ACTA SCIENTIFIC NUTRITIONAL HEALTH (ISSN:2582-1423)

Volume 4 Issue 2 February 2020

Research Article

Breast Feeding Duration and Attention Deficit Hyperactivity Disorder

Zahra Sepehrmanesh[1], Hossein Sarmast[2]*, Seyyed Alireza Moraveji[3], Behina Sarmast[4], Zohreh Mehri[5] and Afshin Ahmadvan[6]

[1]MD, Full Professor of Psychiatry Kargarnegad Hospital, Medical University of Kashan, Kashan, Iran

[2]MD, Cardiovascular Surgeon of Cardiac Surgery Hospital of Damascus University, Damascus, Syria

[3]MD, PHD, Full Professor of Occupational Health Department, Medical University of Kashan, Kashan, Iran

[4]Medical Student of Medical University of Kashan, Kashan, Iran

[5]MD, GP, Medical University of Kashan, Kashan, Iran

[6]MD, Associate Professor of Psychiatry, Kargarnegad Hospital, Medical University of Kashan, Kashan, Iran

***Corresponding Author:** Hossein Sarmast, MD, Cardiovascular Surgeon of Cardiac Surgery Hospital of Damascus University, Damascus, Syria

DOI: 10.31080/ASNH.2020.04.0622

Received: January 09, 2020

Published: January 27, 2020

Abstract

Background: Attention-deficit hyperactivity disorder (ADHD) is one of the most common childhood-onset neuro developmental disorders. Breast feeding has positive effects on physical health and mental development of child. This study evaluates relation between duration of breastfeeding and ADHD.

Method: A total of 404 children aged 7-12 years (196 children with ADHD and 208 children without ADHD) were studied. The questionnaire including the risk factors: sex, birth order, type of delivery, birth weight, gestational age, maternal age, pregnancy and delivery complications, neonatal drug history and duration of breastfeeding were used. Data were analyzed by t-test, chi square and logistic regression.

Result: Breastfeeding duration in children with ADHD was 17.05 months compared with 18.59 months in control group ($p = 0.03$). A stepwise logistic regression that included the variables found to be significant in univariate analysis demonstrated a significant association between ADHD and insufficient breastfeeding, male gender, and mother hypothyroidism and history of drug use in neonatal period.

Conclusion: The long duration of breastfeeding could be as protective factor in ADHD. However, the further studies are needed.

Keywords: ADHD; Breast Feeding; Children

Introduction

Attention deficit hyperactivity disorder (ADHD), is a common behavioral disorder that affects approximately 3 to 5 percent of the children. The children suffer from ADHD are more vibrant, inattentive and behavior impulsively in compared to children of the same age. In order to diagnose ADHD in a kid, the symptoms must start before the age of six and have been present for at least 6 months [1,2]. The prevalence of the disorder has been reported in various studies, for example, when DSM diagnostic criteria are used the prevalence would be 7 to 10% [3]. The prevalence of ADHD is reported 6.8% in among Iranian kids [4]. Although this disorder is the most commonly studied and diagnosed psychiatric disorder in children, but in most cases the cause is unknown. It is also diagnosed in boys 3 times more than girls and the reason behind this difference is unknown. Full recovery is rare before age 12. About 30 to 50% of individuals who were diagnosed with this disorder in childhood show the symptoms until adulthood and about 2 to 3% of the adults are suffering from ADHD. Hyperactivity diminishes with increasing age, however impaired concentration and impulsive behavior may persist [5,6]. The main difficulty that ADHD children may face is the lack the ability to maintain and adjust their behavior, thus they usually fails to match their behavior with environmental conditions which damages performance of the child's family, community and education [7].

