NON-TRAUMATIC COMA- INCIDENCE, AETIOLOGY AND OUTCOME

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ABSTRACT

BACKGROUND

Acute non-traumatic coma is one of the most common paediatric emergencies, which arouses much anxiety and apprehension in both parents and physicians. Due to heterogeneity of causes in these patients, prediction of outcome is difficult and unfortunately no single clinical, laboratory or electrophysiological parameters singly predict their outcome. Aetiology of non-traumatic coma varies depending on different geographical area. We have attempted to find the incidence, aetiology and outcome and delineate neurological signs to predict the prognosis in this study.

The aim of this study is to study the incidence, aetiology and outcome of non-traumatic coma in children.

MATERIALS AND METHODS

100 consecutive cases of non-traumatic coma between 5months and 15 years of age were selected for the study. Clinical signs and findings were recorded at admission ('0' Hr) and after '48' Hrs. of hospital stay. Aetiology of coma is determined on the basis of clinical history, examination and relevant laboratory investigations by the treating physician. These children were followed up till the death in the hospital or discharged from the hospital. Discharged patients were asked for followup after 4 weeks. During this period, all of them were evaluated by formal neurological examination and for special sensory involvement. The neurological outcomes were categorised into 6 groups (I-VI) based on the severity of neurological involvement. Chi-square test was applied to determine the predictors of outcome.

RESULTS

1. The incidence of non-traumatic coma in our hospital based study was 8.02% of all paediatric admissions and 21.64% of all PICU admissions.
2. CNS infections contributed the majority (58%) of cases. (Dengue encephalitis-28%, viral encephalitis-12%, TB meningitis-8%, pyogenic meningitis- 6%, Shigella encephalopathy-3% and cerebral malaria-1%).
3. Other non-infectious aetiologies were toxic and metabolic group- 21%, post status epilepticus- 9%, intracranial bleed-5% and others contributed-7% of cases. Survival was significantly better in CNS infections group (77.6%) as compared to those with toxic and metabolic causes (57.1%) and intracranial bleed (40%).
4. Low MGCS Score (3-5) was associated with high mortality and survival was better with increasing MGCS score ($p<0.001$).

CONCLUSION

Neuroinfections contribute majority of cases of non-traumatic coma in children followed by toxic metabolic group. The overall outcome of CNS infections was significantly better than toxic/metabolic group and among survivors most of them improved with intact neurological outcome. Clinical variables and MGCS score remain the most readily available tools for assessment of non-traumatic coma and also help in prediction of outcome.

KEYWORDS

Non-Traumatic Coma, MGCS, Morbidity, Meningitis, Encephalitis.

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BACKGROUND

In the era of improved resuscitation and supportive systems, one of the commonest problems faced by paediatricians is the assessment of a patient in comatose state. Assessment in ER and PICU is a real challenge, as most of the times history is unclear and clinical signs are often masked by previous treatment. These factors prompted the need to systematically study the clinical profile of comatose patients in hospitals.

Impaired, reduced or absent conscious behaviour implies the presence of severe brain dysfunction and demands an urgent attention from the physician if potential recovery is expected. Stupor and coma mean advanced brain failure and longer such brain failure lasts the

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narrower becomes the margin between recovery and the development of permanent neurological invalidism.[1]

Acute non-traumatic coma account for 10% -15% of all hospital admissions[2] and is associated with significant mortality. NTC can result from a wide range of primary aetiologies.[3] Neuroinfections contribute majority of causes of NTC.[3-6] Neurological outcome in comatose children is a concern to both parents and physicians,[4] which may range from absence of impairment to severe disability and death which mostly depend on the clinical status at the time of presentation.[7]

NTC is a paediatric emergency and there is always an urgency to determine the underlying disease process, the direction in which it is evolving and to protect the brain against more serious or irreversible damage.

MATERIALS AND METHODS

This study was aimed at knowing the incidence and aetiology of non-traumatic coma and knowing the outcome of patients in relation to aetiology of coma.

It was one-year prospective observational study in medical college hospital providing tertiary level care. Study group comprised of consecutive 100 children with non-traumatic coma, between the age group of 5 months and 15 years admitted in PICU. The study was approved by hospital ethical committee and a well-informed consent was obtained from parents/guardians of the children who were included in the study.

Exclusion Criteria

1. Children < 5 months and >15 years of age.
2. Children with neurodevelopmental delay.
3. Any other known pre-existing neurological illness.
4. Children with traumatic coma.
5. Parent who did not give consent for the study.

After initial stabilisation, demographic details, detailed history, clinical examination, MGCS were recorded in a predesigned proforma at admission (at '0' Hrs.). Relevant investigations were done for the arrival of proper diagnosis as per clinical suspicion. All the admitted patients underwent a serial clinical examination as per the standard protocol. Clinical variables recorded were vital signs, coma severity scoring (MGCS), pupils, brain stem reflexes at 4 Hourly interval till the time of discharge or death of the patient. Aetiology of coma was identified based on history, clinical signs and appropriate laboratory tests such as CSF analysis, CT/MRI, EEG, metabolic tests which were asked by the treating physician. Aetiologies were classified into infectious, toxic and metabolic, post status epilepsy, hypoxic ischaemia, intracranial bleed and others.

