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Attention deficit hyperactivity disorder and associated perinatal risk factors in preterm children

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Summary
Aim: The aim of this study was to examine Attention Deficit Hyperactivity Disorder (ADHD) and its association with perinatal risk factors in preterm children at the age of 5.
Material and Method: The cohort was derived from children born between 30-36 weeks of gestation and hospitalized in the Neonatal Intensive Care Unit. Children who survived beyond the age of 5, without a history of congenital anomaly, neurological or chronic disease and mental motor retardation were included in the study. 106 children who met the inclusion criteria were evaluated when they were 5 years old. The Perinatal Risk Factors Form was completed for each child. All children and their parents were interviewed using the Schedule for Affective Disorders and Schizophrenia for School Aged Children- Present and Lifetime version for psychiatric diagnosis. Approval was obtained from the Ethics Committee (HEK 08/3-4) and written informed consent was obtained from all parents.
Results: 20.8% of the children were diagnosed with ADHD. The diagnosis of ADHD was more common in children who had smaller gestational age and lower birth weight, developed respiratory distress syndrome, received surfactant therapy and mechanical ventilation treatment and had longer hospitalization period. ADHD was less prevalent among children from families with a high socioeconomic status. Among the perinatal factors assessed, gestational age was found to be the main predictor for ADHD.
Conclusions: With regard to perinatal risk factors, psychopathologies including especially ADHD should be taken into account for early recognition and intervention in the long term follow up of premature children. *(Turk Arch Ped 2013; 48: 315-322)*

Key words: Attention deficit hyperactivity disorder, premature, perinatal risk factors

Introduction

In the last 30 years, preterm infants can be kept alive with gradually increasing rates. Currently, the survival chance of infants born with a weight of 1500-2500 g has reached 95% (1). Because of the increase in survival rates, increasingly more children with a history of prematurity are being encountered and developmental processes, difficulties and health problems of these children at advanced ages and their families are becoming a focus with a gradually increasing rate. On the other hand, attention deficit and hyperactivity disorder (ADHD) is one of the most important issues in child and adolescent psychiatry, since it is a common condition, affects the indiviual's whole life in psychiatric and social point of views and carries the risk of being persistent and continuing from the preschool period to the adulthood with developmental differences. There are many studies investigating the relation between preterm birth and ADHD symptoms. While the prevalence of ADHD has been reported to be 5-8% in the community, it has been reported to be 20-30% in children with a history of preterm birth (2). In a meta-analysis in which studies evaluating children with a history of preterm birth were evaluated in cognitive and behavioral perspectives were collected, it was found that preterm infants had introversion

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and extraversion problems with a higher rate compared to controls and developed ADHD with a more than 2-fold higher frequency (3). In our country, there is no study investigating the relation between preterm birth and ADHD.

Material and Method

The hospital records composed of names and surnames and phone numbers of the parents of 226 children who were born at the 30-36th gestational week and followed up in the Neonatal Intensive Care Unit (NICU) were reached by examining the hospitalization records of 2003. The families of these children who were at the age of 5 years in 2008 were called by phone and they were invited for evaluation.

25 babies who were learned to have died before discharge or had at least one congenital anomaly from the records were excluded from the study. It was learned that 8 of 118 children whose families could be reached by phone had a chronic disease which necessit

ated continuous drug usage or developmental failure which necessitated special education. These children were also excluded from the study. 3 of 110 children who were evaluated had clincial mental retardation which prevented development of necessary verbal expression ability for psychiatric evaluation used in the study and one child was found to have severe hearing deficit which was not informed during the phone interview and verbal communication difficulty. These children were also excluded from the study. The remaing 106 children constituted the study sample. Constitution of the study sample is summarized in Figure 1.

A table in which prenatal risk factors were questioned was filled in using files and detailed NICU recordings for all children who could not be reached and who were reached and evaluated. The prenatal risk factors questioned are listed below:

A) Prenatal risk factors: Consanguinity between the mother and father, pregnancy by assistive reporduciton techniques (intracytoplasmic sperm injection or in vitro fertilization), parity, number of alive children, delivery order, use of drugs during pregnancy, being child of a diabetic mother, hypertension in the mother, preeclampsia, presence of chronic disease during pregnancy, maternal age and smoking status, history of sibling with chronic disease.

