Prevalence and Risk Factors for Disruptive Behavior Disorders in Children with ADHD

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Abstract:

Background: Attention-deficit hyperactivity disorder (ADHD), along with coexisting disruptive behavior disorders (DBD), can complicate diagnosis and treatment and worsen the prognosis. The current study aimed to detect the prevalence and risk factors for the development of disruptive behavior in ADHD children. This was an observational cross-sectional study that included all the patients with ADHD diagnosed according to the Diagnostic and Statistical Manual of Mental Disorders (fifth edition) (DSM-5) at Assiut University Children's Hospital through the period from September 2021 to September 2022.

Results: The prevalence rate of disruptive behavior in ADHD cases in the current study represented (7.5%) of the total participants. During the multivariate analysis of all the explanatory variables of ADHD, it was found that Age (3-12), sex (male factor), child education (primary school or lower), and socio-economic status of the family (low by wealth index) were associated with disruptive behavior with statistical significance ($p > 0.001$).

Conclusion: According to the findings, the prevalence rate of disruptive behavior in ADHD cases in the current study represented (7.5%) of the total participants. Age (3-12), sex (male factor), child education (primary school or lower), and socio-economic status of the family (low by wealth index) were associated with disruptive behavior with statistical significance.

Keywords: Disruptive behavior disorder, ADHD, risk factors, prevalence.

Introduction:

ADHD (Attention Deficit Hyperactivity Disorder) is a psychiatric disorder that has long been recognized as having an impact on children's capacity to function [1].

Disruptive behavior disorders and untreated ADHD have been found to lead to an increased risk of substance use disorders. In addition, adolescents with disruptive behavior disorders and ADHD are more likely to be aggressive and hostile in their interactions with others and to be arrested. It has also been suggested that greater impulsivity associated with ADHD may cause greater antisocial behavior and its consequences. Thus, early recognition and treatment of both ADHD and disruptive behaviors in children is essential [2].

Approximately one-third to one-half of all children with ADHD may have coexisting oppositional defiant disorder (ODD). These children are often disobedient and have outbursts of temper. The rate of children meeting full diagnostic criteria for ODD is similar across all ages. Males have a greater incidence of ADHD and ODD, as do children of divorced parents and mothers with low socio-economic status. Children with the ADHD combined subtype seem to be more likely to have ODD [3].

The DSM-5 unified the two diagnoses of Attention Deficit Hyperactivity Disorder and Attention Deficit Hyperactivity Disorder into one disorder with three subtypes: primarily inattentive, mainly hyperactive, or combination type. Lack of focus, concentration, disorganization, difficulty finishing chores, forgetfulness, and losing

items are common symptoms that appear at an early age [4].

To be categorized as 'ADHD,' these symptoms must be present before the age of 12, last for six months, and interfere with everyday life activities. This has to be present in multiple settings (i.e., at home and school or school and after-school activities). It can have serious implications, such as disrupted social connections, increased hazardous behavior, job loss, and academic difficulties [3]. **T**he objectives of the current study were to detect the prevalence and risk factors for the development of disruptive behavior in ADHD children.

Patients and Methods

Aim:

To detect the prevalence and risk factors for the development of disruptive behavior in ADHD children.

Study Design:

Observational cross-sectional study.

Settings:

The study was done at Assiut University Children's Hospital from September 2021 to September 2022.

Participants:

All patients from 3 years to 18 years old having ADHD (according to the DSM-5) with or without disruptive behavior attending the outpatient Neuropsychiatric clinic [5, 6] were included.

Any psychiatric problems other than ADHD, like Autism, depression, schizophrenia, or mental retardation, were excluded.

All cases included in the study were subjected to:

I) **History:** The following was reported for all cases:

Personal history and Present history

- Age of onset of ADHD.
- Age of onset of Disruptive behavior.
- Type of disruptive behavior.

Family history:

- Sibling has ADHD.
- Social problems: divorce.
- Death of parents.
- Socio-economic status of the family (by wealth index) [7].

Developmental, Perinatal, and Past History.