Several factors are involved in causing this disorder; one of them is impaired development of the nervous system. In this case, areas of the brain that are responsible for attention, concentration and motor activities may have minor defects. Heredity and genetics also play a role in the disorder. In some cases, environmental factors also can cause this problem. Infection during pregnancy, birth and early childhood, brain damages caused by trauma, premature birth,

low birth weight and malnutrition are of environmental factors contributing to this disorder [8].In studies, a positive correlation between breastfeeding and good prognosis in terms of health was concluded for children, including the reduction of respiratory infections - Asthma - Obesity - diabetes and Leukemia [9]. Additionally, breastfeeding is associated with better cognitive development in children [10-14]. In studies the relationship between breastfeeding and ADHD. In previous studies, the relationship between breastfeeding and ADHD [15,16] and other behavioral problems [17,18] has been proposed.

According to the conducted studies on the role of breastfeeding, the main nutrition factors in breast milk can have an effect on brain development and as a result advent of ADHD as an environmental factor. The relationships between cognitive development and longer period of breastfeeding have been proposed in a number of studies [15,16,19]. In a study conducted by Shamberger in America, a significant inverse relationship was found between ADHD and exclusive 3 to 6 month breast feeding. Also, there was a direct relationship between the premature birth, low birth weight and very low birth weight, obesity, infant mortality and ADHD. It was also noted that breast milk appears to contain substances that prevent ADHD [19]. In an experiment run by Park, the protective effect of breastfeeding on children's behavior and positive effects of breastfeeding on children's intelligence was mentioned [20]. Julvez conducted an experiment in Spain in which he investigated attention deficit and hyperactivity behaviors at age 4 and during breastfeeding period. He concluded that long-term breastfeeding with breast milk is associated with fewer attention deficit hyperactivity symptoms and improvement in the behavior (neurological outcomes and social behavior) [21]. Mimouni-Bloch in a study stated that breastfeeding in infancy eating milk may have a protective effect against ADHD for the rest of childhood. Furthermore, in this study, there was a significant relationship between ADHD and lack of breastfeeding in the first three months of life, maternal age at birth, infant being a boy and parental separation [15]. Additionally, in the study of Kadziela-Olech it was noted that a shorter duration of breastfeeding may be a peripheral factor for ADHD [16].

The current study was designed since there was no study in this field in Iran and there are limited studies done on the possible protective role of breast feeding and also due to the prevalence of ADHD among children and the consequences of this disorder on children and their families, determining the protective and risk factors of ADHD for prevention is important.

Materials and Methods

In this study, 404 children, including 196 children with ADHD and 208 children without ADHD, which were chosen from siblings of ADHD kids, were investigated using case-control method. The children with ADHD were selected among the children who referred to a psychiatric clinic of Kashan University of Medical Sciences. They were diagnosed with ADHD using clinical interview by child psychiatrist based on DSM IV criteria for ADHD. The inclusion and exclusion criteria for children included age of 6 to 12 years, lack of mental retardation, a history of head injury or brain surgery and medical conditions such as the endocrine disease, cleft palate. The exclusion criteria for mothers included a history of specific problems that impede breastfeeding such as inverted nipple or a history of certain drugs that are contraindicated during breastfeeding (such as chemotherapy drugs) - mothers with mental retardation or severe mental disorders such as mood and psychiatric disorders. A questionnaire contained risk factors for ADHD and other required data was designed and provided to the mothers of children with ADHD and control groups. The questionnaire included sex, age, place of birth, type of delivery, birth weight, gestational age, maternal age at birth, duration of breastfeeding, history of disease or drug use during pregnancy, neonatal infection in children, history of hospitalization in the neonatal period, history of jaundice or blood transfusions because of jaundice and the child's history of drug abuse. The questions were open-ended and multiple choice questions. Data collected were analyzed by chi square tests and t-test. Also, logistic regression was used for control of confounding.