B) Perinatal risk factors: Gestational age, birth weight, birth place and mode of delivery, APGAR scores at the 0 and 5th minutes, history of early rupture of membranes and history of meconium aspiration.

C) Postnatal risk factors: Time in NICU, use of mechanical ventilation, administration of oxygen, surfactant treatment, respiratory distress syndrome (RDS), bronchopulmonary dysplasia, cranial ultrasonography (CrUSG), intraventricular bleeding (IVB), sepsis, necrotizing enterocolitis (NEC), congenital anomaly, diagnoses at the time of discharge.

The Schedule for Affective Disorders and Schizophrenia for School Age Children-Present and Lifetime Version (K-SADS-PL) is a semi-structured clinical interview tool directed to detect past and present psychopathologies according to DSM-IV diagnostic criteria in children and adolescents between the ages of 6 and 16 years (4,5). Although the Schedule for Affective Disorders and Schizophrenia for School Age Children-Present and Lifetime Version was designed to be used in the pre-school period, its reliability especially in terms of ADHD, oppositional defiant disorder, anxiety and mood disorders and elimination disorders in children between the ages of 2 and 5 years has been shown in subsequent studies (6). The Pre-school Assessment Form (4-6 years) which also included sociodemographic information and K-SADS-PL were used in the interview made by the child and adolescent psychiatrist with parents. Each child was interviewed one by one under guidance of K-SADS-PL. Pervasive developmental disorders were evaluated according to the diagnostic criteria of DSM-IV TR, though they were not included in K-SADS-PL. To determine the socioeconomic level (SEL) of families the Turkish translation of the Hollingshead-Redich scale from the "Comprehensive Assessment of Symptoms and History" published in 1987 by Andreasen (7) was used.

The study was approved by the local ethics committee of clinical and drug investigations on 03.07.2008 (HEK 08/3-4). Written informed consent was obtained from the families for all evaluations to be performed.

Statistical Program for Social Sciences (SPSS 1.30) was used for statistical analysis of the data. Chi-square (χ^2) test was used in evaluation of the data expressed

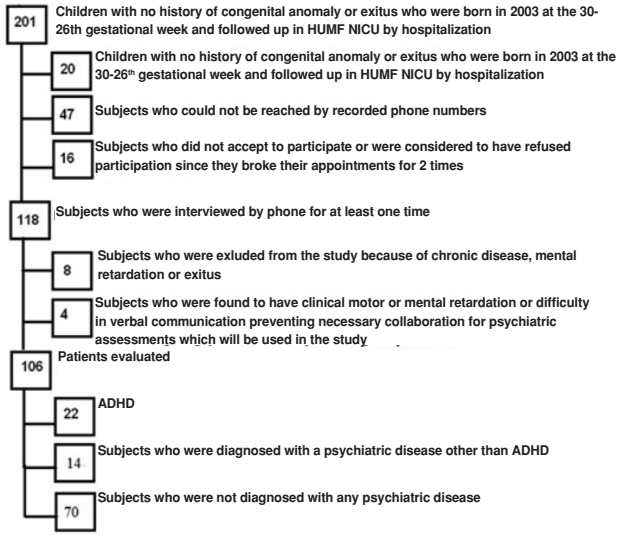

Figure 1. Steps with which the study sample was constituted

as numbers. In evaluation of the data expressed as measurement, t-test and one-way variance analysis were used when variance test assumptions were met and Mann-Whitney U test and Kruskal Wallis test were used when variance test assumptions were not met. Tukey test was used in post hoc analyses to investigate the source of difference in one-way variance analysis. All analyses were performed in a bipolar fashion and a p value of <0,05 was considered significant. In correlation analyses, Pearson's or Spearman's correlation test was used. Prenatal factors which could affect development of ADHD in the study sample were evaluated by logistic regression model which is one of the multiple analysis methods.

