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# STUDY OF COMMON CAUSES OF SEIZURE IN NEONATES HOSPITALIZED IN ABUZAR HOSPITAL, AHVAZ DURING FIRST HALF OF 2020

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## Abstract

**Introduction:** Seizures are one of the most common causes of neurological dysfunction in infants, which increases the risk in the first month of life. It is often associated with an increased risk of death and tragic consequences, including cerebral palsy, mental disorders and epilepsy. At present, the epidemiology of seizures in infants is not well understood and the incidence of seizures has been reported in very different countries. In some studies in Iran, the most common cause of seizures in hospitalized infants were HIE as well as idiopathic causes. The aim of this study was to determine the etiology of seizures in neonates admitted to the NICU of Abuzar Hospital in Ahvaz.

**Materials and methods:** A retrospective descriptive cross-sectional study was performed on neonates admitted to the intensive care unit and neonatal ward of Abuzar Hospital in Ahvaz in 2009 for a period of 6 months starting from January 1, 2017. Sampling was done by census and the sample size included all cases of seizures in infants under 28 days of hospitalization in Abuzar Hospital during the study period. The file information was removed from the system, then the files were studied and reviewed.

**Results:** The most common etiology of seizures in this group of patients was hypoxic-ischemic encephalopathy with 33.3% of all hospitalized cases, followed by electrolyte disorders (22.9%) and central nervous system infections (20.8%). Most of the neonates enrolled in the study were full-term neonates. The mortality rate was relatively high (33.3% of patients). A significant proportion of children were from consanguineous marriages (47%), which was much higher among patients with structural brain damage (80%). Antibiotic resistance was reported in 4 of the 7 bacteria (57.14%) present in the samples. These included *Escherichia coli* resistance to cefixime, ampicillin, ceftriaxone, nalidixic acid, and gentamicin, and staphylococcal coagulase-negative resistance to ciprofloxacin, gentamicin, cefazolin, oxacillin, and cotrimoxazole. Blood transfusions were required in 35 patients in this study (72.91%). In the seven mothers in this study, there was an underlying disease. Of these, 5 mothers had gestational diabetes, three had preeclampsia (6.25%), one had hypothyroidism, and one mother reported smoking regularly.

**Conclusion:** Neonatal seizures in infants admitted to the NICU is a dangerous event with a very unfavorable prognosis. The seizures appear to be more common in the first week of infancy, occurring more often in boys than in girls, and also appear to have a worse prognosis in preterm infants than in term infants. Given that some studies have described neonatal seizures as an event that can occur without significant clinical symptoms, Video It seems that the use of Video-EEG for this center and in all centers that provide NICU care services More accurate diagnosis is necessary. Using this method can also more accurately diagnose the type of seizures that occur in infants, which is effective on the prognosis and, of course, treatment. The knowledge of infant health care providers should also be re-examined.

**Keywords:** Neonates, Children, Iran, Khuzestan, Neonatal intensive care, Seizures, Encephalopathy, Frequency

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## Introduction

Seizures are one of the most common causes of neurological dysfunction in infants, the risk of which increases in the first month of life (1-4). It is often associated with an increased risk of death and tragic consequences, including cerebral palsy, mental disorders, and epilepsy (1, 3). Seizures are known as sudden brain disorders that manifest as behavioral and autonomic activities as well as abnormal movements (5). The neonatal nervous system is anatomically and functionally immature. Although the developmental process of the nervous system, including myelination after birth, increases during the neonatal period, several pathophysiological mechanisms negatively affect the neonatal brain development and development during this period; including hypoxia, ischemia, infections and maternal factors. Neonatal brain also has high levels of synaptogenesis and neuroplasticity, which explains the physiological hypersensitivity and consequently vulnerability to seizures. (6-8).

The epidemiology of neonatal seizures is not well understood and seizures are reported differently in different countries, ranging from 1.8 to 5 per 1,000 live births in the United States (9) to 39.5 out of every 1,000 live births in Kenya are different. Worldwide, one in 5.3 babies per 1,000 live births will have seizures (10, 11).

The most common cause of seizures in infants is hypoxic-ischemic encephalopathy, which accounts for 50% of cases (1). HIE is any brain injury caused by cerebral insufficiency and inadequate oxygen transfer (12). In some studies in Iran, the most common cause of seizures in hospitalized infants was HIE as well as idiopathic causes (13-16). In one study in Iran, the prevalence of neonatal seizures was 7.6%, the most common cause of which was sepsis (17). The higher incidence of neonatal seizures in developing countries may be due to the higher prevalence of neonatal sepsis (9).

