Acta Medica Alanya

Birth Order and Number of Siblings in Attention Deficit Hyperactivity Disorder: A Case Control Study

Dikkat Eksikliği ve Hiperaktivite Bozukluğu'nda Doğum Sırası ve Kardeş Sayısı: Olgu Kontrol Çalışması

Orhan Kocaman¹*, Tayfun Kara¹, Pınar Aydoğan Avşar², Tacettin Kuru³

1.Department of Child and Adolescent Psychiatry, Alanya Alaaddin Keykubat University, Faculty of Medicine, Antalya, Türkiye
2.Department of Child and Adolescent Psychiatry, Alanya Training and Research Hospital, Antalya, Türkiye
3.Department of Psychiatry, Alanya Training and Research Hospital, Antalya, Türkiye

ABSTRACT

Aim: Studies addressing the etiology of Attention Deficit Hyperactivity Disorder (ADHD) in recent years have focused on family and birth-related factors.This study aimed to examine the relationship between Attention Deficit Hyperactivity Disorder (ADHD) and birth order and number of siblings.
Method: A total of 239 participants, 135 children diagnosed with ADHD and 104 healthy children, were included in the study. All participants were evaluated through DSM-5-based psychiatric examinations, and their sociodemographic data forms were obtained. Conners' Parent Rating Scale-Revised Short form (CPRS-RS) was also applied to the case group in order to determine the severity of ADHD symptoms. The findings were then compared using statistical methods.
Results: No significant difference was observed between the individuals with ADHD and the healthy controls in terms of birth order or number of siblings (p= 0.252 and p= 0.222, respectively). A significant positive correlation was determined in the ADHD group between birth order and hyperactivity and oppositional subscales (r= 0.212, p= 0.022 and r= 0.231, p= 0.012, respectively). A significant positive correlation was also determined in the ADHD group between number of siblings and the oppositional subscale (r= 0.237, p= 0.009).
Conclusions:In our study, no significant difference was observed between the ADHD and control groups in terms of birth order or number of siblings.It was observed that hyperactivity and defiance symptoms increased as birth order increased in children diagnosed with ADHD. Oppositional findings also increased in line with the number of siblings.We think that these findings should be taken into consideration in future research on ADHD.

Keywords: Attention-deficit hyperactivity disorder, birth order, number of siblings

ÖZ

Amaç: Son yıllarda Dikkat Eksikliği Hiperaktivite Bozukluğu (DEHB) etyolojisine yönelik çalışmalarda aile ve doğuma ilişkin etkenlere odaklanılmıştır. Bu çalışmada Dikkat Eksikliği Hiperaktivite Bozukluğu (DEHB) ile doğum sırası ve kardeş sayısı arasındaki ilişkinin incelenmesi amaçlanmıştır.
Yöntem: Çalışmaya DEHB tanısına sahip 135 çocuk ile 104 sağlıklı çocuk olmak üzere toplam 239 katılımcı alınmıştır. Tüm katılımcılar DSM-5 temelli psikiyatrik muayene ile değerlendirilmiş ve sosyodemografik veri formları elde edilmiştir. Olgu grubuna ilave olarak DEHB belirti şiddetini değerlendirmek için Conners Anababa Dereceleme Ölçeği-Yenilenmiş Kısa Formu uygulanmıştır. Elde edilen bulgular istatistiksel yöntemler ile karşılaştırılmıştır.
Bulgular: DEHB olan bireyler ile sağlıklı kontroller arasında doğum sırası ve kardeş sayısı açısından anlamlı farklılık saptanmamıştır (sırasıyla p=0,252/p=0,222). DEHB'li grupta doğum sırası ile hiperaktivite ve karşı gelme alt ölçekleri arasında anlamlı düzeyde pozitif korelasyon saptanmıştır (sırasıyla r=0,212, p=0,022/ r=0,231, p=0,012). DEHB li grupta kardeş sayısı ile karşı gelme alt ölçeği arasında anlamlı düzeyde pozitif korelasyon saptanmıştır (r=0,237, p=0,009).
Sonuç: Çalışmamızda DEHB ve kontrol grubu arasında doğum sırası ve kardeş sayısı açısından anlamlı fark saptanmadı. DEHB tanılı çocuklarda doğum sırası arttıkça hiperaktivite ve karşı gelme bulgularının arttığı görüldü. Aynı zamanda kardeş sayısı arttıkça karşıt gelme bulgularının arttığı görüldü. Bu bulguların gelecekteki DEHB'ye yönelik araştırmalarda dikkate alınması gerektiğini düşünmekteyiz.