Results

Prenatal characteristics of the children who could not be reached

Since only 58.7% of the targeted sample could be reached, 106 children who were evaluated and 83 children who could not be reached were compared in terms of prenatal risk factors in order to assess the bias which could occur. No significant difference was found between the two groups in terms of 30 prenatal risk factors questioned.

Prenatal characteristics of the study sample

The ages of 106 children who were evaluated ranged between 62 and 69 years at the time of evaluation and the mean age was found to be 64.3±1.5 months. It was found that 54 (50.9%) of 106 children were siblings. 58 (54.7%) of the children were male and 48 (45.3%) were female. The maternal age at the time of delivery ranged between 17 and 42 years and the mean age was found to be 30.8±4.9 years. 34 (32.1%) children were born by way of intracytoplasmic sperm injection and 6 children (5.7%) were born by way of in vitro fertilization method. 76 mothers of 106 children were evaluated in terms of the characteristics of the pregnancy process. It was found that 30 mothers (39.4%) had a disease during pregnancy. None of the mothers described smoking during pregnancy. 58 children (54.7%) were born as a result of multiple pregnancies. The mean gestational age at the time of birth was found to be 33.4±1.5 weeks and the mean birth weight was found to be 2099.2±495.5 g. A complication was found in the neonatal period in 33 children (31%). The most common complication was RDS. Surfactant treatment was administered in 12 children (11,3%) and mechanical ventilation was performed in 18 children (17,0%). The children were hospitalized in NICU for a mean period of 7.7±5.2 days. Prenatal characteristics of the study sample are summarized in Table 1.

Distribution of psychiatric diagnoses in the study sample

When 106 children were evaluated according to the DSM-IV TR criteria by K-SADS-PL in terms of present diagnoses, it was found that a diagnosis of psychiatric disease was made in 36 children (34%). No difference

Table 1. Prenatal characteristics of the study sample

Study sample (s=106)	
	s (%)
Male gender	58 (%54.7)
Nuclear family	86 (%81.1)
Low SEL	31 (%29.2)
Moderate SEL	55 (%51.9)
High SEL	20 (%54.7)
Consanguinity between the mother and father	12 (%18.9)
History of morbidity in the mother	30 (%39.4)
History of diabetes in the mother	7 (%6.6)
History of hypertension in the mother	22 (%20.8)
History of preeclampsia in the mother	16 (%15.1)
History of early rupture of membranes	7 (%6.6)
History of chronic disease in a sibling	1 (%0.9)
History of multiple pregnancy	58 (%54.7)
Spontneous pregnancy	66 (%62.3)
Delivery by cesarean section	92 (%86.8)
SGAB	13 (%12.3)
Subjects in whom CrUSG was performed	51 (%48.1)
Leeding findings on CrUSG	1 (%0.9)
History of RDS	13 (%12.3)
History of surfactant treatment	12 (%11.3)
History of mechanical ventilation	17 (%16.0)
History of sepsis	1 (%0.9)
	Mean ± SD (the lowest- the highest)
Age (months)	64.3±1.5 (62-69)
Maternal age at the time of delivery (years)	30.8±4.9 (17-42)
Number of siblings at the time of delivery	0.4±0.8 (0-5)
Gestational week (weeks)	33.4±1.5 (30-36)
Birth weight (grams)	2099.2±495.5 (900-3600)
APGAR score at the 0th minute	7.3±1.9 (3-10)
APGAR score at the 5th minute	9.6±1.3 (3-10)
Hospitalization time (days)	7.7±5.2 (2-27)

SEL: Socioeconomic level, SGAB: Small for gestational age baby
CrUSG: Cranial ultrasonography, SDS: Respiratory distress syndrome

Table 2. Prenatal risk factors in children who were and were not diagnosed with a psychiatric disease other than ADHD