Seizures in infants are an emergency condition and prompt diagnosis and treatment are necessary because any delay in treatment leads to long-term disability and negative neurological outcomes (13). Although seizures are a common problem in hospitalized infants, few studies have examined the causes of

seizures. On the other hand, diagnosing the cause of seizures is essential for proper and timely treatment and helps determine the risk of mortality and morbidity. Therefore, the aim of this study was to determine the etiology of seizures in neonates admitted to the NICU of Abuzar Hospital in Ahvaz.

## Methods & Materials

This retrospective cross-sectional descriptive study was performed on neonates admitted to the intensive care unit and neonatal ward of Abuzar Hospital in Ahvaz in the first half of 2020.

This study was performed after approval by the Research Council of Ahvaz Jundishapur University of Medical Sciences and receiving the code of medical ethics in the Medical Ethics Committee of Ahvaz Jundishapur University of Medical Sciences. Also, in all stages of the research, the provisions of the Helsinki Declaration on Research Ethics and the principles of patient information confidentiality were observed. Sampling was done by census and the sample size includes all cases of seizures in infants under 28 days of hospitalization in Abuzar Hospital in Ahvaz in 6 months starting from January 1<sup>st</sup>. In this study, after obtaining the necessary permits, the files of all neonates admitted to the hospital during the study period were isolated using the hospital information system of Abuzar Hospital. Data on infants under 28 days of age were then extracted from the system. In this study, infants who were hospitalized before the start of the period were not included in the study. In the next step, the file information of patients who were hospitalized with seizures during the study period was extracted. To complete the study and to avoid possible cases, the case information of each patient who was treated with anticonvulsant drugs - including phenytoin, oxcarbazepine, phenobarbital, levetiracetam, clonazepam - was extracted and compared with the patient list and studied.

## Results

During the study period, 523 patients were hospitalized and their files were reviewed. Of these, 90 (17.2%) patients were eligible for inclusion in the study, of which 42 patients were excluded from the study due to age above the inclusion criteria (more than 28 days). The remaining files (48 people; 9.1%) were

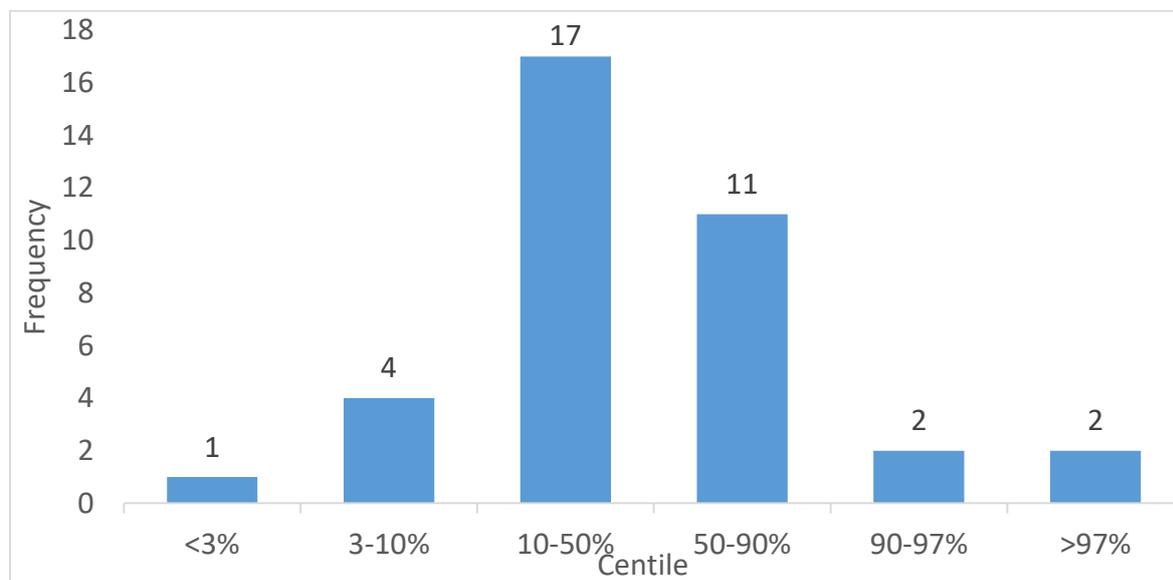
isolated and carefully studied. Of these, 33 patients (68.8%) were male and 15 patients (31.3%) were female. The minimum age of infants was 0 days (day of birth) and the maximum age was 28 days. The mean age was  $6.40 \pm 8.165$ . Of these, 9 (25%) were preterm and 27 (75%) were term. There was no data in the file from the gestational age of 12 infants (dispatched from other centers).