Complete examination:

Investigations:

A. ADHD evaluation by the ADHD symptoms checklist, fourth edition (ADHD – SC4 scale scores)[1].
B. ADHD diagnostic criteria by the DSM-5.

A- Symptoms count scores

Diagnostic criteria by (DSM-5): Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition

The alternatives for the different answers are estimated as follows:

Count score as:

- Never: zero
- Sometimes: zero
- Much: 1
- Too much: 2 [8]

B- Symptoms severity scores

Estimated by comparison between groups of normal children and children with ADHD using the standard deviation curve

It is estimated as follows:

- Never: zero
- Sometimes: 1
- Much: 2
- Too much: 3
- Symptoms' severity is determined by one to two standard deviations above the mean (60 – 69).

Data Analysis Statistical analysis

The collected data were verified, coded by the researcher, and analyzed using the Statistical Package for Social Sciences (IBM-SPSS/PC/VER 24)*. Descriptive statistics: mean, standard deviation, median, range, frequencies, and percentage were calculated. Test of significance: A Chi-square test was used to compare the differences in the distribution of frequencies among different variables. Student t-test was calculated to test the mean differences in continuous variables. The confidence interval was 95%, and the accepted error margin was 5%. So, the p-value was considered significant if < 0.05.

Results

The study included 1300 patients: 1200 suffered from ADHD without disruptive behavior, and 100 others had ADHD associated with disruptive behavior disorder. The demographic data shows 65 cases (65%) from children with ADHD and DBD in the age group 3-12 years. Regarding sex, (75%) cases were males, and 25 cases (25%) were females. According to child education, most cases were at the primary school level or lower, with DBD. Most of the ADHD cases were living with single parents, with a percentage of 78% of cases with DBD, as shown in Table (1).

According to the type and severity of ADHD cases, there are cases with and without disruptive behavior.

In ADHD cases with disruptive behavior, it was noticed that (73%) of cases had a Combined type of ADHD, followed by predominantly impulsive or hyperactive type ADHD, which represented (17%) of the studied cases. Finally, the predominantly inattentive type of ADHD represented only (10%) of the studied cases. Regarding the severity of ADHD among the studied cases, it has been shown that (73%) of cases had severe ADHD, moderate ADHD was found in (23%) of cases, and mild ADHD represented (4%) of patients, as shown in Table 2.

Concerning the frequency of disruptive behavior subtypes among studied cases, it has been noticed that annoying people were found in 90% of cases, followed by 'often blaming other people for their mistakes and behaviors' found in 73% of the studied cases. Then comes losing temper, which represented 66%, followed by violation of rules and social norms at home, school, and with peers, representing 65%. Aggression or harmful attitudes toward people and animals represented 61% of the studied cases, as shown in Table (3).

According to the factors associated with disruptive behavior in ADHD in comparison with ADHD cases without disruptive behavior.

During bivariate analyses of ADHD, Age (3-12), sex (male factor), child education (mostly primary school or lower), and low socio-economic status of the family (by wealth index) [6] were associated with disruptive behavior with statistical significance ($p > 0.001$), as shown in Table (1).

Concerning the parameter of the studied patients with disruptive behavioral disorders in ADHD, the mean ± SD of raw scores according to attention deficit was 19.04 ± 5.6 with a median (IQR) 19(4-27). According to hyperactivity, the mean raw score was 19.2 ± 5.3, ranging from 18(3-28). The defiant opposition represented a mean of 16.6 ± 7.7 with a range of 16.5(5-75). Peer conflict recorded 19.75 ± 7.5 with range 20(4-30). Standard grades of attention deficit recorded a mean score of 70.86 ± 14.3 with a range of 74(-50-79). Hyperactivity, defiant opposition, and Peer conflict's mean scores were 73.1 ± 6.7, 70.7 ± 10.2, and 73.14 ± 24.4 with range 75(50-79), 75(18-79), and 79 (-50-79) respectively as shown in Table (4).