	ADHD (s=22)	Psychiatric disease other than ADHD (s=14)	Subjects who were not diagnosed with a psychiatric disease (s=70)	Statistics
Consanguinity between the mother and father s (%)	3 (%13.6)	1 (%7.1)	8 (%11.4)	χ^2=3.071AD
Nuclear family s (%)	17 (%77.3)	11 (%78.6)	58 (%82.9)	χ^2=0.562AD
Low SEL s (%)	5 (%22.7)	6 (%42.9)	20 (%28.6)	χ^2=1.722AD
Moderate SEL s (%)	17 (%77.3)	5 (%35.7)	33 (%47.1)	χ^2=7.783 *
High SEL s (%)	0 (%0)	3 (%21.4)	17 (%24.3)	χ^2=6.523 *
Maternal age at the time of delivery (years) (mean ± sd)	28.8±5.7	30.6±4.7	31.5±4.7	F=2.609AD
History of morbidity in the mother s (%)	5 (%22.7)	7 (%50.0)	29 (%41.4)	χ^2=3.343AD
History of diabetes in the mother s (%)	0 (%0)	2 (%14.3)	5 (%7.1)	χ^2=2.928AD
History of hypertension in the mother s(%)	4 (%18.2)	2 (%14.3)	16 (%22.9)	χ^2=0.633AD
History of preeclampsia in the mother s(%)	1 (%4.5)	2 (%14.3)	13 (%18.6)	χ^2=2.578AD
History of early rupture of membranes s(%)	2 (%9.1)	0 (%0)	5 (%7.1)	χ^2=1.244AD
Number of siblings (mean ± sd)	0.3±0.7	0.2±0.5	0.5±0.8	F=1.981AD
History of chronic diseases in a sibling s(%)	1 (%4.5)	0 (%0)	0 (%0)	χ^2=3.677AD
History of multiple pregnancy s (%)	15 (%68.2)	8 (%57.1)	35 (%50.0)	χ^2=5.149AD
Spontaneous pregnancy s (%)	13 (%59.1)	9 (%64.3)	44 (%62.9)	χ^2=3.995AD
Delivery by cesarean section s (%)	18 (%81.8)	12 (%85.7)	62 (%88.6)	χ^2=0.682AD
Gestational week (weeks) (mean ± sd)	31.8±1.6	33.6±1.1	33.9±1.2	F=22.348 **
Birth weight (g) (mean ± sd)	1792.7±484	2092.9±439	2196.8±476	F=6.111 *
SGAB s (%)	2 (%9.1)	3 (%21.4)	8 (%11.4)	χ^2=3.541AD
History of LBW s (%)	16 (%72.7)	12 (%85.7)	48 (%68.6)	χ^2=0.01AD
History of VLBW s (%)	4 (%18.2)	1 (%7.1)	5 (%7.1)	χ^2=5.96AD
Male gender s (%)	17 (%77.3)	7 (%50.0)	34 (%48.6)	χ^2=5.710AD
APGAR score at the 0th minute (Mean ± sd)	7.2±1.9	7.0±2.1	7.5±1.8	F=0.421AD
APGAR score at the 5th minute (Mean ± sd)	9.2±2.2	9.2±1.1	9.8±0.5	F=2.171AD
Subjects in whom CrUSG was performed s (%)	17 (%77.3)	6 (%42.9)	29 (%41.4)	χ^2=11.662 *
Bleeding findings on CrUSG s (%)	1 (%4.5)	0 (%0)	0 (%0)	χ^2=3.677AD
History of RDS s (%)	8 (%36.4)	1 (%7.1)	5 (%7.1)	χ^2=12.986 *
History of surfaxctant treatment s (%)	6 (%27.3)	1 (%7.1)	5 (%7.1)	χ^2=7.621 *
History of mechanical ventilation s (%)	10 (%45.5)	3 (%21.4)	5 (%7.1)	χ^2=17.654**
History of sepsis s (%)	1 (%4.5)	0 (%0)	0 (%0)	χ^2=3.855AD
Hospitalization time (days) (mean ± sd)	11.8±5.6	6.9±4.8	6.6±4.6	F=9.716 **

NS: Not significant; * p<0,05; ** p<0,001

ADHD: Attention deficit and hyperactivity disorder, SEL: Socioeconomical level, SGAB: Small for gestational age baby, LBW: Low birth weight

VLBW: Very low birth weight, CrUSG: Cranial ultrasonography, SDS: Respiratory distress syndrome

was found between the children who were and were not diagnosed with a psychiatric disease in terms of age, gender and SEL (p=0.076 χ^2=3.142; p=0.73 t=-0.341; p=0.127 χ^2=4.132).

