limitations of the present study should be noted. Due to its cross-sectional design, no causal conclusions can be drawn regarding the relationship between ADHD and IBS symptom severity, emphasizing the necessity of longitudinal approaches in future research. The relatively small sample size may constrain the extent to which the findings can be generalized, indicating the value of replication studies with larger and more heterogeneous samples. The use of self-report instruments such as the ASRS and IBS-SSS may have introduced potential response bias; incorporating structured interviews or objective diagnostic methods could improve measurement accuracy. Moreover, selecting healthy controls from hospital personnel may have led to sampling bias, potentially impacting the comparability of groups. In addition, BMI, which may influence gastrointestinal symptomatology, was not measured and could not be controlled for in this study. Lastly, the study did not systematically account for possible confounding variables—including dietary habits, lifestyle factors, and medication use—which could have influenced the observed associations. Furthermore, the IBS-SSS was applied to participants regardless of a confirmed IBS diagnosis, and its use in non-clinical populations may raise concerns regarding measurement validity. In particular, applying the scale to healthy controls who did not meet diagnostic criteria for IBS may limit the interpretability of severity scores in that group. Additionally, as the control group was composed of hospital staff members with no reported history of IBS, this may have introduced a selection bias by underrepresenting subclinical or undiagnosed IBS cases that could exist in the general population. Another limitation is that correlations between IBS severity and ASRS subscale scores were not analyzed. Future studies with larger sample sizes may investigate whether specific ADHD dimensions (inattention vs. hyperactivity/impulsivity) show differential associations with IBS symptom patterns. Finally, information regarding participants' ADHD treatment history, including stimulant use, was not collected. This limits the authors' ability to assess

the potential influence of pharmacological treatment on gastrointestinal symptom profiles.

The findings of this study indicate that adults diagnosed with ADHD report significantly greater IBS symptom severity than healthy individuals. A moderate positive association was also observed between the symptom intensities of ADHD and IBS. These outcomes point to a possible comorbid relationship between the 2 disorders, highlighting the need for further research to clarify the underlying mechanisms driving this overlap. These findings strongly suggest the presence of a potential link between ADHD and IBS, which warrants further investigation to elucidate the underlying mechanisms contributing to this comorbidity. Future studies employing longitudinal designs and more comprehensive assessments of potential confounders are essential to deepen the authors' understanding of this relationship. Improved recognition and management of IBS symptoms among individuals with ADHD could contribute to better clinical outcomes and enhance the overall quality of life. Therefore, clinicians should consider routine screening for gastrointestinal symptoms in adults with ADHD as part of a more integrative diagnostic approach.

Data Availability Statement: The data that support the findings of this study are available on request from the corresponding author.

Ethics Committee Approval: Ethical Committee approval was received from the Ethics Committee of Ataturk University Faculty of Medicine Research Hospital (Approval no: B.30.21.ATA.0.01.00/104; Date: 28.02.2024).

Informed Consent: Written informed consent was obtained from all participants who agreed to take part in the study.

Peer-review: Externally peer reviewed.

Author Contributions: Concept – T.S.; Design – T.S., U.T.; Supervision – T.S.; Resources – T.S.; Materials – T.S., U.T.; Data Collection and/or Processing – U.T.; Analysis and/or Interpretation – T.S.; Literature Search – U.T.; Writing Manuscript – T.S.; Critical Review – T.S., U.T.

Acknowledgments: The authors would like to thank all participants for their valuable contributions to this study.

Declaration of Interests: The authors have no conflicts of interest to declare.

Funding: The authors declared that this study has received no financial support.

