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Original Article

Childhood sleep disorders in premature infants that hospitalized in neonatal intensive care unit in neonatal period

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Abstract

Aim: Children requiring intensive care in the neonatal period have more fine motor injuries, learning difficulties, eating disorders and sleeping problems. Sleep disorder rate is about 10-30% in children who had no problem in newborn period. We aimed to investigate the rate of sleep disorder in children who were hospitalized in the neonatal intensive care unit during the neonatal period.

Material and Methods: Fourty-six patients hospitalized in neonatal intensive care unit and still followed in outpatient policlinic at Çukurova University were enrolled in to the study. Children's Sleep Habits Questionnaire was performed to evaluate sleep resistance, delay in fall into sleep, duration of sleep, sleep anxiety, parasomnia, midnight awakening and daily sleepiness.

Results: Children were 6.64±1.18 years old. They were healthy and had no neurological sequela. None of the parents complained about sleep disorders. However, 20 of the 46 (43.47%) children had sleep disorder (Sleep disorder group). Twenty-six children had no sleep disorder (No sleep disorder group). There isn't any statistically difference between the groups that terms of gestational age, birth weight, ventilator support, gender (p>0.05).

Conclusion: Although there isn't any significant difference between groups, sleep disorder rate is higher compared to normal population's rates reported in the previous studies. Infants discharged from neonatal intensive care unit should be under evaluation also for sleep disorder.

Keywords: Hospitalized newborn babies; sleep disorder; early childhood; premature

INTRODUCTION

Active perinatal care increases survival of preterm infants; however, improved survival might be associated with increased disability among survivors. In neonatal period, babies requiring intensive care have more fine-motor injuries, learning difficulties and sleeping problems in their future life. Late-period morbidities may arise in a period extending to the school age.

Sleep is an absolute need for human life and includes both physiological and mental developmental processes. Sleep is not only a resting state, it is also known as a brain development state in which neurotransmitters specific to each sleep stage are heavily released, affecting brain maturation (1-3). During sleep many maturational events occur for development. Adequate, productive sleep is one of the most important determinants of psychosocial adjustment in childhood. Importantly, a broad set of evidence suggests that children with sleep disorders are at higher risk for behavioral and emotional problems (4).

Failure to fall asleep and waking up at night are the most common sleep problems in young children; it affects about 20% of children aged 13 and about 10% of children aged 4-5 (5,6). Sleep maturation in infancy period may affect the maturation of the central nervous system, general functioning, future cognitive and motor development. School-age children have a high sleep requirement of around 9-11 hours per night, while sleep problems are common with a prevalence of around 30% (7).

In this study, the aim is to evaluate sleep disorders in preschool-school aged children who were hospitalized during newborn period.

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MATERIAL and METHODS

Patients aged 5-9 years who were hospitalized in the NICU of Çukurova University in the newborn period that the reasons for hospitalization included: respiratory distress, transient tachypnea of the newborn, pneumonia, pneumothorax, prolonged ruptured membranes, premature ruptured membranes, premature infants, and urinary tract infections and are still being followed up in neonatology and general pediatric outpatient clinics were included in the study. Hospital data for newborn period was reviewed and actual systemic physical and neurological examinations were done by specialists in Paediatric Psychiatrists and Paediatrics. Children's Sleep Habits Questionnaire reported by Owen et al at 2000 was performed to evaluate sleep resistance, delay in fall into sleep, duration of sleep, sleep anxiety, parasomnia, midnight awakening, and daily sleepiness (8). A total score of 41 was considered as sleep disorder. DSM IV-based diagnostic screening and rating scale were performed by the same paediatric psychiatrist.

Infants with congenital problems associated with neurological or developmental problems (such as Down Syndrome, congenital hydrocephalus, or microcephaly), congenital heart defects and who had general anaesthesia before 5-9 years of age were excluded. Written informed consent was obtained from the parents for the study. This study was approved by the institutional ethics committee (Conference Number:49/ Decision Number:9, 09 Jan 2016).