The distribution of psychiatric diagnoses was as follows: ADHD 20.8% (s=22), seperation anxiety 11.3% (s=12), oppositional defiant disorder (ODD) 11.3% (s=12), enuresis nocturna 11.3% (s=12), specific phobia 4.7% (s=5), chronic tic disorder 1.9% (s=2), encopresis 1.9% (s=2), obsessive compulsive disorder 0.9% (s=1), transient tic disorder 0.9 % (s=1), depression 0.9% (s=1) and adaptation disorder 0.9 % (s=1). No diagnosis of pervasive developmental disorder was made according to the DSM-IV TR criteria. Multiple diagnoses of psychiatric disease were made in 25 children (23.6%).

ADHD was diagnosed in 22 (61.1%) of 36 children who were diagnosed with any psychiatric disease and a psychiatric disease other than ADHD was diagnosed in 14 (38.9%). 17 (77.3%) of 22 children who were diagnosed with ADHD were male and 5 (22.7%) were female. 7 (50%) of 14 children who were diagnosed with a psychiatric disease other than ADHD were male and 7 (50%) were female. It was found that boys were diagnosed with ADHD with a significantly higer rate (p=0.035 χ^2=6.720). Seperation anxiety, ODD and enuresis nocturna which were the most common disorders other than ADHD did not show difference between SELs and genders (p=0.772 χ^2=1.801; p=0.355 χ^2=4.394; p=0.239 χ^2=2.863; p=0.283 χ^2=2.522; p=0.101 χ^2=4.595; p=0.377 x2=0.780).

Another accompanying psychiatric disorder was present in 18 (82%) of 22 children who were diagnosed with ADHD and in 7 (50%) of 14 children who were diagnosed with a psychiatric disorder other than ADHD. The prevalence of another accompanying psychiatric disorder was found to be significantly higher in children who were diagnosed with ADHD (p=0.043 χ^2=4.082). The prevalence of another accompanying psychiatric disorder did not show difference by gender and SEL in the groups with a diagnosis of ADHD and a psychiatric disorder other than ADHD (p=0.593 χ^2=0.286; p=0.905 χ^2=0.014; p=0.053 χ^2=5.867; p=0.905 χ^2=0.014). When the accompanying disorders in 22 children with ADHD were examinbed, it was found that 45.5% (s=10) had ODD, 22.7% (s=5) had seperation anxiety, 22.7% (s=5) had enuresis nocturna, 9.1% (s=2) had simple phobia, 4.5% (s=1) had obsessive compulsive disorder, 4.5% (s=1) had transient tic disorder and 4.5% (s=1) had chronic tic disorder.

Attention deficit and hyperactivity disorder and prenatal risk factors

No significant difference was found between the children who were and were not diagnosed with a psychiatric disease other than ADHD in terms of sociodemographic variables and perinatal risk factors.

When the children with a diagnosis of ADHD were examined in terms of risk factors, it was found that the rate of diagnosis of ADHD was significantly lower in children coming from families with a high SEL (p=0.04 χ^2=6.523). No significant relation was found between the diagnosis of ADHD and consanguinity between the parents, family structure, maternal age at the time of delivery, number of siblings, history of maternal morbidity during pregnancy, history of early rupture of membranes, multiple pregnancy, preagnancy (spontaneous pregnancy- assistive reprodution techniques) and delivery mode (vaginal-cesarean), APGAR scores at the 0th and 5th minutes, oxygen therapy and history of sepsis.

