

# Evaluation of cases with impaired state of consciousness: Gaziantep Children's Hospital experience

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**SUMMARY:** Yiş U, Yüksel ÇN, Köse A, Erdoğan S. Evaluation of cases with impaired state of consciousness: Gaziantep Children's Hospital experience. Turk J Pediatr 2012; 54: 30-34.

The aim of this study was to characterize the etiology, course and prognosis in children admitted to a pediatric intensive care unit (PICU) of Gaziantep Children's Hospital for impaired state of consciousness. Three hundred and eighty cases were evaluated. Convulsions (44%; n=170) were the leading cause of the impaired state of consciousness followed by poisonings, envenomation, infection, metabolic disease, electrical injury, hepatic encephalopathy, intracranial hemorrhage, brain tumor, and drowning. The diagnosis was definite in 95% (n=359) and probable in 5% (n=21) of cases. Twenty-seven (7%) patients died with impaired state of consciousness. We suggest that defining the causes of impaired state of consciousness in a specific region will help physicians to evaluate the patients faster and in a more systemic manner. Since most of the causes seem to be preventable, appropriate education programs and policies should be provided for improving sanitation and socioeconomic conditions.

*Key words:* consciousness, intensive care unit, child.

Impaired state of consciousness in children is one of the difficult topics of pediatric neurology and pediatric emergency medicine with respect to the clinical approach, diagnosis and treatment. Since potential diagnoses are diverse, clinicians have to evaluate patients in a fast systemic manner in order to prevent irreversible brain damage. First, airway, breathing and circulation of the patient must be controlled in order to maintain vital functions. Once the patient is stabilized, laboratory evaluations should be planned for specific treatment. The causes of impaired state of consciousness in children vary among different countries, and even among different regions of the same country. Defining the causes of impaired state of consciousness in a specific region will provide opportunities for preventive medicine. The aim of this study was to present the clinical features and prognosis of patients admitted to Gaziantep Children's Hospital pediatric intensive care unit (PICU) for impaired state of consciousness.

## Material and Methods

Gaziantep Children's Hospital is a reference government hospital in the southeast region

of Turkey. It is a 400-bed hospital with 540,000 patient visits and 109,000 patient admissions each year. The PICU of the hospital is the greatest PICU in southeast Turkey, with approximately 1,000 admissions per year. Pediatricians experienced in pediatric intensive care decide regarding admission to the ICU. It is a "closed" ICU in which the intensive care specialist takes the senior role and the patient's primary doctor acts as a consultant. Impaired consciousness is a fairly common reason for admission to the medical intensive unit in our hospital. Every child with impaired state of consciousness is evaluated by a child neurologist. We retrospectively examined the clinical characteristics and prognosis of patients with impaired state of consciousness who were admitted between January 2009 and 2010. The Glasgow Coma Scale (GCS) was used to assess the level of consciousness at admission, and we defined an impaired state of consciousness as a score of <15 on the GCS. We excluded patients with incomplete data and head injury. Video electroencephalography was applied to the cases who had prolonged encephalopathy after the seizure activity to

exclude nonconvulsive status epilepticus. The reference diagnosis was considered definite when the final diagnosis could be considered with appropriate diagnostic methods. The final diagnosis was defined as probable when investigations were inadequate (example, suspected metabolic disease not confirmed with detailed metabolic investigations). Frequencies, mean, median, and standard deviations were calculated by using the 11.0 version of the Statistical Package for the Social Sciences.

## Results

Between January 2009 and 2010, a total of 1009 patients were admitted to the PICU. Thirty-seven percent of cases (n=380) were admitted for impaired state of consciousness. The mean age of the patients was  $5.64 \pm 4.11$  (1-18) years, and 62% (n=235) of cases were boys.

Of the 380 cases, 170 had convulsions (44%), 89 (24%) poisoning, 35 (9%) scorpion, snake or insect envenomation, 33 (8.5%) infection, 20 (6%) metabolic disease, 12 (3%) electrical injury, 9 (2%) hepatic encephalopathy, 5 (1.5%) intracranial hemorrhage, and 5 (1.5%) brain tumor; 2 (0.5%) had drowned (Fig. 1).

Of the 170 cases with convulsion, 82 (48%) had febrile and 88 (52%) afebrile convulsion. Clinical characteristics of convulsions are summarized in Table I.