Results

The study was conducted on196 children with ADHD and 208 children without ADHD. The average duration of breastfeeding in ADHD group was 17.05 months with a standard deviation of 7.52 and in the control group 18.59 with a standard deviation of 6.74 months, the difference was significant between the two groups. (P value= 0.031). Regarding breastfeeding in the study group (children with ADHD), 11.22% for 0 to 6 months, 14.28% for 7 to 12 months, 27.04% for 13 to 18 months, 37.24% for 19 to 24 months and 10.20% for more than 24 months were breastfed. In the control group, 8.17% for 0 to 6 months, 14.42% for 7 to 12 months, 15.86% for 13 to 18 months, 52.40% % for 19 to 24 months and 9.13% for more than 24 months were breastfed. There was no significant difference between the two groups of control and experiment with regard to the weight - gestational age and maternal age during pregnancy (Table 1).

Variable	ADHD group (N=196) Mean ± SD	Control group (N=208) Mean ± SD	P-value
Birth weight	3205.20 ± 634.88	3161.359 ± 359.79	0.39
Duration of breast feeding	17.05 ± 7.52	18.59 ± 6.74	0.03
Age of mother	25.10 ± 5.09	25.32 ± 4.44	0.63
Gestational age	8.82 ± 0.53	8.88 ± 0.35	0.18

Table 1: Mean of variables in the two groups of children.

In the group of children with ADHD, 56 patients (28.6%) were female and 140 (71.4%) were male. no significant gender differences were seen between the two groups p>0.001). However, there was a significant difference between the two groups regarding birth order, so that 55% of children with ADHD were the first child (Table 2).

Factors		ADHD group (19 (N%)	Control group(208) (N%)	Total (N%)	P-value
Gender	Girl	56(28.6)	110(52.9)	166	0.001
	Boy	140(71.4)	98(47.1)	98	
History of neonatal icter	Yes	98(50.0)	81(38.9)	179	0.025
	No	98(50.0)	127(61.1)	225	
History of neonatal blood exchange	Yes	8(4.1)	0(0)	8	0.003
	No	188(95.9)	208(100)	396	
History of neonatal hospitalization	Yes	62(31.6)	42(20.2)	104	0.009
	No	134(68.4)	166(79.8)	300	
History of drug use in neonatal period	Yes	19(9.7)	2(1)	21	0.001
	No	177(90.3)	206(99)	283	
History of drug use in pregnancy	Yes	54(27.6)	36(17.3)	90	0.013
	No	142(72.4)	172(82.7)	314	
History of hypothyroidism in pregnancy	Yes	17(8.7)	5(2.4)	22	0.006
	No	179(91.3)	203(97.6)	382	
History of hyperthyroid in pregnancy	Yes	0(0)	2(1)	2	0.499
	No	196(100)	206(99)	402	
Delivery method	Normal	89(45.4)	110(52.9)		0.133
	Cesarean	107(54.6)	98(47.1)		
Birth rank	First	108(55.1)	100(48.1)	208	0.016
	Second	55(28.1)	83(39.9)	138	
	Third and over	33(16.8)	25(12)	58	

Table 2: Frequency of Maternal, pregnancy and neonatal risk factors for ADHD in the subjects.

89 children (45.4%) with ADHD and 110 kids (52.9%) in the control group were natural childbirth infants and 107 (54.6%) of children with ADHD and 98% (47.1%) of the kids in the control group were born by caesarean section. There was no significant difference between the two groups with regard to the type of birth.

Regarding history of jaundice (P value=0. 025) and blood exchange transfusion (P value= 0.003), there was a significant difference between the two groups (Table 2). Blood exchange transfusion and jaundice in children with ADHD was markedly higher than non-hyperactive children.

19 (9.7%) kids from the ADHD group and 2 kids (1%) in the control group had a history of drug use in the neonatal period, which in this case also the difference was significant p=0. 001 (Table 2). 17 (8.7%) of mothers of ADHD children and 5 (2.4%) of mothers in the control group had a history of hypothyroidism during pregnancy which the difference was significant between the two groups p= 0.006. In the case of hyperthyroidism with P value= 0.133, gestational hypertension P value= 0.235, gestational diabetes P value= 0.988 the difference was not significant between the two groups. 54 (27.6%) mothers with ADHD children and 36 (17.3%) in the control group mothers reported use of medications during pregnancy that the difference between the two groups was significant (P value= 0.013). 62 (31.6%) children with ADHD have a history of hospitalization in the neonatal period, compared to the control group 42 (20.2) children in the control group, there were significant differences between the two groups with the p-value of 0.009 (table 2).