REFERENCES

1. Barkley RA, Fischer M, Smallish L, Fletcher K. The persistence of attention-deficit/hyperactivity disorder into young adulthood as a function of reporting source and definition of disorder. *J Abnorm Psychol*. 2002;111(2):279-289. [CrossRef]
2. Takım U, Belli H, Gökçay H, Köse H, Arslan Akgül H, Çakır A. Examination of changes in levels of empathy and narcissistic pathology after treatment of adult with attention-deficit/hyperactivity disorder. *Alpha Psychiatry*. 2024;25(5):598-603. [CrossRef]
3. Kessler RC, Adler L, Barkley R, et al. The prevalence and correlates of adult ADHD in the United States: results from the National comorbidity Survey Replication. *Am J Psychiatry*. 2006;163(4):716-723. [CrossRef]
4. da Silva BS, Grevet EH, Silva LCF, Ramos JKN, Rovaris DL, Bau CHD. An overview on neurobiology and therapeutics of attention-deficit/hyperactivity disorder. *Discov Ment Health*. 2023;3(1):2. [CrossRef]
5. Del Campo N, Chamberlain SR, Sahakian BJ, Robbins TW. The roles of dopamine and noradrenaline in the pathophysiology and treatment of attention-deficit/hyperactivity disorder. *Biol Psychiatry*. 2011;69(12):e145-e157. [CrossRef]
6. Adesman AR, Altshuler LA, Lipkin PH, Walco GA. Otitis media in children with learning disabilities and in children with attention deficit disorder with hyperactivity. *Pediatrics*. 1990;85(3 Pt 2):442-446. [CrossRef]
7. Butwicka A, Lichtenstein P, Frisén L, Almqvist C, Larsson H, Ludvigsson JF. Celiac disease is associated with childhood psychiatric disorders: a population-based study. *J Pediatr*. 2017;184:87-93.e1. [CrossRef]
8. Takım U, Gökçay H. A prospective study on postmethylphenidate treatment changes in premature ejaculation among adults with attention-deficit/hyperactivity disorder. *Am J Ther*. 2025;32(2):e117-e124. [CrossRef]
9. Akmatov MK, Ermakova T, Bätzing J. Psychiatric and nonpsychiatric comorbidities among children with ADHD: an exploratory analysis of nationwide claims data in Germany. *J Atten Disord*. 2021;25(6):874-884. [CrossRef]
10. Brawley A, Silverman B, Kearney S, et al. Allergic rhinitis in children with attention-deficit/hyperactivity disorder. *Ann Allergy Asthma Immunol*. 2004;92(6):663-667. [CrossRef]
11. van den Heuvel E, Starreveld JS, de Ru M, Krauwer V, Versteegh FG. Somatic and psychiatric co-morbidity in children with attention deficit hyperactivity disorder. *Acta Paediatr*. 2007;96(3):454-456. [CrossRef]
12. Duel BP, Steinberg-Epstein R, Hill M, Lerner M. A survey of voiding dysfunction in children with attention deficit-hyperactivity disorder. *J Urol*. 2003;170(4 Pt 2):1521-1523. [CrossRef]
13. Lovell RM, Ford AC. Global prevalence of and risk factors for irritable bowel syndrome: a meta-analysis. *Clin Gastroenterol Hepatol*. 2012;10(7):712-721.e4. [CrossRef]
14. Drossman DA. Functional gastrointestinal disorders: history, pathophysiology, clinical features and Rome IV. *Gastroenterology*. 2016;150:S0016-5085(16)00223-7. [CrossRef]
15. Bonaz BL, Bernstein CN. Brain-gut interactions in inflammatory bowel disease. *Gastroenterology*. 2013;144(1):36-49. [CrossRef]
16. Finegold SM, Dowd SE, Gontcharova V, et al. Pyrosequencing study of fecal microflora of autistic and control children. *Anaerobe*. 2010;16(4):444-453. [CrossRef]
17. Knight JR, Locke GR, 3rd, Zinsmeister AR, Schleck CD, Talley NJ. Family history of mental illness or alcohol abuse and the irritable bowel syndrome. *J Psychosom Res*. 2015;78(3):237-241. [CrossRef]
18. Cryan JF, O'Riordan KJ, Cowan CSM, et al. The microbiota-gut-brain axis. *Physiol Rev*. 2019;99(4):1877-2013. [CrossRef]
19. Checa-Ros A, Jeréz-Calero A, Molina-Carballo A, Campoy C, Muñoz-Hoyos A. Current evidence on the role of the gut microbiome in ADHD pathophysiology and therapeutic implications. *Nutrients*. 2021;13(1):249. [CrossRef]
20. Kedem S, Yust-Katz S, Carter D, et al. Attention deficit hyperactivity disorder and gastrointestinal morbidity in a large cohort of young adults. *World J Gastroenterol*. 2020;26(42):6626-6637. [CrossRef]
21. Yeh TC, Bai YM, Tsai SJ, Chen TJ, Liang CS, Chen MH. Risks of major mental disorders and irritable bowel syndrome among the offspring of parents with irritable bowel syndrome: a nationwide study. *Int J Environ Res Public Health*. 2021;18(9):4679. [CrossRef]
22. Gong W, Guo P, Li Y, et al. Role of the gut-brain axis in the shared genetic etiology between gastrointestinal tract diseases and psychiatric disorders: a genome-wide pleiotropic analysis. *JAMA Psychiatry*. 2023;80(4):360-370. [CrossRef]
23. Mathee K, Cickovski T, Deoraj A, Stollstorff M, Narasimhan G. The gut microbiome and neuropsychiatric disorders: implications for attention deficit hyperactivity disorder (ADHD). *J Med Microbiol*. 2020;69(1):14-24. [CrossRef]
24. Dam SA, Mostert JC, Szopinska-Tokov JW, Bloemendaal M, Amato M, Arias-Vasquez A. The role of the gut-brain axis in attention-deficit/hyperactivity disorder. *Gastroenterol Clin North Am*. 2019;48(3):407-431. [CrossRef]
25. McKeown C, Hisle-Gorman E, Eide M, Gorman GH, Nylund CM. Association of constipation and fecal incontinence with attention-deficit/hyperactivity disorder. *Pediatrics*. 2013;132(5):e1210-e1215. [CrossRef]
26. Katzman MA, Bilkey TS, Chokka PR, Fallu A, Klassen LJ. Adult ADHD and comorbid disorders: clinical implications of a dimensional approach. *BMC Psychiatry*. 2017;17(1):302. [CrossRef]
27. Johnston BD, Wright JA. Attentional dysfunction in children with encopresis. *J Dev Behav Pediatr*. 1993;14(6):381-385. [CrossRef]