**Table 1: shows patient information at baseline**

variable		Number	%
Sex	Boy	33	8/68
	Girl	15	3/31
Gestational Age	Preterm	9	25
	Term	27	75
Clinical signs at	Respiratory Distress	22	8/45

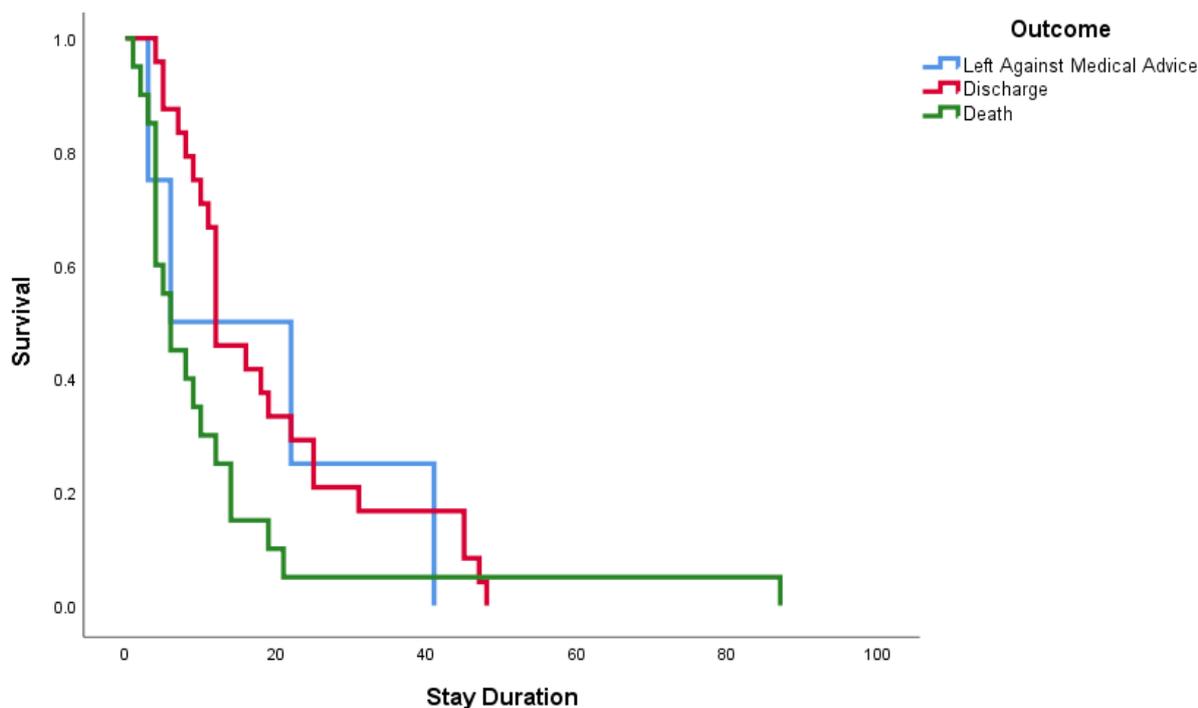
presentation	Poor Feeding	14	2/29
	Cyanosis	11	9/22
	Asphyxia	10	8/2
	Sepsis	16	3/33
	Convulsion	6	5/12
	Poor Apgar Score	14	2/29

Most hospitalizations were in the first week (75.8% of boys and 60% of girls; 70.8% in total) and relatively few visits occurred in the second week of life (24.2% of boys, 40% of girls; Total 2/29%). The mean age at the time of seizures was 5.48 (standard deviation 6.975) in term neonates and 4.78 (standard deviation 6.685) in preterm infants. The mean weight of convulsive infants was  $3021.25 \pm 647.192$  g. Because the age of the children was different, the weight percentile was calculated.



A total of 48 patients in this study were hospitalized for an average of  $16.02 \pm 16.539$  days with a minimum hospital stay of 1 and a maximum of 87 days. Also, these neonates were admitted to the ICU for an average of  $11.38 \pm 14.371$  days. Death generally

happened sooner in the course of hospitalization ( $11.85 \pm 18.545$ ) compared to discharge ( $19.17 \pm 14.1616$ ). Fig 2 compares the course of hospitalization based on outcome.



HIE was the most common cause of Seizure (33.3%), followed by Electrolyte disturbance (22.9%), CNS Infection (20.8%), Sepsis (12.5%) and Brain Malformations (10.4%). Death was highly prevalent in the population, with 41.6% of cases resulting in death. Brain Malformations had the poorest outcome with 60% resulting in death, followed by Electrolyte disturbances (45.5%), HIE (43.75%), CNS infection (40%) and Sepsis (16.6%).

Familial Marriages were common in this population, with 47.05% of the patients being offsprings of familial marriages. This was mostly seen in patients with Brain Malformations (80%), followed by CNS Infection (57%), Electrolyte disturbances and HIE (37.5%) and sepsis (33.3%).