In the second stage analysis, according to the proposed strategy by Hosmer and Lemeshow, the variables that had a significant relationship or close to the significance level (p value less than 2.0) with ADHD were entered into the next phase of analysis or multiple analyzers. For this purpose, the logistic regression model was used to enter model for the above-mentioned variables in order to finally, by removing the effects of confounding factors, identify the factors that have an actual correlation with ADHD. In order to express the intensity of correlation in the final model, OR (odds ratio) was used and the significance level was set at 0.05. The fitness of the model was confirmed by Hosmer and Lemeshow test.

After multivariate analysis, ultimately, gender, duration of breastfeeding, history of hypothyroidism in pregnancy and history of drug use during pregnancy were remained in the model that had a real correlation with ADHD after eliminating the confounding effects of other variables (Table 3). By controlling the confounding effect of other variables it was realised that for every month of increase in breastfeeding, the odds of developing ADHD decrease by the rate of 4%.

It was also found that the odds of ADHD in boys are 3.43 times higher than in girls. History of maternal hypothyroidism leads to 4.47 times increase in the odds of developing ADHD and also using drugs leads to an increase of developing ADHD by 18.5 times.

Discussion

In the current study, the duration of breastfeeding in school-aged children with ADHD and children without ADHD were studied. In this study, 196 hyperactive children and 208 children without ADHD were evaluated.

The duration of breastfeeding in the ADHD group was significantly lower than the control group. The mean duration of breastfeeding in the group of hyperactive children was 17.0510 months and in the control group it was 18.5913. This result is consistent with the results of previous studies [15,17,19,21-25]. In the study of Kadziela-Olech, the average duration of breastfeeding in children with ADHD is significantly lower than the control group so the duration of breastfeeding has been reported as a risk factor for ADHD symptoms.

Variables in the Equation		B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I. for EXP (B)	
								Lower	Upper
Step 1[a]	Sex (1)	1.232	.247	24.973	1	.000	3.430	2.115	5.561
	Hypothyroidism(1)	1.497	.581	6.646	1	.010	4.467	1.432	13.940
	Duration	-.041	.016	6.231	1	.013	.960	.929	.991
	Drugs (1)	2.919	.844	11.965	1	.001	18.530	3.544	96.895
	Constant	2.505	.716	12.255	1	.000	12.245		

Table 3: Logestic regression of related variables to ADHD.

a. Variable(s) entered on step 1: sex, hypothyroidism, Duration, drugs.

In the present study in, 71.4% of the ADHD kids were male and 28.6% were females, which are consistent with the previous studies. Other studies have also clearly been reported prevalence of ADHD in boys more than girls [1,5,15,19,22,23,25-27]. Typically diagnosed in girls occurs in older ages in compared to boys which may not diagnosis more. This age ratio is less salient after childhood [27].

In the present study, there was no significant difference in the mean birth weight of the children with ADHD and the control group. In the study of Kadziela-Olech that was conducted in the Netherlands, no significant difference was observed in the birth weight of children in both groups [8]. However, in the study of Mimouni-Bloch in Israel, preterm birth was higher among ADHD children, also a significant correlation was seen between ADHD and birth weight [28].

The average gestational age in the ADHD group was 8.82 months and 88.8 months in the control group which was not significantly different in the two groups, while in other studies, preterm birth has been proposed as a risk factor for ADHD [15-28,23].

In this study, there was no significant difference in terms of method of delivery was observed between the two groups. However, in the Golmirzaei study, a significant relationship was seen between cesarean section and ADHD [25].

History of hospitalization in the neonatal period, history of jaundice, history of drug use and blood transfusions in neonates in the ADHD group was remarkably more than the control group. In some studies neonatal disease has been proposed as a risk factor in patients with ADHD [23]. In other studies, no relationship has been observed in this case [16-25].

