

# Non-traumatic Coma in Children in South-East of Iran

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Received: October 31, 2014; Revised: November 21, 2014; Accepted: November 25, 2014

**Background:** Non-traumatic coma is a common condition in children that may cause considerable morbidity and mortality. Determining the most common causes of loss of consciousness in any specific region, and any sex and age group will dramatically reduce mortality and morbidity.

**Objectives:** The purpose of this study was to evaluate the most common causes of non-traumatic coma among children in south east of Iran.

**Patients and Methods:** All children (aged 1 month to 15 years) hospitalized for non-traumatic coma were included in this study. All of the patients received clinical measures such as history, physical, and neurological examinations. Glasgow coma scale (GCS) was used to determine the level of consciousness and paraclinical examinations, including CBC with differential, blood biochemistry, urine analysis, and liver function tests were performed on all patients. In case of indication, blood and urine culture, brain CT (Computed Tomography) scan or brain MRI (Magnetic Resonance Imaging), lumbar puncture, metabolic study, EEG (electroencephalogram), and so forth were carried out. Finally, the data were analyzed and the most common causes of loss of consciousness were determined.

**Results:** Among the 123 children under investigation, 76 cases were male (61.8%) and 47 females (38.2%) with the mean age of  $3.2 \pm 0.64$  years. The most common causes of loss of consciousness among children were as follows: toxic causes in 61 patients (49.6%), infectious causes in 30 patients (24.4%), metabolic causes in 11 patients (8.9%), structural brain abnormalities in 4 patients (3.3%) and seizure in 7 children (5.7%). Moreover, 10 patients (8.1%) had other causes of loss of consciousness.

**Conclusions:** Toxic causes with an incidence of 49.6% were the most common cause of loss of consciousness among all age groups.

**Keywords:** Coma; Non-traumatic; Child

## 1. Background

Coma is a neurological emergency in children, with possibly unpleasant consequences (1). There are multiple etiologies of coma, but they are usually divided into two major groups, namely traumatic and non-traumatic. They are mostly handled and treated by neurosurgeons and neurologists, respectively (2). Most epidemiological studies of coma in children have focused on traumatic coma (3-6). Non-traumatic coma in children is a common cause of admission in pediatric emergency department and carries a high morbidity and mortality (7-10). Changes in consciousness level in a number of diseases are due to pathologic processes in the central nervous system. Pediatric Glasgow coma scale (GCS) used to assess the mental state of child patients (Table 1). It is considered coma when the score is less than 12 for more than 6 hours (10, 11). Many children with loss of consciousness will eventually achieve complete neurological recovery. But depending on the cause of coma, a considerable number of children end in morbidity or mortality (11-14). These children need to be hospitalized in the intensive care unit. Coma may be a non-specific manifestation of different diseases and thus identifica-

tion of the causes of loss of consciousness can be helpful in prognosis of patients who are in coma (13).

## 2. Objectives

Adopting different methods for recognizing the causes of non-traumatic coma within different regions, age and sex groups, and eventually on-time and appropriate treatment of those etiologies would be helpful in reduction of complications and mortality rates. The purpose of this study was to assess the most common causes of non-traumatic coma in children.

## 3. Patients and Methods

In this cross-sectional descriptive study, all patients (age range, 1 month to 15 years) hospitalized in Ali ebne Abitaleb Hospital for loss of consciousness were studied (no randomization of patients was performed). Patients died before reaching hospital, children with developmental delays or cerebral palsy, patients with post-traumatic disorders of consciousness, and the patients with previous history of consciousness loss, presented to hospital for

**Table 1.** Pediatric Glasgow Coma Scale <sup>a</sup>

Pediatric Glasgow Coma Scale						
	1	2	3	4	5	6
<b>Eyes</b>	Does not open eyes	Opens eyes in response to painful stimuli	Opens eyes in response to speech	Opens eyes spontaneously	N/A	N/A
<b>Verbal</b>	No verbal response	Inconsolable, agitated	Inconsistently inconsolable, moaning	Cries but consolable, inappropriate interactions	Smiles, orients to sounds, follows objects, interacts	N/A
<b>Motor</b>	No motor response	Extension to pain (decerebrate response)	Abnormal flexion to pain for an infant (decorticate response)	Infant withdraws from pain	Infant withdraws from touch	Infant moves spontaneously or purposefully

<sup>a</sup> Abbreviations: N/A: not applicable.