Anahtar Kelimeler: Dikkat eksikliği hiperaktivite bozukluğu, doğum sırası, kardeş sayısı

*Corresponding Author: Orhan Kocaman, MD. Alanya Alaaddin Keykubat University, Faculty of Medicine, Department of Child and Adolescent Psychiatry, Oba Mah. Fidanlık Cad. Alanya/ Antalya/ Türkiye. Phone:+905324882207 / mail: dr_orhankocaman@hotmail.com

ORCID: 0000-0002-7504-5604

Introduction

Attention-deficit hyperactivity disorder (ADHD) is one of the most commonly seen neurodevelopmental disorders in childhood and adolescence. It is characterized by hyperactivity, impulsivity, and attention deficit symptoms [1]. The prevalence in childhood and adolescence ranges between 2% and 7% [2] and a visible increase has been experienced in the number of children diagnosed with ADHD in recent years [3]. Genetic, epigenetic, and environmental risk factors are thought to play a role in the etiology. Studies of the etiology of ADHD initially concentrated on genetic factors, although the focus in recent years has been on environmental risk factors [4]. Research into the etiology of ADHD has suggested that environmental risk factors are responsible for 20-30% of phenotypic variability in ADHD symptoms [5].

Birth order is defined as the order in which a child is born among its siblings. It plays an important role in the child's psychological development and also affect the development of an individual's psychopathology [6]. Relationships between birth order and psychopathology have therefore attracted the interest of several researchers [7]. It has been suggested that birth order plays an important role in the etiology of ADHD as one of the familial factors. The numbers of studies investigating the relationship between birth order and ADHD are limited. Differing results have also been reported. While some research has observed an association between birth order and ADHD, other studies have found no relationship [8–10]. There are various hypotheses concerning the effect of birth order on the development of psychiatric diseases. One of these is that in pregnancies involving maternal-fetal incompatibility, early pregnancies render the mother immunologically more sensitive to subsequent pregnancies. This situation, which depends on the order or pregnancy rather than on the age of the mother is capable of triggering immunological process involved in the development of psychiatric disorders. Studies have suggested that this immunological sensitivity plays a role in the development of psychiatric disorders [11]. Another hypothesis is that the disease risk may be associated with parental ages, and that the ages of the parents may rise indirectly in line with birth order. Advanced parental age may contribute to the development of psychiatric disorders by triggering de novo mutations [12].

Having siblings affects the individual's mental development. First, middle, or later-born children may exhibit different developmental and personality characteristics to children with no siblings. Living in families with large numbers of siblings, and being the first or last child, has been proposed as a potential risk factor in terms of neurodevelopmental disorders [6]. It has been suggested that possession of a large number of siblings may reduce the adverse effects of birth order in some diseases. Sibling numbers as well as birth order should therefore be considered in studies investigating the relationship between ADHD and familial factors [13].

Few studies have examined the relationship between ADHD and birth order and number of siblings, and their findings are inconsistent. The purpose of this study was therefore to examine the association between the severity of ADHD symptoms and birth order and number of siblings.