In the current study, a significant difference between the two groups in terms of birth order was observed, so that more kids in the ADHD group was the first child in compared to the control group.

In the present study, the average maternal age at birth in the ADHD group was 25.23 years and in the control group was 25.10 years, no significant difference was observed between the two groups. However, in the Mimouni-Bloch study in Israel, maternal age at birth was higher compared to the control group [15] which was not consistent with the current study.

In this study, hypothyroidism, and history of drug use during pregnancy in mothers of children with ADHD was higher than the control group, however in the case of hyperthyroidism, high blood pressure during pregnancy, gestational diabetes, infections during pregnancy, no significant difference was found between the two groups. However, in the conducted studies by Mimouni-Bloch and Kadziela-Olech, no significant difference between the groups of ADHD and non-ADHD in terms of pregnancy and parturition complications. Schmitt ran an experiment in Germany in which gestational diabetes was reported more among ADHD children and diabetes was reported as a risk factor for developing ADHD which was not consistent with the current study. The reason for this difference could be due to the differences in sampling method. In the present study sample was selected from the same family that did not differ in terms of diabetes [23]. According to a study conducted in Bandar Abbas by Golmirzaei, maternal physical ailments in the ADHD group were more than the control group. In this study, preeclampsia and a history of trauma and accidents during pregnancy were higher in the ADHD group and in general the incidents that pregnant women or parents face had been associated with ADHD [25].

Furthermore, after multiple analysis in this study, variables such as sex, duration of breastfeeding, history of hypothyroidism in pregnancy, and the history of drug use in infancy were remained in the model which had true correlation with AHDH after excluding the confounding effects of other variables. In other words, by controlling the confounding effect of other variables, it was shown that for every month that is added to breastfeeding, developing ADHD reduces by 4%.

Furthermore, it was found that the odds of developing ADHD in boys are 3.43 times more than girls. History of maternal hypothyroidism cause a 4.47 times increase and using anti-seizure medication in childhood increases the risk of ADHD by 18.5 times.

Conclusion

The results of this study show that the average duration of breastfeeding was lower in children with ADHD than children without ADHD. Therefore, longer duration of breastfeeding can be a protective factor against risk factors of developing ADHD. Running more experiments with more control groups to determine the most accurate protective and risk factors seems to be necessary.

Acknowledgments

The current results are adapted from a research project proven by the research council of Kashan University of Medical Sciences with Number thesis 9483. Special thanks to the council of Kashan University of Medical Sciences and Clinical Research Development Unit-Matini/Kargarnejad Hospitals and all of dear mothers who helped in this project.

Bibliography

1. "Attention-Deficit/Hyperactivity Disorder (ADHD): Symptoms and Diagnosis". Centers for Disease Control and Prevention. National Center on Birth Defects and Developmental Disabilities (2013).

2. Dulcan MK and Lake MB. Concise guide to child and adolescent psychiatry (4th ed.). Washington, DC: American Psychiatric Pub. p. 34. ISBN 9781585624164. OCLC 754798360.

3. Lingineni RK., *et al*. "Factors associated with attention deficit/hyperactivity disorder among US children: Results from a national survey". *BMC Pediatrics* 12 (2012): 50.

4. Alavi A., *et al*. "Frequency of Psychological Disorders amongst Children in Urban Areas of Tehran". *Iran Journal of Psychiatry* 5 (2010): 55-59.

5. Polanczyk G., *et al*. "The worldwide prevalence of ADHD: a systematic review and metaregression analysis". *American Journal of Psychiatry* 164 (2007): 942-948.

6. Lambek R., *et al*. "Validating neuropsychological subtypes of ADHD: how do children with and without an executive function deficit differ?". *Journal of Child Psychology and Psychiatry* 51 (2010): 895-904.

7. Taylor E., *et al*. "European clinical guidelines for hyperkinetic disorder - first upgrade". *European Child and Adolescent Psychiatry* 13 (2004): I7-I30.

