

OUTCOME AND ETIOLOGY OF NON TRAUMATIC COMA IN INTENSIVE CARE UNIT CHILDREN

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Abstract: The objective of this study was to analyze the clinical signs, outcomes, and causes of non-traumatic coma (NTC) in the pediatric ICU. The study was conducted retrospectively in the pediatric ICU of Nishtar Medical Hospital, Multan, from January 2021 to January 2022. The study included 140 children aged between 1 month and 14 years who were admitted to the ICU. The presenting symptoms were categorized as organ-specific, central nervous system (CNS), and non-CNS related. The causes of NTC were classified as infectious, metabolic, epilepsy, accidents, intoxication, shunt dysfunction, and others. The outcome was assessed based on the neurological state of the patients at the time of discharge or death. The results showed that out of the 140 patients, 57 (40.7%) were under two years old, 56 (40%) were between 2-6 years, and 27 (19.2%) were between 6-14 years. The children under two years old had higher systemic manifestations compared to other age groups. The most common causes of NTC were infections (32.1%) and epilepsy (28.5%). Congenital etiology and infections were significantly higher in children under two years compared to other groups, while intoxications and accidents were more common in children aged between 2-6 years. Epilepsy was more common in children over six years. Out of the 140 patients, 120 survived and 20 died. Among the 120 surviving patients, 8 had mild disability, 15 had moderate disability, 17 had severe disability, and 80 were normal at the time of discharge from the PICU. Mortality and etiology were significantly associated. In conclusion, infectious etiology is the most common cause of NTC. Infections and accidents are associated with the highest mortality rate. Children below two years have major systemic presentations at the time of PICU admission.

Keywords: Non traumatic coma, Pediatrics, Neurological dysfunction

Introduction

Non-traumatic coma (NTC) is associated with significant morbidity and mortality in children. According to the Glasgow Coma Score (GCS), episodes can be for < 12 or for > 6 hours (Duyu et al., 2021; Korhonen et al., 2023). Acute illness in children leads to a partial loss of consciousness as pathological processes can affect the central nervous system. The majority of the children fully recover neurologically. However, depending on different etiological factors, non-traumatic coma may cause significant morbidity in pediatric children (Mejiozem et al., 2022; Teoh et al., 2021). Non-traumatic coma accounts for about 10 to 15% of hospital admissions in pediatric practice and puts the burden on intensive care units (Śmigiel et al., 2020).

It is important to diagnose and distinguish between non traumatic and traumatic coma correctly. In the pediatric setting, it is challenging to determine the cause and etiology of coma; however, it is vital for appropriate management. The patient's clinical status and etiology of coma are predictors of the prognosis (Nijar, 2022). Though structural and non-structural causes may overlap, acute physiological dysfunction of brain and destructive structural brain lesion (brain stem or cerebral hemisphere) should be distinguished through specific investigations for proper patient management (Cervera Castellano, 2022).

Many studies have been conducted on traumatic coma in children (Egbohohou et al., 2019; Sarnaik et al., 2018). Most studies on NTC have focused on specific etiologies like virus-associated encephalitis, posterior reversible encephalopathy, and super refractory convulsive status

epilepticus (Fisler et al., 2020; Lu et al., 2018). There are limited studies on the presentation and outcome of NTC. Thus, this study aims to evaluate clinical signs, outcomes, and etiology of NTC in pediatric ICUs.

Methodology

The retrospective study was conducted in the pediatric ICU of Nishtar Medical Hospital, Multan, from January 2021 to January 2022. Children aged from 1 month to 14 years admitted to ICU were included in the study. Children who were in a coma due to trauma or malignancy were excluded. A total of 140 children were included. An ethical review committee of the hospital approved the study.

Coma was defined as a GSC of < 12 for more than 6 hours. In children aged below five years, modified GCS was used. The nursing staff and physicians routinely checked GSC. Clinical data, medical history, presenting symptoms, and laboratory data of the patients were collected, and based on this collected data, etiology was determined. Showing signs were classified as organ-specific, CNS-related, and non-CNS-related. Etiology was classified as infectious, metabolic, epilepsy, accidents, intoxication, shunt dysfunction, and others (hypertensive encephalopathy, vasculitis, acute disseminated encephalomyelitis). The neurological state assessed the outcome at the time of discharge or death.