Method

Sampling and Application

This study was performed with 239 children and adolescents, 135 diagnosed with ADHD and 104 healthy volunteers. The study sample was obtained from a children's hospital child and adolescent psychiatry outpatient clinic. All participating adolescents underwent Diagnostic and Statistical Manual of Mental Disorders-5 (DSM 5 TR) based psychiatric evaluations, because of the exclusion of another psychiatric disease. These were conducted by experienced child and adolescent mental health and diseases specialists. The Conners Parent Rating Scale-Revised Short form (CPRS-RS) was complete to screen the severity of the children's ADHD symptoms. Non-biological mothers and fathers and individuals lacking the cognitive capacity required to read the forms and complete the scales were excluded. Twenty participants were excluded from the study (eleven due to comorbid psychiatric disorder and nine for incomplete filling of the forms), and study was performed with 135 participants. The control group was composed of individuals between the ages of

6-18 who had no physical disease or psychiatric disease according to DSM-5. An information form consisting of structured multiple-choice questions prepared by psychiatrists was used to determine the sociodemographic and clinical characteristics of all participants. Written and verbal consent was obtained from the families of all the participating. Ethical approval was granted by the Alanya Alaaddin Keykubat University clinical research ethical committee, Turkey (decision 17-01 dated 22/11/2023).

Tools

Sociodemographic Information Form: This investigated sociodemographic characteristics including name, surname, age, sex, education, number of siblings, and birth order.

Conners Parent Rating Scale-Revised Short Form (CPRS-RS): This form was developed by Conners in order to evaluate behaviors during childhood. It was produced by selecting the items with the highest factor loading following exploratory factor analysis applied to the data collected by Conners for the renewed long forms [14]. The CPRS-RS consists of 27 items in three subscales (Oppositional -O, Cognitive Problems/ Inattention-CP-I, and Hyperactivity-H) and one assistant scale (ADHD Index- ADHD-I). Each item is scored on a four-point scale from 0 to 3; Not true at all (very rarely), 0; somewhat true (sometimes), 1; quite true (frequently, 2; very true (very frequently), 3. Higher scores indicate greater possession of problems defined in the CPRS-RS. The validity and reliability of the Turkish-language version were established by Kaner [15].

Statistical Analysis

The study results were calculated as mean pus standard deviation for continuous variables and as percentage values for categorical variables. Deviation from normal for continuous variables was examined using skewness and kurtosis values. Values within a ± 1.5 for skewness and kurtosis were regarded as indicating normal distribution [16]. Differences in continuous variables measured between the control and case groups were evaluated using the independent samples t test. Comparison of the case and control groups in terms of categorical variables was performed

using the chi-square and Fisher's exact tests. Relationships between variables were examined using Pearson coefficients. p values <0.05 were regarded as significant. Statistical analyses were performed on SPSS version 27 software.

Results

The study was conducted with 239 volunteers, 135 (56.5%) consisting of individuals diagnosed with ADHD. The participants' mean age was 9.81 years (SD = 2.28), and 164 (68.6%) were girls.

No significant differences were determined between the case and control groups in terms of age (t (236) = 690, p = 0.491) or gender (X2 (1, N=238) = 3.540, p = 0.060). No significant differences were also observed for the case and control groups in terms of birth order (p = 0.222) or number of siblings (X2 (3, N=236) = 4.093, p = 0,252) (Table 1).

Table 1: A comparison of the case and control groups

		Case (135)	Control (104)	t/X2	p
Age	(Mean ±SD)	9.90 ± 2.65	9.70±1.69	0.690	0.491
Sex (female)	(N. %)	99 (73.9%)	65(62.7%)	3.540	0.060
Number of siblingsa	1	20 (15.2%)	19 (18.3%)		
	2	76 (57.6%)	63 (60.6%)		
	3	26 (19.7%)	20 (19.2%)		
	4	10 (7.6%)	2 (1.9%)	4.093	0.252
Birth orderb	1	74 (56.5%)	56 (53.8%)		
	2	36 (27.5%)	39 (37.5%)		
	3	18 (13.7%)	8 (7.7%)		
		3(2.3%)	1 (1%)	4.297	0.222

The Independent Samples t Test, achi-square test, b Fisher's exact test. p<0.05 results shown in bold.

Table 2 shows the ADHD subscales in the case group according to the descriptive statistic results. All the subscales were found to be normally distributed (skewness and kurtosis values at a range of ± 1.5).