8. Mayes SD., *et al*. "ADHD subtypes and co-occurring anxiety, depression, and oppositional-defiant disorder: differences in Gordon diagnostic system and Wechsler working memory and processing speed index scores". *Journal of Attention Disorders* 12 (2009): 540-550.

9. Ip S., *et al*. "Breastfeeding and maternal and infant health outcomes in developed countries". *Evidence Report/Technology Assessment* 153 (2007): 1-186.

10. Whitehouse AJ., *et al*. "Duration of breast feeding and language ability in middle childhood". *Paediatric and Perinatal Epidemiology* 25 (2011): 44-52.

11. Quinn PJ., *et al*. "The effect of breastfeeding on child development at 5 years: a cohort study". *Journal of Paediatric Child Health* 37 (2001): 465-469.

12. Der G., *et al*. "Effect of breast feeding on intelligence in children: prospective study, sibling pairs analysis, and meta-analysis". *BMJ* 333 (2006): 945.

13. Belfort MB., *et al*. "Infant feeding and childhood cognition at ages 3 and 7 years effects of breastfeeding duration and exclusivity". *JAMA Pediatrics* 167 (2013): 836-844.

14. Kramer MS., *et al*. "Effects of prolonged and exclusive breastfeeding on child behavior and maternal adjustment: evidence from a large, randomized trial". *Pediatrics* 121 (2008): e435-e440.

15. Mimouni -Bloch A., *et al*. "Breastfeeding may protect from developing attention-deficit/hyperactivity disorder". *Breastfeed Medicine* 8 (2013): 363-367.

16. Kadziela-Olech H., *et al*. "The duration of breastfeeding and attention deficit hyperactivity disorder". *Roczniki Akademii Medycznej w Bialymstoku* 50 (2005): 302-306.

17. Oddy WH., *et al*. "The long-term effects of breastfeeding on child and adolescent mental health: a pregnancy cohort study followed for 14 years". *Journal of Pediatrics* 156 (2010): 568-574.

18. Liu J., *et al*. "Breastfeeding and active bonding protects against children's internalizing behavior problems". *Nutrients* 6 (2014): 76-89.

19. Shamberger R. "Attention-deficit disorder associated with breast-feeding: a brief report". *Journal of the American College of Nutrition* 31 (2012): 239-242.

20. Park S., *et al*. "Protective effect of breastfeeding with regard to children's behavioral and cognitive problems". *Nutrition Journal* 13 (2014): 111.

21. Julvez J., *et al*. "Attention behaviour and hyperactivity at age 4 and duration of breast-feeding". *Acta Paediatrics* 96 (2007): 842-847.

22. Stadler DD., *et al*. "Recalled Initiation and Duration of Maternal Breastfeeding Among Children with and without ADHD in a Well Characterized Case-Control Sample". *Journal of Abnormal Child Psychology* (2015).

23. Schmitt J and Romanos M. "Prenatal and perinatal risk factors for attention-deficit/hyperactivity disorder". *Archives of Pediatrics and Adolescent Medicine* 166 (2012): 1074-1075.

24. Sabuncuoglu O., *et al*. "Breastfeeding and parafunctional oral habits in children with and without attention-deficit/hyperactivity disorder". *Breastfeed Medicine Journal* 9 (2014): 244-250.

25. Golmirzaei J., *et al*. "Evaluation of attention-deficit hyperactivity disorder risk factors". *International Journal of Pediatrics* (2013): 953103.

26. Ghanizadeh A., *et al*. "Comorbidity of psychiatric disorders and parental psychiatric disorders in a sample of Iranian children with ADHD". *Journal of Attention Disorders* 12 (2008): 149-155.

27. Gallo EF and Posner J. "Moving towards causality in attention-deficit hyperactivity disorder: overview of neural and genetic mechanisms". *The lancet* (2016).

28. Field SS. "Interaction of genes and nutritional factors in the etiology of autism and attention deficit/hyperactivity disorders: a case control study". *Journal of Medical Hypotheses* 82 (2014): 654-661.