The course of the illness in the hospital is noted and all the discharged children were asked for followup after 4 weeks. During followup, they were assessed by formal clinical neurological examination. Screening for visual and auditory defects were performed by suitable methods if any suspicion of special sensory involvement was noted and the findings were recorded. The outcome of non-traumatic coma is allocated into 6 categories based on the severity of neurological impairment (Cat-I to Cat-VI).

Category	Neurological Status
I (Intact)	Normal or no change from premorbid functioning seizures, if recorded 100% controlled.
II (Mild)	Minimal alternation of tone, power or reflexes; isolated cranial nerve palsies; mild (MRC 4) weakness or ataxia. Seizures, if present, >75% controlled.
III (Moderate)	Moderate (MRC 3) weakness or ataxia; multiple cranial nerve involvement. Seizures, if present, >50% controlled.
IV (Severe)	Severe weakness (<MRC 3) or ataxia; tetraparesis. Uncontrolled seizures.
V (Profound)	Persistent vegetative state
VI (Death)	Death

Statistics- All the data from the standardised study forms were entered in the computer database for analysis using SSPS software. Age, sex, aetiology, physical signs, MGCS were included for statistical analysis to know the association with outcome by applying Chi-square test.

RESULTS

A total of 100 consecutive children with non-traumatic coma (57 boys and 43 girls) were included in this one year prospective study. The average incidence of non-traumatic coma was 8.02% of total paediatric admissions and 21.84% of all PICU admissions. Table 1 and 2 indicate the age wise and sex wise distribution of non-traumatic coma.

Age	Total	Survived	Died
<1 Yr.	11	8 (72.2%)	3 (27.3%)
1-5 Yrs.	42	29 (69%)	13 (31%)
6-10Yrs.	31	21 (67.7%)	10 (32.3%)
11-15 Yrs.	16	12 (75%)	4 (25%)
x^2=0.32,P (0.96) NS			
Table 1. Age Wise Distribution of NTC			

Sex	Total	Survived	Died
Male	57	38 (66.7%)	19 (33.3%)
female	43	32 (74.4%)	11 (25.6%)
x^2=0.70,P (0.40) NS			
Table 2. Sex Wise Distribution of NTC			

Sl. No.	Symptoms	No. of Cases	%
1	Altered sensorium	100	100
2	Convulsions	89	89
3	Fever	76	76
4	Irritability	67	67
5	Headache	66	66
6	Skin rashes	54	54
7	Nausea/vomiting	46	46
8	Lethargy	29	29
9	Shortness breath	16	16
10	Poor feeding	14	14
11	Behavioural	14	14
12	Sore throat	09	09
13	Photophobia	08	08
14	Others	23	23
Table 3. Presenting Complaints			

Sl. No.	Aetiology	Total	Survived	Died
I	**CNS INFECTIONS**	**58**	**45 (77.6%)**	**13 (22.4%)**
	Dengue encephalitis (DE)	28	20 (71.4%)	08 (28.6%)
	Viral encephalitis (VE)	12	09 (75%)	03 (25%)
	Pyogenic meningitis (PM)	06	05 (83.3)	01 (16.7%)
	TB meningitis (TBM)	08	07 (87.5%)	01 (12.5%)
	Cerebral malaria (CM)	01	01 (100%)	00
	Shigella encephalopathy (Sh E)	03	03 (100%)	00
II	**TOXIC AND METABOLIC**	**21**	**12 (57.1%)**	**09 (42.9%)**
	Hepatic encephalopathy	09	12 (57.1%)	05 (55.6%)
	Hypoxic encephalopathy	01	01 (100%)	00
	DKA	02	02 (100%)	00
	Poisoning	04	01 (25%)	03 (75%)
	Snake bite	02	02 (100%)	00
	IEM	03	02 (66.7%)	01 (33.3%)
III	**POST STATUS EPILEPSY**	**09**	**06 (66.7%)**	**03 (33.3%)**
IV	**INTRACRANIAL BLEED**	**05**	**02 (40%)**	**03 (60%)**
V	**OTHERS**	**07**	**05 (71.4%)**	**02 (28.6%)**
	Hypertensive Encephalopathy	03	02 (66.7%)	01 (33.3%)
	ICSOL	02	01 (50%)	01 (50%)
	Submersion Injury	02	02 (100%)	00

Table 4. Aetiology of Coma

Outcome- Mortality was highest among IC bleed (60%). This is followed by toxic/metabolic causes (42.9%). Mortality due to CNS infections constituted 22.4% of all deaths. CNS infections had significantly better survival rate as compared to toxic-metabolic and IC bleed cases. This is consistent with the various other studies. MGCS at admission ('0' Hr) has got strong correlation with the outcome. Lower is the score, higher is the mortality and statistically highly significant (X^2=14.9, P<0.001) (Table5). However, MGCS at "48 Hrs." had relatively less correlation with mortality and was statistically less significant (X^2=5.47, P< 0.05) (Table6).