Pearson's product-moment correlation coefficients were calculated to determine relationships

between the ADHD subscales and number of siblings and birth order. A significant correlation was observed between number of siblings and the oppositional subscale (r = 0.237, p = 0.009). Birth order was significantly positively correlated with both the ADHD oppositional (r = 0.231, p = 0.012) and hyperactivity (r = 0.212, p = 0.022) subscales. The ADHD-I subscales exhibited no significant correlation with number of siblings (r = 0.182, p = 0.061) or birth order (r= 0.124, p = 0.204). Similarly, the cognitive problems/Inattention subscale exhibited no correlation with number of siblings (r = 0.081, p = 0.389) or birth order (r=0.060, p = 0.529) (Table 3).

Table 2: Descriptive Statistics

	Mean±Standard Deviation	Min-Max	Skewness	Kurtosis
Age	9.89 ± 2.65	6-17	0.38	-0.71
ADHD-I	22.10 ± 7.22	2-35	-0.47	-0.15
O	6.57 ± 3.50	0-12	-0.08	-1.10
CP/I	11.57 ± 4.45	0-18	-0.51	-0.45
HA	8.38 ± 5.13	0-18	0.17	-1.03

O: Oppositional, CP/I: Cognitive problems/Inattention, H: Hyperactivity. ADHD-I: ADHD-Index

		Number of siblings	Birth order
ADHD-I	r	0.182	0.124
	p	0.061	0.204
O	r	0.237	0.231
	p	0.009	0.012
CP/I	r	0.081	0.060
	p	0.389	0.529
HA	r	0.177	0.212
		0.057	0.022

r: Pearson's product-moment correlation coefficient. Statistically significant results shown in bold. O: Oppositional, CP/I: Cognitive problems/Inattention, H: Hyperactivity. p<0.05 results shown in bold.

Discussion

This study examined the relationship between ADHD and birth order and number of siblings. Statistical analysis revealed no significant difference between the case and control groups in terms of either variable. A significant correlation was observed between birth order and the hyperactivity and oppositional subscales in the children with ADHD. A significant correlation was also observed between number of siblings and the oppositional subscale in those children.

Familial and birth-related factors play a role in the etiology of ADHD. While the effect of each of these factors is small, they still contribute to the emergence of ADHD, particularly in individuals with genetic susceptibility [17]. Research investigation the association between ADHD and birth order has generally been conducted with large samples, but without control groups, children with ADHD being compared among themselves [8,13,18]. Studies involving a control group have found no association between ADHD and birth order [19,20]. Similarly in the present study, no difference was observed between the children with ADHD and the healthy controls in terms of birth order. We think that the use of different methodologies in research examining the relationship between ADHD and birth order, and the different sample size, may lead to variable results.

Impairments of parent-child relationships and familial functions are observed in the families of children diagnosed with ADHD. In particular, young children with ADHD experience greater conflict with parents than older children [21]. One study to date has examined the relationship between the severity of ADHD symptoms and birth order, but no association was determined [19]. In the present study, positive correlations were observed between birth order in the children with ADHD and the hyperactivity and oppositional subscale scores. The number of siblings increases indirectly in line with the birth order, and this finding of the present research may be attributable to the parents devoting less time to each child and experiencing difficulties in setting limits.

Research into the effect of the number of siblings on a child's mental health has shown that the presence of older or younger siblings have different impacts [22]. Studies addressing the relationship between number of siblings and ADHD have reported inconsistent findings. Some studies have reported fewer siblings in individuals with ADHD [19], while others have found no association between ADHD and sibling number [23]. Similarly in the present study, no significant difference was found between the children with ADHD and the healthy controls in terms of numbers of siblings. Being the first child is one of the predictive factors for ADHD [8] and it has been suggested that the difficult aspect of having a child with ADHD may

affect the decision to become pregnant again, thus causing a decrease in child numbers [19]. In terms of the relationship between sibling numbers and ADHD, we do not think that having a child with ADHD will affect the number of children in the family on condition that the child concerned is not the first to be born.