Tables:

Table (1): Demographic data of the studied cases:

Variable	Total cases n= 1300		p-value
	Cases of ADHD without disruptive Behavior N=1200 (92.5%)	Cases of ADHD with disruptive behavior, N=100 (7.5%)	
Age in years			
• 0-12	894 (74.5%)	65 (65%)	< 0.001
• 13-17	306 (25.5%)	35 (35%)	
Mean ± SD	6.95 ± 2.33	7.176 ± 2.8	
Median (IQR)	6.5 (3-17)	7 (3 - 16)	
Sex			
• Male	740 (61.7%)	75 (75%)	< 0.001*
• Female	460 (38.3%)	25 (25%)	
Child education			
• From nursery to primary school	1052 (87.7%)	60 (60%)	< 0.001*
• Preparatory and secondary school	148 (12.3%)	40 (40%)	
Living circumstances			
• Living with both parents	233 (19.4%)	22 (22%)	< 0.001*
• Living with a single parent	967 (80.6%)	78 (78%)	
Socio-economic			
• Low/Not Regular	830 (69.2%)	60 (60%)	< 0.001*
• Middle	250 (20.8%)	28 (28%)	
• High	120 (10%)	12 (12%)	
Age of onset of ADHD (in years)			
Mean ± SD	2.9 ± 1.7	3.19 ± 1.8	0.548
Median (IQR)	2.5 (3 - 10)	3 (3-10)	

Note. IQR = interquartile range, Data expressed as mean (SD), frequency (percentage).

Table 2: Type and severity of ADHD cases, with and without disruptive behavior

Variable	Category	Category N (%)		p-value
		Cases of ADHD with disruptive behavior, N=100 (7.5%)	Cases of ADHD without disruptive behavior, N=1200 (92.5%)	
Type of ADHD	Predominantly inattentive type of ADHD	10 (10%)	153 (12.75%)	< 0.001
	Predominantly impulsive or hyperactive type ADHD	17 (17%)	255 (21.25%)	
	Combined type of ADHD	73 (73%)	792 (66%)	
Severity of ADHD	Mild	4 (4%)	152 (12.67%)	< 0.001
	Moderate	23 (23%)	215 (17.92%)	
	Severe	73 (73%)	833 (69.42%)	

Data expressed as frequency (percentage).

Table (3): The frequency of disruptive behavior subtypes among studied cases

Variable	Category	N (%)
Type of Disruptive Behavior	Annoys people	90 (90%)
	Often blaming other people for their mistakes and behaviors	73 (73%)
	Losing temper	66 (66%)
	Violation of rules and social norms at home, school, and among peers	65 (65%)
	Aggression or a harmful attitude toward people and animals	61 (61%)
	Staying out at night	46 (46%)
	Lying	39 (39%)
	Stealing	34 (34%)
	Skipping school	23 (23%)

Note. IQR = interquartile range, Data expressed as mean (SD), frequency (percentage). H.S: highly significant.

Table 4: Interpretation parameters of the studied cases with disruptive behavioral disorders in ADHD patients:

Sub-Test	Raw Scores		Standard grades		Turbulence level N (%)				
	Mean ± SD	Median (IQR)	Mean ± SD	Median (IQR)	High	Middle	Low	χ^2	P-value
Attention deficit	19.04 ± 5.6	19(4-27)	70.86 ± 14.3	74(-50-79)	66 (66%)	25 (25%)	9 (9%)	51.9	< 0.001 (H.S)
Hyperactivity	19.2 ± 5.3	18(3-28)	73.1 ± 6.7	75(50-79)	71 (71%)	24 (24%)	5 (5%)	69.2	< 0.001 (H.S)
The defiant opposition	16.6 ± 7.7	16.5(5-75)	70.7 ± 10.2	75(18-79)	69 (69%)	18 (18%)	13 (13%)	57.6	< 0.001 (H.S)
Peer conflict	19.75 ± 7.5	20(4-30)	73.14 ± 24.4	79(-50-79)	28 (28%)	1 (1%)	1 (1%)	125.1	< 0.001 (H.S)

Discussion

Attention-Deficit/Hyperactivity Disorder (ADHD) is one of the most common neurobehavioral disorders of childhood, which interferes with social and educational development. Disruptive behavior disorders (DBD) and ADHD are common and co-occurring psychiatric disorders among children and adolescents [9].