The reasons for impaired state of consciousness in convulsions were ongoing seizure activity (39%; n=66), respiratory depression due to seizure (30%; n=51), respiratory depression due to benzodiazepines that were applied at home, during transport or at admission to the emergency department (23%; n=40), and

prolonged postictal period (8%; n=13). Of 51 cases with epilepsy, 35% (n=18) of them were mentally retarded, and these patients were receiving more than one antiepileptic drug. Of the 32 cases presenting with first afebrile seizure, 53% (n=17) of them had an underlying abnormality. Among the cases with an underlying abnormality, 5 (30%) had hydrocephalus, 5 (30%) metabolic disease, 3 (16%) intracranial hemorrhage, 2 (12%) central nervous system developmental anomaly, and 2 (12%) hypoxic ischemic encephalopathy. The remaining (47%; n=15) cases were diagnosed as epilepsy based on electroencephalographic and brain magnetic resonance imaging findings. None of the cases had nonconvulsive status epilepticus.

The causes of acute poisonings resulting in impaired state of consciousness were drugs (66%; n=59) and insecticides (18%; n=16). In 16% (n=14) of cases, a cause could not be identified. Among drugs, analgesic-antipyretics were the most common, followed by antidepressant, antiepileptic and antipsychotic drugs.

Scorpion, snake and insect envenomation was the cause of impaired state of consciousness in 9% of cases. Eleven (30%) of these cases had varying degrees of left ventricular dysfunction and vascular collapse.

Meningoencephalitis (58%; n=19) and sepsis (42%; n=14) were the causes of the impaired state of consciousness in cases with infection. Of the cases with meningoencephalitis, 4 (21%) of them had tuberculosis meningitis.

Of the cases with metabolic disease, 5 (25%) of them had Leigh disease, 5 (25%) had medium chain acyl-CoA dehydrogenase deficiency, 2 (10%) had organic acidemia, and 1 (5%) had urea cycle disorder. In 7 (35%) cases, basic laboratory examinations pointed to a metabolic disease, but a definite diagnosis could not be made.

The diagnosis was definite in 95% (n=359) and probable in 5% (n=21) of cases. Twenty-seven (7%) patients died with impaired state of consciousness. Clinical characteristics of the exitus patients are summarized in Table II.

## Discussion

Any injury or illness that affects the cerebral cortex and the ascending reticular

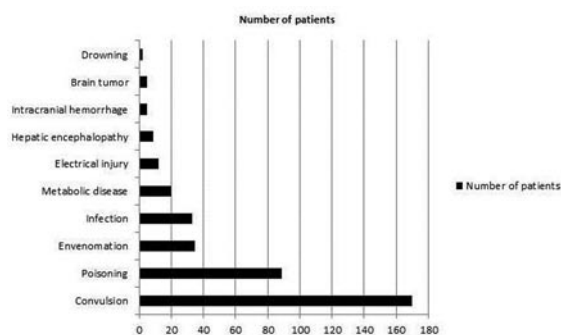


Figure 1. Distribution of cases with impaired state of consciousness.

**Table I.** Clinical Characteristics of the Patients Presenting with Convulsions

First simple febrile seizure (36%)	Epilepsy (58%)
Complicated febrile seizure (30%)	First afebrile seizure (36%)
Recurrent febrile seizure (28%)	Status epilepticus (6%)
Febrile status (6%)	

activating system can cause coma or altered consciousness<sup>1</sup>. López Pisón et al.<sup>2</sup> described the relative frequency of neurological diagnosis as a reason for admission of children to a PICU. Similarly, in our study, 37% of total admissions were due to impaired state of consciousness. Convulsions were the leading cause of impaired state of consciousness. Ongoing seizure activity, prolonged postictal period, respiratory depression due to the seizure itself, and benzodiazepine treatment were responsible for altered consciousness in seizures. Epileptic patients with mental retardation who are receiving multiple antiepileptic drugs should be carefully evaluated in the emergency department because these patients need special care with more need of a PICU. Approximately 2-5% of people experience an afebrile seizure, and most of these patients are 15 years or younger. There are multiple causes of seizure, and new-onset epilepsy is the most common. One in six patients who present with a single seizure will have an identifiable potential cause. There is no standardized algorithm for evaluation of every patient with a first seizure<sup>3-5</sup>. A careful history and physical examination should determine imaging and laboratory testing decisions. There has been no study evaluating the final diagnosis of children with a first seizure admitted to a PICU. In our study, more than half of the patients had an underlying metabolic or structural brain abnormality. The remaining patients were diagnosed as epilepsy. These findings suggest that every child with a first afebrile seizure who is admitted to a PICU

should be evaluated in detail before discharge from the hospital.