The number of children in the family has been shown to affect parental child-raising attitudes in the literature, with parents exhibiting less emotional warmth, interest, and overprotection as the number of children rises [24]. Children diagnosed with ADHD have been found to feel that they experience less acceptance and interest from their parents as their oppositional symptoms increase, and that they are subjected to more disciplining from parents [25]. When the children with ADHD were evaluated among themselves in the present study, a positive correlation was determined between the number of siblings and oppositional subscale scores. We think that the number of siblings may affect parental attitudes and lead to the development of oppositional behaviors in individuals diagnosed with ADHD.

This study will make an important contribution to the literature by examining birth order and number of siblings in children with ADHD. However, there are also a number of limitations to this research. The most important of these lies in its cross-sectional nature. Another limitation is that a self-report tool completed only by mothers was employed to determine the severity of ADHD.

In conclusion, no difference was determined in this study between children with ADHD and healthy controls in terms of birth order or number of siblings. Evaluation of the children with ADHD revealed positive correlations between birth order and hyperactivity and opposition subscale scores. A positive correlation was also determined in the children with ADHD between number of siblings and oppositional symptoms. We think that these findings should be borne in mind in future research into the causes of ADHD.

ORCID and Author contribution: O.K. (0000-0002-7504-5604), T.K. (0000-0002-2156-3457), P.A.A. (0000-0001-5938-3243) and T.K. (0000-0002-0313-558X). All authors contributed to the manuscript conception, design, literatüre research, writing, critical review and final approval.

Note: This study has not been published anywhere before.

REFERENCES

1. Austerman J. ADHD and behavioral disorders: Assessment, management, and an update from DSM-5. Cleve Clin J Med. 2015;82(11 Suppl 1):S2-7. doi: 10.3949/ccjm.82.s1.01.

2. Sayal K, Prasad V, Daley D, Ford T, Coghill D. ADHD in children and young people: prevalence, care pathways, and service provision. Lancet Psychiatry. 2018;5(2):175–86. doi: 10.1016/S2215-0366(17)30167-0.

3. Olusanya BO, Davis AC, Wertlieb D, Boo N-Y, Nair MKC, Halpern R, et al. Developmental disabilities among children younger than 5 years in 195 countries and territories, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. Lancet Glob Health. 2018;6(10):e1100–21. doi: 10.1016/S2214-109X(18)30309-7.

4. Carlsson T, Ma FM, Taylor MJ, Jonsson U, Bölte S. Early environmental risk factors for neurodevelopmental disorders-a systematic review of twin and sibling studies. Dev Psychopathol. 2021;33(4):1448–95. doi: 10.1017/S0954579420000620.

5. Freitag CM, Haenig S, Schneider A, Seitz C, Palmason H, Retz W, et al. Biological and psychosocial environmental risk factors influence symptom severity and psychiatric comorbidity in children with ADHD. J Neural Transm (Vienna). 2012;119(1):81–94. doi:10.1007/s00702-011-0659-9.

6. Carballo JJ, De Leon V, García-Nieto R, Lvarez-García RA, Caro-Cañ I, López-Castromán J, et al. Sibship size, birth order, family structure and childhood mental disorders. Soc Psychiatry Psychiatr Epidemiol. 2013;48(8):1327–33. doi: 10.1007/s00127-013-0661-7.

7. Risal A, Tharoor H. Birth order and psychopathology. J Family Med Prim Care. 2012;1(2):137–140. doi: 10.4103/2249-4863.10498.

8. Reimelt C, Wolff N, Hölling H, Mogwitz S, Ehrlich S, Martini J, et al. Siblings and Birth Order-Are They Important for the Occurrence of ADHD? J Atten Disord. 2021;25(1):81–90. doi: 10.1177/1087054718770020.

9. Jahangard L, Haghighi M, Bajoghli H, Holsboer-Trachsler E, Brand S. Among a sample of Iranian students, adult attention deficit hyperactivity disorder is related to childhood ADHD, but not to age, gender, socioeconomic status, or birth order-An exploratory study. Int J Psychiatry Clin Pract. 2013;17(4):273–8. doi: 10.3109/13651501.2013.800555.