This study aimed to recognize disruptive behavior early and detect the prevalence and associated risk factors for the development of disruptive behavior in children with ADHD. The prevalence rate of disruptive behavior in ADHD cases in the current study represented (7.5%) of the total participants. This result was higher than a study done by ***Senol et al.,*** who proved that the prevalence of disruptive behavior in ADHD patients was 6.2% [9]. The pooled worldwide prevalence of disruptive behavior in ADHD rate was (5.29–5.79%) for children and adolescents. This may be due to differences in the risk factors between the two studies.

At the same time, the current findings are consistent with a previous study conducted by ***Güler et al.,*** who declared that among elementary school children using parent-based estimates, who reported ADHD and disruptive behavior in prevalence between 2.7% and 9.6% [10].

The mean age of children with ADHD accompanied by DBD was 7.176 ± 2.8 years, with a range of 7 (3 - 16) years. It has been shown that ADHD accompanied by DBD is found more in males than in females.

In a study done by ***Gul et al.***, the gender distribution of the students participating in the study was 54.3% (n=611) male and 45.7% (n=515) female. The age range of the whole group was between 6 and 12 years, and the mean age was 9.0 ±1.3 years for males and 9.0±1.2 years for females. Most students were 10, and only 6 (0.5%) were 12 years old [11].

According to the current study, as per socio-economic status, it has been indicated that ADHD associated with disruptive behavior was more prevalent in low-income families in comparison with ADHD without disruptive behavior.

The current results are consistent with a study that indicated that adverse family factors were associated with detected DBD symptoms in their study. They found that

compared with their counterparts, ADHD and other DBDs were more prevalent in boys and children whose parents had lower monthly incomes and whose mothers were homemakers [9].

In the current study, regarding the age of onset of ADHD cases without DBD and the age of onset of cases of ADHD with disruptive behavior, it has been calculated as median (range) 2.5 (3 - 10), 3 (3 - 10), respectively.

In the study of ***Visser et al.,*** based on data from the National Survey of Children's Health (NSCH), it was found that the median age of onset for children with current ADHD was 6 years [12]. The reason for this difference was that more severe cases of ADHD in children, as described by parents, were diagnosed earlier. In the current study, according to the type of ADHD, it has been noticed that 12.75% of cases had predominantly inattentive type of ADHD, 21.25% of cases had predominantly impulsive ADHD, and 66% of cases had combined type of ADHD. Regarding the severity of ADHD, it was noticed that 12.6% of cases had mild ADHD, 17.92% had moderate ADHD, and 69.42% had severe ADHD.

The prevalence of ADHD subtypes, as reported in the studies, is that the combined type is the most common. Leung et al. used the "or rule" from Nigeria – West Africa and Maracaibo – Venezuela: predominantly inattentive subtype [13]. While the combined and inattentive subtypes were the prevalent subtypes [14], the hyperactive, impulsive subtype was found to be the least frequent in most epidemiological studies [15].

Concerning factors associated with disruptive behavior in ADHD among children found in the current study, it has been found that age (2-12) years, males, child education (primary school or lower), and socio-economic (low level) status were significantly associated with ADHD cases with disruptive behavior (p-value < 0.001) in comparison with cases of ADHD without disruptive behavior.

On the other hand, ***Nordström et al.*** indicated that parental smoking during pregnancy or early childhood does not affect a child's ADHD [16]. ***Lavigne et al.*** found that higher scores on family risk factors (family conflict, parent hostility in parenting, child emotional temperament) were positively associated with child oppositional defiant disorder symptoms in a cross-sectional study [17].

Another study revealed that only variables significantly associated with disruptive behavior ($P < 0.05$), including gender, parent education, school scores, smoking status, life satisfaction, social support, hopefulness, perceived stress, and perceived depression, were entered in further analysis[18].

Limitations

The limitation was that the current data were obtained based mainly on parental reporting and, to a lesser extent, on children's reporting. The prevalence of ADHD and other DBDs may have been over- or underreported, compared with information gathered from combined sources such as parents and teachers or clinicians.