It was found that children with a diagnosis of ADHD had significantly lower gestational ages and lower birth weights (p<0.001 F=22.348; p=0.003 F=6.111). ADHD was diagnosed in 18 (41.9%) of 43 children who were born at the 30th-33th gestational week and in 4 (6.5%) of 63 children who were born at the 34-36th gestational week. Conclusively, it was found that 18 of 22 children who were diagnosed with ADHD were born before the 34th gestational week and delivery before the 34th gestational week was significantly related with a diagnosis of ADHD (p<0.001 χ^2=19.842). It was found that the children who were diagnosed with ADHD had significantly higher rates of history of RDS, surfactant treatment and mechanical ventilation and they were hosptialized for a longer time in the neonatal period (p=0.002 χ^2=12,986; p=0.02 χ^2=7.621; p<0.001 χ^2=17.654; p<0.001 F=9.716). Prenatal characteristics of the children with a diagnosis of ADHD, with a diagnosis of a psychiatric disorder other than ADHD and with no diagnosis of a psychiatric disorder are comperatively summarized in Table 2.

Logistic regression analysis was performed to investigate which variables independently predicted the diagnosis of ADHD. A diagnosis of ADHD was considered as a dependent variable. In the one-way variance analysis, independent variables included SEL (low, moderate, high) related with ADHD, gestational week, birth weight, RDS, history of surfactant treatment and mechanical ventilation (yes, no) and hospitalization time during the neonatal period. It was found that the best variable predicting ADHD was gestational week (p=0.007) and other independent variables did not predict ADHD when the gestational age was controlled (p=0.065, p=0.0610, p=0.995, p=0.990, p=0.25, p=0.990). As the gestational week decreased one week, the risk of development of ADHD increased by 0.5-fold (OO=0.5; GA %95 0.271-0.583).

Discussion

This study in which prenatal risk factors were aimed to be determined by evaluating preterm children who were hospitalized and followed up in the same NICU in one year

at the age of 5 years in terms of ADHD in a retrospective cohort design was the first study which examined ADHD among prematurity follow-up studies performed in our country. The most important limitation of the study was the fact that only 58.7% of the patients targeted could be reached, but no significant difference was found between the children who were and were not reached in terms of prenatal risk factors. Therefore, it can be stated that the study sample represented the whole sample in terms of prenatal risk factors without a bias. Other important limitations included lack of evaluation of the genetic load which has a significant role in the etiology of ADHD, lack of evaluation of developmental disorders related with speech and language, learning disorders, developmental disorders of motor functions and somatoform disorders since they were not included in the scope of K-SADS-PL used to make a diagnosis and lack of intellectual evaluation. Although lack of a control group was considered as a limitation, the children who were born preterm and were not diagnosed with ADHD functioned as a control group, since the aim of the study was to determine which risk factors occuring in presence of premature delivery predicted development of ADHD rather than to determine the frequency of ADHD in premature delivery.

In the literature, the prevalence of psychiatric symptoms has been reported to be 40-46% and the prevalence of psychiatric disorders has been reported to be 25-27% in children who were born preterm (8,9). The most common psychiatric symptoms include attention deficit and anxiety symptoms (10,11). In this study sample, psychiatric disease was found with a rate of 34% by a semi-structured psychiatric intervew in which K-SADS-PL was used. The most common psychiatric diseases included disruptive behaviour disorders which were composed of ADHD and ODD and these were followed by anxiety disorders.

In population-based studies, the prevalence of pre-school children who met all diagnostic criteria of ADHD has been reported to be 2-6% (12,13,14). Considering history of delivery, a four-fold increased ADHD risk has been defined in VLBW children and a 2.5-3-fold increased ADHD risk has been defined in children with a history of preterm delivery and low birth weight (9). In this study, the prevalence of ADHD was found to be 20.8% at the age of five in preterm children who were born at the 30-36th gestational week and followed up in NICU by hospitalization. The prevalence of ADHD was significantly higher in boys who were born preterm compared to girls who were born preterm which was compatible with the literature. Despite the view that there must be an increae in development of ADHD independent of gender difference, since girls and boys are commonly exposed to the risk of prematurity it has been stated that male gender was three fold higher in children who were born preterm and had ADHD in recent studies and prematurity affects development of nerves in a different way depending on gender (15).