**Table 2.** Etiologies of Non-Traumatic Coma According to Different Age Groups (n = 123) <sup>a</sup>

Etiology	Seizure	Metabolic	Toxic	Infectious	Structural	Others	P Value
<b>Age groups</b>							0.091
1 month- 5 years	4 (3.3)	4 (3.3)	43 (34.9)	25 (20.3)	2 (1.6)	7 (5.7)	
6-10 Years	2 (1.6)	5 (4.0)	6 (4.9)	3 (2.5)	2 (1.6)	1 (0.8)	
11-15 Years	1 (0.8)	2 (1.6)	12 (9.8)	2 (1.6)	0 (0.0)	2 (1.6)	
<b>Total</b>	7 (5.7)	11 (8.9)	61 (49.6)	30 (24.4)	4 (3.3)	10 (8.1)	

<sup>a</sup> Data are presented as No. (%).

**Table 3.** Etiologies of Non-traumatic Coma According to Sex Group (n = 123) <sup>a</sup>

Etiology	Seizure	Metabolic	Toxic	Infectious	Structural	Others	P value
<b>Sex Group</b>							0.012
Male	4 (3.3)	6 (4.9)	35 (28.5)	17 (13.8)	4 (3.3)	10 (8.1)	
Female	3 (2.4)	5 (4.0)	26 (21.1)	13 (10.6)	0 (0.0)	0 (0.0)	
<b>Total</b>	7 (5.7)	11 (8.9)	61 (49.6)	30 (24.4)	4 (3.3)	10 (8.1)	

<sup>a</sup> Data are presented as No. (%).

deterioration of consciousness level, were excluded from the study. For all patients, after considering ABC (airway, breathing, circulation) stages and vital signs, the previous history and full physical examination, especially neurological examination with evaluation of the level of consciousness using GCS were evaluated. Patients with GCS < 12 are considered to be in a coma. Paraclinical measures including CBC with differential, blood chemistry, urine analysis, liver and renal function tests were carried out for all patients. The blood and urine culture, brain CT scan or MRI, LP (in patients with normal brain CT scan), metabolic examinations, electroencephalography (EEG) and so forth were done regarding to the condition of each patient. Finally, with respect to the findings from the history, clinical examinations, and paraclinical information, the cause of loss of consciousness was determined. Information forms of all patients were completed and their demographical information including age and gender, previous disease history, physical examination, paraclinical measures, and the most likely cause for the loss of consciousness

were recorded in those forms as the final diagnosis. In this study, coma etiology was categorized in one of the subcategories including infectious, toxic and metabolic causes, seizure, structural disorders of the brain, and other causes. In this study, coma refers to the loss of consciousness level to the CGS below 12. A written informed consent was obtained from each patient's parents in this study. The collected information was coded and analyzed using SPSS 16. Descriptive statistics expressed as mean and standard deviation. A chi-square test was used to examine the association between categorical variables between two or more groups. P < 0.05 was considered statistically significance.

#### 4. Results

In this cross-sectional descriptive study, a number of 123 children with non-traumatic coma fulfilled the study criteria. Among them, 76 cases (61.8%) were male and 47 (38.2%) were female with the mean age of 3.2 ± 0.64 years. The subjects included 85 children (69.1%) aged from 1

month to 5 years, 16 children (15.5%) aged from 6 years to 10 years, and 16 children (15.4%) aged from 10 to 15 years. The most common causes of non-traumatic coma were as follows: toxic causes in 61 patients (49.6%), infectious causes in 30 patients (24.4%), metabolic causes in 11 patients (8.9%), structural abnormality of the brain in 4 patients (3.3%) and seizure in 7 children (5.7%). Other causes accounted for 8.1% of the subjects (10 patients) including electric shock (4 cases), drowning (2 cases), and CNS (central nervous system) hemorrhage (4 cases). Tables 2 and 3 demonstrate the causes of age and gender-based non-traumatic coma.