MGCS	Total	Survived	Died
3-5	44	22 (50%)	22 (50%)
6-8	56	48 (85.7%)	08 (14.3%)
X^2=14.9, P< 0.001			

Table 5. MGCS at '0' Hr and Outcome

MGCS	Total	Survived	Died
3-5	48	25 (65.8%)	22 (50%)
6-8	52	45 (86.5%)	07 (13.5%)
X^2= 5.47, P< 0.05)			

Table 6. MGCS at '48' Hrs. and Outcome

Aetiology	I	II	III	IV	V	VI	Total
CNS Infections	29 (50%)	03 (5.2%)	07 (12.1%)	05 (8.6%)	01 (1.7%)	13 (22.4%)	58 (58%)
Toxic/Metabolic	06 (28.6%)	00	00	03 (14.3%)	03 (14.3%)	09 (33.3%)	21 (21%)
Status Epilepticus	01 (11.1%)	00	01 (11.1%)	04 (44.4%)	00	03 (33.3%)	09 (9%)
IC Bleed	01 (20%)	00	00	01 (20%)	00	03 (60%)	05 (5%)
Others	04 (57.1%)	00	00	01 (14.3%)	00	02 (28.6%)	07 (7%)

Table 7. Aetiology and Overall Outcome

The neurological outcome depends mainly on the aetiology of the non-traumatic coma. Most of the cases (50%) in CNS infection group improved with intact neurological outcome (Category-I) as compared to other groups like toxic/metabolic group, where the intact recovery was 28.6%, status post epilepsy11.1% and IC bleed 20%.

MGCS	Died	Survived	Total
3-5	22	22	44
6-8	08	48	56
Total	30	70	100

Table 8. Predictive Value of MGCS

Sensitivity = 22/30 X 100= 73.3%
Specificity = 48/70 X 100 = 69.7%
Positive predictive value = 22/44 X 100 = 50%
Negative predictive value = 48/56 X 100 = 96%
Diagnostic efficacy = 70/100 = 70%

DISCUSSION

Childhood coma is a non-specific consequence of a variety of serious pathological states. Non-traumatic coma is one of the most common paediatric medical problems in emergency paediatrics. During this hospital based, prospective, observational, one-year study in addition to demographic variables, incidence, aetiology and outcome of non-traumatic coma and MGCS as a prognostic indicator was studied; 100 consecutive cases were selected for the study after considering inclusion and exclusion criteria. The average incidence of non-traumatic coma in the present study was 8.02% of total paediatric admissions and 21.64% of all PICU admissions; 57 were males and 43

were females and male-to-female ratio being 1.32:1. The study showed that the difference in the mortality rates among males and females were statistically not significant (p=0.40). These findings are consistent with other Indian studies.[4] However, another study in Canada[8] had shown a greater mortality among males compared to females. Analyses of age group revealed that majority of cases were between the age group 1 and 5 yrs. (42%). There was no correlation between the age group and mortality (X^2= 0.32, p=0.96). Most common presenting symptoms noted were altered sensorium (100%), convulsions (89%) and fever (76%) followed by irritability (67%), headache (66%) and skin rashes (54%). It was observed that neuro-infections were the commonest causes of non-traumatic coma in children. These findings are consistent with other studies.[4,6,9] However, the type of infection seems to vary in different parts of the world. For example cerebral malaria was common in Africa,[10] whereas Dengue Haemorrhagic Fever was an important cause of coma in South East Asia. In our study, we found that Dengue Fever with encephalitis was the commonest aetiology (28%). The importance of infectious aetiology in children is in sharp contrast to adult hospital based series, where degenerative and cerebrovascular accidents predominate. Among the non-infectious causes toxic and metabolic causes were the commonest and were also comparable in frequency with other studies.[6,9,10] The overall mortality was 30% and was slightly higher as compared to other hospital based study,[6] but was on par with other South East Asian studies.[4,10]The difference in the mortality rates between different age groups was statistically not significant in our study. This finding is in contrast to another study in India,[4]where mortality rate among children under 3 yrs. was significantly higher. Outcome of CNS infections was significantly better than toxic/metabolic group. Among survivors of CNS infections in our study, most of them (50%) improved with intact neurological outcome. In our study, MGCS score recorded at '0' Hr had a significant correlation with the outcome; mortality rate progressively increased with decreasing MGCS score. Score between 3-5 carried higher mortality as compared to score between 6-8, which was statistically highly significant (X^2=14.9, $p < 0.001$). Similar findings were also noted in other study in Chandigarh.[4] The study also emphasises that clinical variables and MGCS score remain the most readily available tools for assessment of non-traumatic coma, to identify those who are likely to die and those having the greatest potential for recovery. This is particularly helpful in resource limited countries like India for directing the limited resources for the maximal benefit.

CONCLUSION

Neuroinfections contribute to majority of case of non-traumatic coma in children followed by toxic metabolic group. The overall outcome of CNS infections was significantly better than toxic/metabolic group and among survivors most of them improved with intact neurological outcome. Clinical variables and MGCS score remain the most readily available tools for assessment of non-traumatic coma and also help in prediction of outcome.

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