All children underwent neurological examination, including sensory and peripheral motor neurological assessment and examination of cerebellar function. The outcome was classified into normal, mild disability (grade 4 ataxia, mild



change in tone, isolated cranial nerve palsy, deep tendon reflexes), moderate disability (grade 3 ataxia, different cranial nerves involved) and severe disability (<grade 3 ataxia, vegetative state, tetraplegia). SPSS version 23.0 was used for data analysis. Descriptive data was presented as mean and standard deviation. Categorical data was presented as frequency and percentages.

Results

The mean age of the participants was 2.48±2.45 years. There were 60 (42.8%) boys and 80 (57.1%) girls. 57 (40.7%) patients were under two years old, 56 (40%) between 2-6 years, and 27 (19.2%) between 6-14 years. Clinical presentation at the time of PICU admission is shown in Table I. Systemic manifestations were significantly higher in children < 2 years old than in other age groups. Most

common causes of NTC were infection (32.1%) and epilepsy (28.5%). Other causes were metabolic (6.4%), intoxication (7.1%), accidents (5.7%), and shunt dysfunction secondary to congenital brain (4.2%). Congenital etiology and infection were significantly higher in children < 2 years compared to other groups, while intoxications and accidents were more common in children aged between 2-6 years. Epilepsy was more common in children > 6 years (Table II). Of 140 patients, 120 survived, and 20 died. Of 120, 8 had mild disability, 15 had moderate disability, 17 had severe disability, and 80 were expected at the time of discharge from PICU. Mortality and etiology were significantly associated. Infections and accidents had substantially higher mortality than other groups. The mortality rate in children < 2 years, between 2-6 years, and 6-14 years was 24.5%, 10.5% and 14.8% respectively (Figure 1).

Table I Clinical manifestations upon presentation

Manifestation	No (%)
CNS related	
Seizure	47(33.5)
Headache	5 (3.5)
Irritability	6 (4.2)
Behavioral change	2 (1.4)
Systemic	
Nausea and vomiting	22 (15.7)
Fever	20 (14.2)
Lethargy	8 (5.7)
Poor feeding	3 (2.1)
Poor weight gain	2 (1.4)
Organ-specific	
Respiratory tract Infection	8(5.7)
Gastrointestinal Infection	6 (4.2)
Rash	4 (2.8)