28. Jameson ND, Sheppard BK, Lateef TM, Vande Voort JL, He JP, Merikangas KR. Medical comorbidity of attention-deficit/hyperactivity disorder in US adolescents. *J Child Neurol*. 2016;31(11):1282-1289. [CrossRef]
29. Hubel R, Jass J, Marcus A, Laessle RG. Overweight and basal metabolic rate in boys with attention-deficit/hyperactivity disorder. *Eat Weight Disord*. 2006;11(3):139-146. [CrossRef]
30. Waring ME, Lapane KL. Overweight in children and adolescents in relation to attention-deficit/hyperactivity disorder: results from a national sample. *Pediatrics*. 2008;122(1):e1-e6. [CrossRef]
31. Güngör S, Celiloğlu OS, Ozcan OO, Raif SG, Selimoğlu MA. Frequency of celiac disease in attention-deficit/hyperactivity disorder. *J Pediatr Gastroenterol Nutr*. 2013;56(2):211-214. [CrossRef]
32. Kessler RC, Adler L, Ames M, et al. The World Health Organization Adult ADHD Self-Report Scale (ASRS): a short screening scale for use in the general population. *Psychol Med*. 2005;35(2):245-256. [CrossRef]
33. Doğan S, Öncü B, Varol Saraçoğlu G, et al. Erişkin dikkat eksikliği hiperaktivite bozukluğu kendi bildirim ölçeği (ASRS-v1.1): türkçe formunun geçerlilik ve güvenilirliği. *Anadolu Psikiyatr Derg*. 2009;10:77-87.
34. Francis CY, Morris J, Whorwell PJ. The irritable bowel severity scoring system: a simple method of monitoring irritable bowel syndrome and its progress. *Aliment Pharmacol Ther*. 1997;11(2):395-402. [CrossRef]
35. Hodgkins P, Montejano L, Sasané R, Huse D. Cost of illness and comorbidities in adults diagnosed with attention-deficit/hyperactivity disorder: a retrospective analysis. *Prim Care Companion CNS Disord*. 2011;13(2):PCC.10m01030. [CrossRef]