Conclusion

The results indicate the presence of disruptive behavioral challenges with ADHD cases among school-going children older than 12 years old. According to the findings, the prevalence rate of disruptive behavior in ADHD cases in the current study represented (7.5%) of the total participants. Age (3-12), sex (male factor), child education (mostly primary school or lower, and low socio-economic status of the family (by wealth index) [6] were associated with disruptive behavior with statistical significance. Widowed or divorced parents and the age of onset of ADHD were not associated with increased disruptive behavior in ADHD cases. A combined type of ADHD was the most common among the ADHD patients with disruptive behavior. Moderate and severe ADHD were more commonly associated with disruptive behavior. The most common forms of disruptive behavior in the current study were

annoying people, found in 90% of cases, followed by 'often blaming other people for their mistakes and behaviors', found in 73% of the studied cases. Then comes losing temper, which represented 66%, followed by violation of rules and social norms at home, school, and with peers, representing 65%. Aggression or harmful attitudes toward people and animals represented 61% of the studied cases. The severity of the severe parameters was assessed in the cases with disruptive behavior, such as attention deficit, hyperactivity, defiant opposition, and peer conflict.

Recommendations

Given the negative outcomes associated with behavioral challenges, as children transition to adolescence and adulthood, the early detection of these emerging behavioral challenges is critical in developing appropriate interventions. School settings could be considered one of the contextually relevant, culturally-appropriate, and non-stigmatizing venues to implement screening procedures, detect emerging behavioral challenges, and make necessary referrals. Encouraging the governments, especially in developing countries, to implement a specific protocol for early detection, management (behavioral, nutritional, and pharmacological), and rehabilitation of ADHD patients, either with or without disruptive behavior. Rehabilitation should include a specific system of education designed for those cases that is suitable for their capabilities, discovering their distinguished gifts, and applied by well-trained teachers who can deal with them. Rehabilitation should also include recreation programs that involve practicing suitable sports and arts. Parents and family education programs about the suitable management of those cases at home. Laws that protect the rights of those people who are different. Encourage all the communities to raise their young generations to respect others who are different.

List of abbreviations:

ADHD: Attention Deficit Hyperactivity Disorder

DSM-5: Diagnostic and Statistical Manual of Mental Disorders (fifth edition)

ODD: Oppositional Defiant Disorder

DBD: Disruptive Behavior Disorders

Declaration:

Ethical approval and consent to participate: This study was approved by the Ethical Committee of Scientific Research of the Faculty of Medicine (IRB No.: 17101832).

Consent for publication: Written informed consent was obtained from parents, who explained the benefits of the study, risks expected, and suggested treatment for each case. The contents have not been published elsewhere, and the paper is not being submitted or considered for publication in another journal. All authors acknowledge they have contributed significantly to completing this work and agree with the manuscript's content and publication.

Availability of data and material: The data supporting this study's findings are available from the corresponding author upon request.

Conflict of interest: There was no conflict of interest.

Funding: There was no funding.

Author contributions:

EM: Examined the patients, collected the data, and evaluated cases.

GA: Designed the study, supervised data collection, interpreted the results, and revised the work.

AS: Interpretation of results, revision of the work, and editing of the manuscript

Acknowledgment:

To the patients and parents for their participation in the study. To the residents, assistant lecturer, and nursing staff in the Neuropsychiatric Clinic.

References

1. Magnus W, Nazir S, Anilkumar AC, Shaban K. Attention Deficit Hyperactivity Disorder. In: *StatPearls*. Treasure Island, FL: StatPearls Publishing; 2022. [Google Scholar]
2. Coker TR, Elliott MN, Toomey SL, Schwebel DC, Cuccaro P, Tortolero Emery S, et al. Racial and ethnic disparities in ADHD diagnosis and treatment. *Pediatrics*. 2016;138(3):e20160407. doi:10.1542/peds.. 2016-0407.