Statistical analysis

Statistical analysis was performed by SPSS 18.0 software package for Windows. Chi-square test was used to compare groups for categorical variables and continuous variables were compared using the t-test for normally distributed variables and the Mann-Whitney U test were used for non-normal distributed continuous data. Categorical measures were done as numbers and percentages, numeric measures were done as mean and standard deviation (median and minimum-maximum if necessary). Group comparisons of these variables were done using the Kruskal Wallis test for non-normal distributed variables. A p-value less or equal to 0.05 was accepted as statistically significant.

RESULTS

There were 46 pre-school aged children meeting inclusion criteria, who were hospitalized in NICU and followed for 5-9 years in the outpatient clinic of Neonatology, were enrolled into study. They were 6.64±1.18 years old age. Neurological examination of them was normal. None of the families complained about sleep disorder of their children. Twenty of the 46 (43.47%) children had 44.2±3.35 (min-max; 41-52) score and were grouped as Sleep disorder group; and 26 children (56.52%) has a score 36.73±1.97 (min-max; 33-40) and grouped as No Sleep Disorder group. The gender and the mean age at the study time were not different between groups. There were no statistical differences between groups in patient birth characteristics such as birth weight, head circumference, gestational age (p=0.187, 0.250, 0.238 respectively) (Table 1). Nine (45%) infants in Sleep Disorder group were smaller than 1500 gr at birth while eight (30.7%) infants were smaller than 1500 gr at No Sleep Disorder group (p>0.05).

Table 1. Birth characteristics of patients of with and without sleep disorder groups

	Sleep disorder group n= 20 mean ± SD median (Min - Max)	No Sleep Disorder group n = 26 mean ± SD median (Min - Max)	p
Birth weight (gr)	1739.00 ± 767.55 2000 800-3650	2161.53 ± 1021.78 2200 780-4460	0.187
Head circumference at birth (cm)	29.95 ± 3.63 32 (26-38)	30.88 ± 3.11 33 (26-37)	0.250
Gestational age (week)	32.0 ± 3.5 34 27-40	33.65 ± 4.0 34 26-41	0.238

There was no statistically significant difference between 1st and 5th minute APGAR scores between the group with and without sleep disorder (p= 0.078, 0.146 respectively) (Table 2).

There was no statistically significant difference between the duration of hospitalization in NICU, follow-up time in ventilator and nutritional status of patients between the group with and without sleep disorder (Table 3).

Table 2. APGAR scores of patients with and without sleep disorder groups

	Sleep disorder group n= 20 mean ± SD median (Min - Max)	No Sleep Disorder group n = 26 mean ± SD median (Min - Max)	p
APGAR 1st min	5.5 ± 2.03 6 (2-8)	6.5 ± 1.8 7 (1-9)	0.078
APGAR 5th min	7.55 ± 1.6 8 (5-10)	8.2 ± 1.2 8 (5-10)	0.146

Table 3. Duration of hospitalization in NICU, follow-up time in ventilator and nutritional status of patients

	Sleep disorder group n= 20 mean ± SD median (Min - Max)	No Sleep Disorder group n = 26 mean ± SD median (Min - Max)	p
Duration of ventilator (days)	9.29 ± 8.9 9 2-31	11.08 ± 10.49 10 2-38	0.650
Duration of hospitalization (days)	25.05 ± 19.4 20 2-76	24.12 ± 23.55 22 2-73	0.520
Start of enteral feeding (days)	4.65 ± 5.18 2 (1-18)	3.07 ± 3.0 3 (1-13)	0.379
Full enteral feeding time (days)	11.6 ± 11.91 9 (1-50)	15.6 ± 18.40 6 (1-70)	0.798

Seventeen (85%) of the 20 patients in the sleep disorder group were premature, while 17 (65,3%) of 26 patients in the no sleep disorder group were premature. While in 13 (65%) patients in the sleep disorder group and 12 (46,1%) patients in the no sleep disorder group was needed resuscitation after birth. It was observed that 14 (70%) patients in sleep disorder group and 13 (50%) patients in no sleep disorder group received mechanical ventilator support in neonatal intensive care unit. The distribution of patient characteristics among the groups is summarized in Table 4.