In the literature, the rate of presence of at least one psyhicatric disease accompanying ADHD in the early childhood has been reported to range between 64% and 74% (13,16). In this study, at least one accompanying psychiatric disease was found in 82% of the children who were diagnosed with ADHD. It was thought that the rate of an accompanying disease was higher compared to the literature, since prematurity was also found as a risk factor in addition to ADHD.

In preterm children in whom environmental factors are important in development of psychopathology, high SEL appears to be a protective environmental factor. In this study, it was found that the rate of a diagnosis of psychiatric disease was significantly lower in children with a family having a high SEL and none of them were diagnosed with ADHD or ODD. The fact that pervasive behaviour disorders were not observed in preterm children of families with a high SEL suggested that SEL was a protective factor. Similarly, it has been reported that SEL predicted the rates of psychopathology in prematurity, a high SEL decreased the frequency of behavioral problems including mainly extroversion problems and a high SEL alleviated the negative effects of prematurity on cognitive development in the literature (17,18). Smoking during pregnancy is a significant risk factor in the relation between prematurity and ADHD. In the study sample, no mother reported smoking during pregnancy. It should be considered that the variable of smoking was not controlled appropriately while evaluating the results.

The results of the study showed that rates of histories of RDS, surfactant treatment and mechanical ventilation were significantly higher in the children with a diagnosis of ADHD and they were hospitalized for a longer time in the neonatal period. It was found that the best variable which predicted a diagnosis of ADHD was gestational week. As the gestational week decreased one week, the risk of development of ADHD increased 0.5-fold.

In studies in which the biological relation between ADHD and prematurity has been investigated, it has been proposed that brain blood flow regulation has not matured adequately in preterm newborns and this predisposes to developmental disorders including ADHD by harming dopaminergic nerve conduction in the first days of life in genetically vulnerable individuals (19). In an imaging study conducted with adolescents who had a history of preterm delivery and who were diagnosed with ADHD, increased number of empty dopamin receptors was related with decreased brain blood flow in the neonatal period and disrupted attention functions in adolescence (20). Insufficient supply of necessary metabolites including oxygen or glucose to the central nervous system (CNS)

which is being developed in the neonatal period may affect development in the long-term. It has been proposed that the number of empty dopamin receptors increases (for the aim of balancing) secondary to decreased amount of dopamin in the synaptic space due to metabolic insufficiencies (21). Decreased amount of dopamin in the synaptic space and increased number of empty dopamin receptors may be a common and related pathophysiology which may be present both in ADHD and in the brain of the preterm baby.

In addition to neuropsychiatric disorders, the presence of increased risk of cardiovascular diseases and type 2 diabetes in the adulthood is also known in children with a history of prematurity. Two main assumptions have been discussed in the literature while examining the pathophysiology of the diseases with increased frequency on a backgound of prematurity. According to the first assumption which is named biopsychosocial assumption, preterm delivery contibutes to development of morbidity as a risk factor alone or by combining with other risk factors including genetic predisposition, challenging life experiences and similar risk factors (22). According to another assumption which is also knows as fetal origin or Barker's assumption, preterm delivery is an indication of insufficient intrauterine conditions which are not appropriate for growth and development. The fetus makes changes which lead to deviation from normal development in the physiological development, but help in adaptation in order to survive under inappropriate intrauterine conditions. Although this physiological adaptation provides survivial of the fetus in the early period, these changes render the individual vulnerable to other threats in the advanced periods. In this case, the effects of preterm delivery may stay concealed until the individual confronts certain states which will challange adaptation. However, the treshold of stress or challenging required for any disease to occur is lower compared to individuals with a history of term delivery (23).

Preterm deliveries increase each year in the world and in our country, mortality rates decrease and the number of children with a history of preterm delivery encountered in clinics gradually increases. Since the pre-school period is important in terms of detection of ADHD and prevention of academical, social and familial problems which may be experienced in the school period by performing psychosocial interventions in the early period, answering the question of over which variables preterm delivery which is defined as a risk in the etiology of ADHD is a more significant factor will be directive in the follow-up of children with a history of preterm delivery.

Conflict of interest: None declared.

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