Poisoning in children is an important cause of morbidity and mortality. Poisonings account for 2% of the accidental deaths in developed countries and for 5% in developing countries<sup>6</sup>. It has been estimated that 150,000 poisoning accidents occur yearly in Turkey<sup>7</sup>. The most important factor in poisoning accidents is the consumption of drugs, followed by cleaning agents and insecticides/pesticides, respectively<sup>8</sup>. Analgesics and antipyretics are the most common in drug poisonings<sup>9</sup>. Similarly, in our study, drugs, especially analgesics and antipyretics, were the most common cause of poisonings. It is suggested that increasing usage in daily life and improper storage within the reach of the children are the responsible factors for childhood poisonings.

Scorpion, snake and insect envenomation are one of the most common causes of pediatric emergency admissions during summer in the south and southeastern regions of Turkey. Snake bite is the most common, followed by scorpion and bee bite<sup>10</sup>. In our study, scorpion bite was the most common, and most of these cases had left ventricular system dysfunction. Hypertension, myocardial dysfunction, acute pulmonary edema, and tachycardia are cardiac manifestations of severe scorpion envenomation<sup>11</sup>. Bosnak et al.<sup>12</sup> showed that 38.5% of cases with scorpion envenomation required admission to the PICU. Children with scorpion envenomation should be admitted to the hospital as soon as possible and closely monitored for cardiac complications.

**Table II.** Clinical Characteristics of the Patients Who Died

Clinical characteristics	Number of patients (n=27)	Subgroup of the diagnosis
Infection	17 (63%)	11 (64%) diagnosed with sepsis
Hepatic encephalopathy	4 (15%)	All of them were due to hepatitis A infection
Metabolic disease	4 (15%)	Definite diagnosis could not be established in these cases
Drowning	2 (7%)	Drowning in a lake

Bacterial and viral infections of the central nervous system may cause alteration in consciousness by direct involvement of the brain parenchyma, interference with blood flow, production of cerebral edema with resulting increased intracranial pressure, and increasing metabolic activity<sup>13</sup>. The onset of symptoms in sepsis is explosive and characterized by hemodynamic instability and mental changes. Mental changes in sepsis include irritability, delirium, coma, asterixis, tremor, and multifocal myoclonus. Multiple organ failure frequently accompanies sepsis<sup>14</sup>. Our study showed that meningoencephalitis and sepsis are important causes of impaired state of consciousness. The mortality rate was highest in this group, and more than half of the cases died. Sepsis was the leading cause of mortality because these patients had multiorgan failure besides central nervous system involvement. This study also showed that tuberculous meningitis is still an important problem in Turkey. One patient was at stage two and others were at stage three at admission. Two of them died and the other two survived with significant morbidity.

Most of the inherited metabolic disorders present in the newborn period and inborn errors presenting in childhood include disorders of pyruvate metabolism, respiratory chain disorders, glycogen storage diseases, primary carnitine deficiency, hemizygotes for ornithine transcarbamylase deficiency, and heterozygotes for carbamyl phosphate synthase deficiency<sup>14</sup>. Our results were consistent with these findings because half of the cases with metabolic disorder presented with a disorder of energy metabolism. Cases with urea cycle disorder and organic acidemia were younger than 12 months. We could not make a definite diagnosis in 35% of cases with a metabolic disorder. The transport of clinical samples including frozen urine, cerebrospinal fluid and muscle biopsy is difficult, and most of these samples putrefy during transport. The incidence of consanguinity and number of children in a family are high in the southeast region of Turkey, and there may be recurrent losses due to an unidentified metabolic disease. We suggest that experts in metabolic disorder and comprehensive metabolic laboratories are needed in the southeastern region of Turkey.

Electrical injury, hepatic encephalopathy, intracranial hemorrhage, brain tumors, and

drowning were other causes of impaired state of consciousness. Hepatic encephalopathy resulted from hepatitis A infection in seven of eight cases. Four of seven children with hepatic encephalopathy due to hepatitis A infection died. Improving the sanitation and hepatitis A vaccination may prevent deaths due to hepatitis A infection.

In conclusion, impaired state of consciousness is an important cause of admissions to PICUs. Convulsions are the leading cause of impaired state of consciousness. Defining the causes in a specific region will help practitioners and pediatricians to evaluate the patients more easily. Most causes seem to be preventable, including electrical burns, drowning, envenomation, poisonings, and hepatic encephalopathy due to hepatitis A infection. Improving sanitation and increasing the economic status and education level may prevent most of these etiological factors.

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