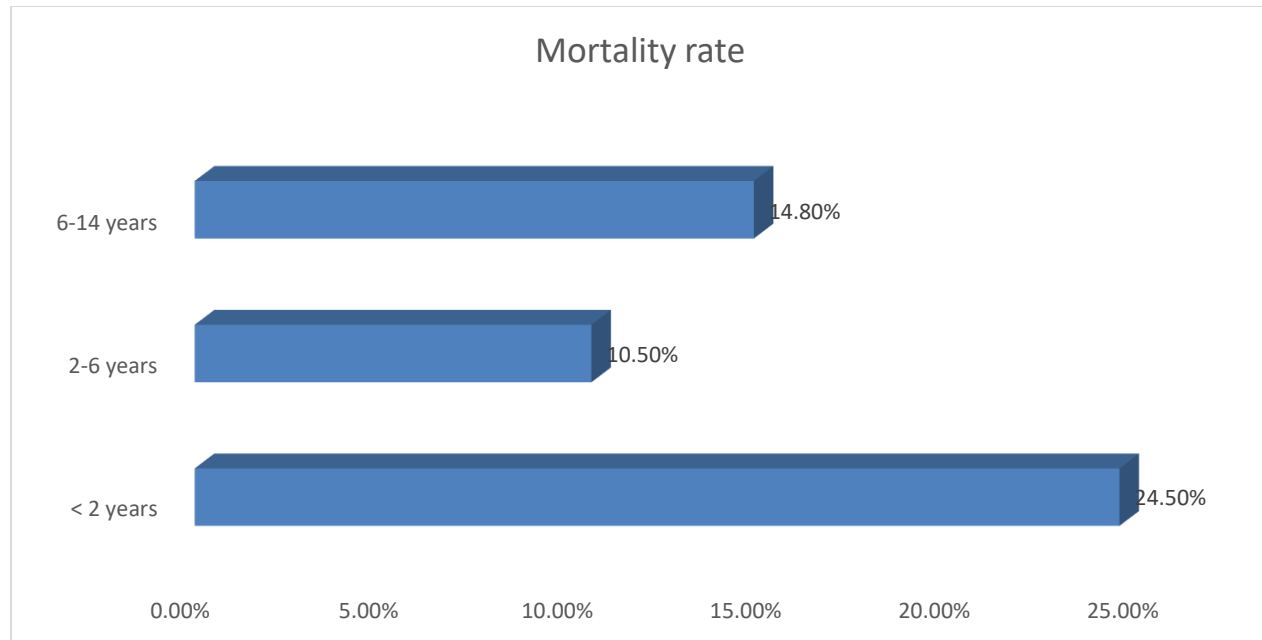


Figure 1: Mortality rate in different age groups:

Table II Etiology of NTC in different age groups

Age group	Infection	Epilepsy	Metabolic	Intoxication	Accidents	Congenital	Others
<2	50.8%	7.0%	5.2%	5.2%	1.7%	10.5%	14.0%
2-6	30.3%	17.8%	3.5%	12.5%	14.2%	5.3%	3.5%
6.1-14	22.2%	25.9%	7.4%	3.7%	3.7%	3.7%	14.8%

Discussion

Coma is the result of the conditions which cause bilateral cerebral cortical dysfunction. The etiology of coma in children can be categorized into metabolic or toxic, structural and inflammatory or infectious. In the current study, the most common cause of NTC was infections. Previous studies have also confirmed that infection is a significant etiology of NTC (Biswas et al., 2021; Venkateshwar, 2020). The second most common cause was epilepsy, accounting for one-third of all cases. These findings were similar to a previous study's results (Resor and Kutt, 2020). In the current study, 4 of 10 children with metabolic etiology had diabetic ketoacidosis, and 4 had a born disorder of metabolism. Clinicians are of the view that NTC in children can be the presentation of a previously undiagnosed inborn disorder of metabolism. Systematic symptoms (poor weight gain, poor feeding, lethargy, fever, nausea, and vomiting) were more common in children < 2 years old. This is consistent with the findings of other studies (Nijar, 2022; Schmidt et al., 2021). The mortality rate of 14.2%, as reported in our study, was lower than previous studies, which reported 25% (Baseer et al., 2022) and 34% (Biswas et al., 2021) mortality. Though the mortality rate in these studies was higher than ours, it was significantly lower than the adult mortality rate of 60% (Shafiee et al., 2022).

In the current study, there was no association between gender and outcome and incidence of NTC. The previous study also reported no significant difference in the incidence of NTC between both sexes (Ayşe et al., 2020). However, another study said that male children had a higher mortality rate compared to females (Balaji et al., 2019). In our study, children < 2 years had higher mortality compared to other groups, and infections and accidents were associated with the highest mortality rate. A study reported that infectious etiology followed by intoxication had the most increased mortality (Candefjord et al., 2020). Of 120 survivors, 80 had normal outcomes, while others had some degree of disability. A previous study reported that one-third of the survivors are standard, similar to our research findings (Mateso et al., 2023).

Due to its retrospective nature, we could not provide information on adaptive and cognitive outcomes in survivors. A study showed that NTC in children may result in significant cognitive dysfunction and that younger brains are more vulnerable to cognitive malfunction after brain injury. Pediatric NTC is a critical health concern that demands intensive care resources. It has a diverse etiological basis and poses a diagnostic challenge. It is essential to understand its causes and outcomes for appropriate management.

Conclusion

Infectious etiology is the most common cause of NTC. Infections and accidents are associated with the highest

mortality rate. Children below two years have major systemic presentations at the time of PICU admission.

Declarations

Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate.

Approved by the department Concerned.

Consent for publication

Approved

Funding

Not applicable

Conflict of interest

The authors declared an absence of conflict of interest.

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