In this study, 9 neonates (18.75%) had neonatal jaundice, 38 blood cultures were performed and the result was reported that 7 cases (18.42%) were positive. Staphylococcus coagulase negative was reported in three cases (42.85%), Klebsiella in one case, Moraxella in one case, Streptococcus hemolytic bread in one case and a combination of several bacteria in one case. 24 cases of urine culture were performed and the result was reported, of which 4 cases (16.7%) were reported positive. Two cases of staph coagulase were negative, one case of Enterobacter and one case of Escherichia coli were reported. Blood

transfusions were required in 35 patients in this study (72.91%).

Antibiotic resistance was reported in 4 of the 7 bacteria (57.14%) present in the samples. These included Escherichia coli resistance to cefixime, ampicillin, ceftriaxone, nalidixic acid, and gentamicin, and staph coagulase-negative resistance to ciprofloxacin, gentamicin, ceftazidime, oxacillin, and cotrimoxazole.

In seven mothers, there was an underlying disease. Of these, 5 mothers had gestational diabetes, three had preeclampsia (6.25%), one had hypothyroidism, and one mother reported smoking regularly.

## Discussion

The aim of this study was to investigate the causes and frequency of seizures in a six-month period in Abuzar Hospital, a pediatric subspecialty hospital in southwestern Iran, Khuzestan and Ahvaz. Abuzar Hospital is a tertiary center that provides services to patients throughout Khuzestan and provinces such as Ilam, Chaharmahal and Bakhtiari, Kohgiluyeh and Boyer-Ahmad.

In our study, seizures occurred in 9.1% of children admitted to ICU. This finding was similar to the finding of Abbaskhanian et al. (2014) who reported a seizure incidence of 12.4% in children admitted to the NICU (16).

Most seizures occurred in the first week (70.8%), most neonates who had seizures were term (75%) and most (59.46%) were below the 50 percent weight percent at birth. The number of boys was more than girls (68.8% vs. 31.3%). The mean age at onset of seizures was 5.48 (standard deviation 6.975) in term neonates and 4.78 (standard deviation 6.685) in preterm infants, and seizures occurred earlier in preterm infants, although this the difference did not reach statistically significant limits. These findings were similar to those of Abbaskhanian et al. (16).

In this study, it was shown that the most common cause of seizures in this population is hypoxic-ischemic encephalopathy (with 33.33%), followed by electrolyte disorders (22.92%), CNS infections, sepsis and structural damage, respectively. The brain (including intracranial and intraventricular hemorrhages as well as congenital malformations) was 20.83%, 12.50% and 10.42%, respectively. In our study, the prognosis for seizures in preterm infants was worse than in term infants, with seizures in preterm infants causing two-thirds (66.7%) of infant deaths, compared with only one-third in term infants was 33.3%.

In our study, the average hospital stay at NICU for patients was about 11 days and the average hospital stay was 16 days. 13.8% of mothers were over 35 years old and 8.33% were under 20 years old. In this study, preeclampsia occurred in five patients (25 6.25), which is similar to previous studies (18-20).

Nearly three out of four patients in this study required a blood transfusion. Although this study examined a specific population of patients, this finding is still important and requires the preparation and coordination of the intensive care unit and blood transfusion to act in an emergency.

In this study, more than 50% of the positive samples showed antibiotic resistance. In addition to the risk of this finding for antibiotic treatment to be ineffective in the not-too-distant future, this finding also highlights the importance of proper disinfection of the NICU environment to prevent further spread and transmission of these resistant strains. It seems that the preparation and implementation of antibiotic care instructions should be on the agenda as soon as possible.

Because in this case the type of seizure is not seen first hand by the treating physician in many cases and the video of each seizure episode is not available, it is questionable to judge the type of seizure that occurred. Also, the knowledge of students, residents, nurses and other health care providers about the types of seizures in this age group should be re-evaluated because the type of seizure affects the type of treatment and prognosis of patients.

Another major limitation of this study was the absence of EEG in the records of any of the patients. In some cases, EEGs were requested but the results and interpretation were not written in any part of the file. Given the role of the EEG in confirming the diagnosis, the absence of this data could affect the findings of this study.

In this study, the number of cases in which the mother's gestational age information was not available was very high (25% of cases) and all of these cases were sent from other centers. Given the importance of this information and the need to have it in the file in this population, which is a sensitive population, and given that it does not seem to require a lot of money to solve, trying to solve this problem can be a priority.

## Conclusion

Neonatal seizures in infants admitted to the NICU is a dangerous event with a very unfavorable prognosis. The seizures appear to be more common in the first week of infancy, occurring more often in boys than in girls, and also appear to have a worse prognosis in preterm infants than in term infants. Given that some studies have described neonatal seizures as an event that can occur without significant clinical symptoms, Video It seems that the use of Video-EEG for this center and in all centers that provide NICU care services More accurate diagnosis is necessary. Using this method can also more accurately diagnose the type of seizures that occur in infants, which is effective on the prognosis and, of course, treatment. The knowledge of infant health care providers should also be re-examined.

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