10. Keshavarzi Z, Bajoghli H, Mohamadi MR, Holsboer-Trachsler E, Brand S. Attention deficit hyperactivity disorder in children is found to be related to the occurrence of ADHD in siblings and the male gender, but not to birth order, when compared to healthy controls. Int J Psychiatry Clin Pract. 2014;18(4):272–9. doi: 10.3109/13651501.2014.957704.

11. Blanchard R. A possible second type of maternal-fetal immune interaction involved in both male and female homosexuality. Arch Sex Behav. 2012;41(6):1507–11. doi: 10.1007/s10508-011-9896-0.

12. Turner T, Pihur V, Chakravarti A. Quantifying and modeling birth order effects in autism. PLoS One. 2011;6(10):e26418. doi: 10.1371/journal.pone.0026418.

13. Marín AM, Seco FL, Serrano SM, García SA, Gaviria Gómez AM, Ney I. Do firstborn children have an increased risk of ADHD? J Atten Disord. 2014;18(7):594–7. doi: 10.1177/1087054712445066.

14. Conners CK, Sitarenios G, Parker JDA, Epstein JN. The revised Conners' Parent Rating Scale (CPRS-R): factor structure, reliability, and criterion validity. J Abnorm Child Psychol. 1998;26(4):257–68. doi: 10.1023/a:1022602400621.

15. Kaner S, Büyüköztürk Ş, İşeri E. Conners Parent Rating Scale-Revised Short: Turkish Standardization Study. Arch Neuropsychiatry. 2013; 50(2):100–9. doi: 10.4274/npa.y 6219.

16. Tabachnick BG, Fidell LS, Ullman JB. (2013) Using multivariate statistics. Boston, MA: Pearson.

17. Thapar A, Cooper M, Jefferies R, Stergiakouli E. What causes attention deficit hyperactivity disorder? Arch Dis Child. 2012;97(3):260–5. doi: 10.1136/archdischild-2011-300482.

18. Berger I, Felsenthal Berger N. Attention-deficit hyperactivity disorder (ADHD) and birth order. J Child Neurol. 2009;24(6):692–6. doi: 10.1177/0883073808330763.

19. Yürümez E, Uğur Ç. The relationship between attention deficit hyperactivity disorder and birth order. Turk J Child Adolesc Ment Health. 2017;24(3):229–37.

20. Ghanizadeh A, Abotorabi-Zarchi M, Mohammadi MR, Firoozabadi A. Birth Order and Sibling Gender Ratio of a Clinical Sample Birth Order and Sibling Gender Ratio of a Clinical Sample of Children and Adolescents Diagnosed with Attention Deficit Hyperactivity Disorder. Iranian J Psychiatry. 2012;7(2):109–13. PMID: 23139691.

21. Cantwell DP. Attention deficit disorder: A review of the past 10 years. J Am Acad Child Adolesc Psychiatry. 1996;35(8):978–87. doi:10.1097/00004583-199608000-00008.

22. Lawson DW, Mace R. Siblings and childhood mental health: Evidence for a later-born advantage. Soc Sci Med. 2010; 70(12):2061–2069. doi: 10.1016/j.socscimed.2010.03.009.

23. Çak HT, Gökler B. Attention deficit hyperactivity disorder and associated perinatal risk factors in preterm children. Turk Arch Pediatr. 2013;48(4):315–22. doi: 10.4274/tpa.682.

24. Richter J, Richter G, Eisemann M, Mau R. Sibship size, sibship position, parental rearing and psychopathological manifestations in adults: Preliminary analysis. Psychopathology. 1997;30(3):155–62. doi:10.1159/000285042.

25. Çöp E, Kültür SEÇ, Dinç GS. Association between parenting styles and symptoms of attention deficit hyperactivity disorder. Turk Psikiyatri Derg. 2017;28(1):1–8. doi: 10.5080/u11227.