Table 4. Distribution of characteristics of patients within groups

	Sleep disorder group n= 20 n (%)	No Sleep Disorder group n = 26 n (%)	p
Prematurity	17 (85%)	17 (65.3%)	0.183
Resuscitation at birth	13 (65%)	12 (46.1%)	0.244
Ventilator support	14 (70%)	13 (50%)	0.141
Intraventricular haemorrhage	6 (75%)	2 (7.1%)	0.062
Sepsis in neonatal period	8 (40%)	9 (34.61%)	0.765

DISCUSSION

As neonatal care evolves, there is a constant need for up-to-date estimates of short- and long-term outcomes of infants to provide treatment guidelines and parental counselling. Infant regulation problems, such as excessive crying, feeding and / or sleep difficulties, are the precursors of negative development. However, the etiology of these regulation problems is still unclear (9). This study aimed to evaluate pre-school and school age sleep disorders in children who were hospitalized during the newborn period.

In general, healthy children who borned very preterm are at higher risk for lower mental health including emotional problems (e.g., anxiety and depression) and behavioural problems (e.g., attention problems) (10,11). In addition, the prevalence of mood disorders in childhood and adolescence has increased up to three times in these very preterm children (12).

Homeostatic, cardio-respiratory, neurological, psychological problems and disruption of the circadian rhythm cause sleep disturbance in children (13). The physical and psychological effects of these problems on the patient; treatment processes and coping mechanisms on all these problems affect sleep (13,14). Also the causes of sleep disorders in children were determined to be hunger, nausea, vomiting, frequent toileting, nightmares, fatigue, pain, medication, hospitalization and hospital noise and light (13,15-17).

We could not find any statistical difference concerning morbidities of the newborns, including prematurity, intraventricular haemorrhage, ventilator duration, resuscitation and sepsis, between sleep disorder group and no sleep disorder group. The sleep disorder incidence is higher most probably due to the small sample size. One of the reasons for the decrease in psychosocial adjustment of preterm children is permanent changes in sleep regulation (18,19). In our study sleep disorder group had more premature infants (85%) but this was not statistically significant, that might because of small sample size of the study. Sleep disorder group had more infants with <1500 gr birth weight than No Sleep Disorder group, which is not statistically significant.

Clinicians who deal with behavioral and emotional problems of preterm children in childhood underline the importance of proper sleep quality. Holditch-Davis and et al (20) found that the duration of mechanical ventilation had minor effects on developmental patterns of sleeping and waking. In our study, patients were followed up in ventilator with conventional modes and there were no patients followed in HFOV mode. Ventilator support and duration of ventilation were not different between Sleep and No Sleep Disorder groups.

The present study indicates that children who had ventilator support at the neonatal period were not at higher risk for sleep during middle childhood. But our study had small sample sizes and did not model developmental patterns of sleep statistically.

Parents of children with developmental complexity may also have difficulty limiting appropriate sleeping habits (eg normal bed hours / waking times, falling asleep without the presence of parents) and inappropriate behavior (21). None of the infants in our study had abnormal neurologic finding in examination.

Parents of the infants in our study did not have any complain about sleep of their children. Unlike adults, children rarely complain of bad sleep or seek treatment on their own. In other cases, children's sleep problems may be the result of serious medical problems that can be successfully treated (22). The most striking part of this study is that none of the parents were aware of the sleep problems of the children.

The potential limitations of our study were small sample size, not including all patients who were hospitalized and the use of Children's Sleep Habits Questionnaire instead of full laboratory-based polysomnography.

CONCLUSION

In conclusion, the etiology of sleep problems is still unclear. Perinatal and postnatal experiences shape the development of lifelong health problems, including mental health and sleep. There is much evidence that preterm children are at higher risk for poor sleep and psychosocial disorders. Although the parents mostly do not notice any problem, we have to search for sleep problems in routine polyclinic follow-ups.

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