3. Cortese S, Coghill D. Twenty years of research on attention-deficit/hyperactivity disorder (ADHD): looking back, looking forward. *Evid Based Ment Health*. 2018;21(4):173-176. doi:10.1136/ebmental-2018-300050.
4. Baglivio MT, Wolff KT, Piquero AR, Greenwald MA, Epps N. Racial/ethnic disproportionality in psychiatric diagnoses and treatment in a sample of serious juvenile offenders. J Youth Adolesc. 2017;46(7):1424-1451. doi:10.1007/s10964-017-0672-x.
5. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5™). Washington, DC: American Psychiatric Association; 2013:103-106.
6. Steinau S. Diagnostic criteria in attention deficit hyperactivity disorder—changes in DSM-5. Front Psychiatry. 2013;4:49. doi:10.3389/fpsyt.2013.00049. PMID: 23755024; PMCID: PMC3667245.
7. Skiba RJ, Arredondo MI, Williams NT. More than a metaphor: the contribution of exclusionary discipline to a school-to-prison pipeline. Equity Excell Educ. 2014;47(4):546-564. doi:10.1080/10665684.2014.958965.
8. Morales-Hidalgo P, Hernández-Martínez C, Vera M, Voltas N, Canals J. Psychometric properties of the Conners-3 and Conners Early Childhood Indexes in a Spanish school population. Int J Clin Health Psychol. 2017;17(1):85-96. doi:10.1016/j.ijchp.2016.07.003. PMID: 30487884; PMCID: PMC6236327.
9. Senol V, Unalan D, Akca RP, Basturk M. Prevalence of attention-deficit/hyperactivity and other disruptive behaviour disorder symptoms among primary school-age children in Kayseri, Turkey. J Int Med Res. 2018;46(1):122-134. doi:10.1177/0300060517717125.
10. Güler AS, Scahill L, Jeon S, Taşkın B, Dedeoğlu C, Ünal S, et al. Use of multiple informants to identify children at high risk for ADHD in Turkish school-age children. J Atten Disord. 2017;21(9):764-775. doi:10.1177/1087054714561859.
11. Gul N, Tiryaki A, Kultur SEC, Topbas M, Ak I. Prevalence of attention deficit hyperactivity disorder and comorbid disruptive behavior disorders among school age children in Trabzon. Klinik Psikofarmakoloji Bülteni. 2010;20(1):50-56.
12. Visser SN, Danielson ML, Bitsko RH, Holbrook JR, Kogan MD, Ghandour RM, et al. Trends in the parent-report of health care provider-diagnosed and medicated attention-deficit/hyperactivity disorder: United States, 2003–2011. J Am Acad Child Adolesc Psychiatry. 2014;53(1):34-46.e2. doi:10.1016/j.jaac.2013.09.001.
13. Leung AK, Hon KL. Attention-deficit/hyperactivity disorder. Adv Pediatr. 2016;63(1):255-280. doi:10.1016/j.yapd.2016.04.002.
14. Adewuya AO, Famuyiwa OO. Attention deficit hyperactivity disorder among Nigerian primary school children: prevalence and co-morbid conditions. Eur Child Adolesc Psychiatry. 2007;16(1):10-15. doi:10.1007/s00787-006-0569-9.
15. Rowland AS, Skipper B, Rabiner DL, Umbach DM, Stallone L, Campbell RA, et al. The shifting subtypes of ADHD: classification depends on how symptom reports are combined. J Abnorm Child Psychol. 2008;36(5):731-743. doi:10.1007/s10802-008-9209-9.
16. Nordström T, Hurtig T, Rodriguez A, Savolainen J, Rautio A, Moilanen I, et al. Different risk factors between disruptive behavior disorders and ADHD in Northern Finland Birth Cohort 1986. J Atten Disord. 2017;21(11):904-912. doi:10.1177/1087054714557355.
17. Lavigne JV, Dahl KP, Gouze KR, LeBailly SA, Hopkins J. Multi-domain predictors of oppositional defiant disorder symptoms in preschool children: cross-informant differences. Child Psychiatry Hum Dev. 2015;46(2):308-319. doi:10.1007/s10578-014-0475-1.
18. Araban M, Montazeri A, Stein L, Karimy M, Mehrizi AAH. Prevalence and factors associated with disruptive behavior among Iranian students during 2015: a cross-sectional study. Ital J Pediatr. 2020;46(1):1-7. doi:10.1186/s13052-020-00814-7.