Moreover, toxic causes including poisoning with methadone, opium, benzodiazepines, tricyclic antidepressant, carbon monoxide, and organophosphates were the most common causes for loss of consciousness in the 1-5-year age group. Infectious causes including meningitis, encephalitis, ADEM, and meningoencephalitis with 25 cases were the second-ranked most common causes for the loss of consciousness. Other causes including electric shock, drowning, and CNS hemorrhage with 7 cases were the third most common causes for loss of consciousness. Structural causes including brain tumors including astrocytoma and glioma accounted for only 2 cases. In the 6-10-year age group, toxic causes was also the most common ones for loss of consciousness, which were followed by metabolic, infectious, seizure, and structural causes. Furthermore, in the 11-15-year-old age group, toxic causes were the most common causes of the loss of consciousness, followed by infectious, metabolic, seizure disorders, and other causes. No patient with structural causes was within this age group.

## 5. Discussion

Non-traumatic coma in children is an important emergency case with different etiologies (15). It is a common manifestation in childhood diseases, accounting for about 10-15% of hospital admissions (16). In this study, considering the importance of the loss of consciousness level and the high mortality and morbidity due to this kind of coma in children, the immediate diagnosis, appropriate treatment, prediction of the expected clinical changes, and identification of the agents causing the loss of consciousness in specific age and sex groups were evaluated. Therefore, by obtaining information about the frequency of the causes of loss of consciousness level in children, in addition to on-time diagnosis, proper treatment for full recovery and preventing the more serious complications was also necessary.

In the present study, there was no significant correlation between the causes of loss of consciousness in different sex and age groups. However, there was no significant difference in etiology of loss of consciousness with respect to the gender (2, 13). In the 1 month to 5 year-old-age group, toxic causes including poisoning with methadone, opium, benzodiazepines, tricyclic antidepressant, carbon monoxide, and organophosphates

were the most common causes for loss of consciousness. In the age group of 6-10 years, toxic causes was also the most common ones for loss of consciousness, which were followed by metabolic, infectious, seizure, and CNS structural causes. In the 11-15 years age group, toxic causes were also the most common causes for loss of consciousness. No patient with structural causes was in this age group. In general, the most common cause for loss of consciousness was toxic one in all age groups (49.6%). In the present study, the toxic (24.4%) and metabolic (8.9%) causes held the second and third ranks.

In a study in Tehran, the most common causes for loss of consciousness were infectious ones mostly in children below 2 years old. Poisoning was mostly happened in 2-6-year-old age group, demonstrating the lack of consistency with our study, where the toxic causes were the most common ones (10). In another study in India, CNS infections were reported as the most common cause of coma. These findings were inconsistent with those of our study (14). In a study in Saudi Arabia, the most common causes for coma in 91 admitted children were trauma, followed by infections. In addition, the mortality rate was higher in non-traumatic coma (1). In a study in Pakistan, the most common causes of non-traumatic coma in 100 children below 14 years old was infectious ones including bacterial meningitis, cerebral malaria, viral encephalitis, tuberculous meningitis. In addition, the most common causes of mortality were infectious ones, too. The next common causes of coma were metabolic ones, poisoning, and epilepsy (16). In a retrospective study in Nigeria, the most common causes of non-traumatic coma in 40 children were infectious ones, mostly by cerebral malaria (17). In another study, the most common causes of non-traumatic coma in 100 children were metabolic ones, followed by central nervous system infections and cerebral hemorrhage. In addition, 50% of these children died in emergency ward (18). In another study, the causes of coma in 104 children aged 2 months to 13 years were meningoencephalitis, epilepsy, toxic-metabolic and intracranial hypertension, respectively (19). In the present study, toxic causes including poisoning with methadone and opium were the major causes of loss of consciousness. With respect to the loss of consciousness level and also availability of drugs in some families, poisoning with drugs should be specifically taken into consideration in initial evaluation of the children with loss of consciousness. In sum, based on the results of the present study and similar investigations throughout the world, it can be concluded that non-traumatic causes of coma in every geographic area differ from other regions. Therefore, the physicians in every region should be familiar with the common causes of non-traumatic coma in that geographical region, its diagnosis measures, and proper treatment.

## Acknowledgements

We would like to express our deep appreciation to the

personnel of Pediatric Emergency Department, Pediatric Ward, and Pediatric Intensive Care Unit of Ali ebne Abitalleb Hospital (Zahedan, Iran) for their cooperation.

### Authors' Contributions

Ali Khajeh: study concepts and design, literature search; Ghasem Miri-Aliabad: clinical studies, data acquisition and analysis, statistical analysis and manuscript preparation. Afshin Fayyazi: manuscript editing and review.

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