

CLINICAL PROFILE OF NONTRAUMATIC COMA IN CHILDREN

Pankaj Vijaykumar Barabde¹, Pratibha Vinay Kale²

¹Assistant Professor, Department of Paediatrics, Dr. Panjabrao Deshmukh Memorial Medical College, Amravati, Maharashtra.

²Associate Professor, Department of Paediatrics, Dr. Panjabrao Deshmukh Memorial Medical College, Amravati, Maharashtra.

ABSTRACT

BACKGROUND

There is an increasing awareness that non traumatic coma is an important source of morbidity and mortality in the paediatric age group. These children make heavy demands on paediatric intensive care unit and neurorehabilitation resources. Coma is recognized to be a nonspecific sign with a wide potential differential diagnosis.

METHODS

This study was carried out over a period of two years in a tertiary care center. First 100 children between 1 month to 12 years old were included. A detailed clinical history was taken in each case. All patients were examined thoroughly, and all possible investigations like haematological, biological, microbiological, CSF, radiological, CT scan, and EEG were performed as and when required. Modified Glasgow coma scale was applied.

RESULTS

In the present study, 100 cases of nontraumatic coma with MGCS score less than 12 for more than 6 hours were studied. More than 50% cases i.e. 54 cases (54%) where of CNS infections while 13 cases (13%) of epilepsy, 18 cases (18%) of metabolic disorders, 7 cases (7%) of hypoxic ischemic encephalopathy and 8 cases (8%) of intoxication were observed. Age wise distribution of nontraumatic coma infants (27%), toddlers (16%), pre-schoolers (29%) and school going (28%) was noted. 44.44% mortality is observed in CNS infections.

CONCLUSIONS

In this study, maximum number of cases of CNS infections were seen in infants. However, epilepsy, metabolic disorders and hypoxia-ischemic encephalopathy were seen in school going, pre-schoolers and infants respectively. In intoxication maximum number of cases were equally distributed in pre-schoolers and school going children. However, CNS infections was the predominant cause of nontraumatic coma in all the groups. Mortality is highest in CNS infections and in infantile age group.

KEYWORDS

Nontraumatic Coma, CNS Infections, Metabolic Disorders, Epilepsy, Hypoxic Ischemic Encephalopathy.

HOW TO CITE THIS ARTICLE: Barabde PV, Kale P. Clinical profile of nontraumatic coma in children. J. Evid. Based Med. Healthc. 2019; 6(23), 1626-1631. DOI: 10.18410/jebmh/2019/328

BACKGROUND

There is an increasing awareness that non-traumatic coma is an important source of morbidity and mortality in the paediatric age range. These children make heavy demands on paediatric intensive care unit and neurorehabilitation resources. Coma is recognized to be nonspecific sign with a wide potential differential diagnosis.¹

Coma in the paediatric patients is a medical emergency and must be dealt with a rapid organized way. Basic life supports, evaluation of history and physical examination are all of paramount importance and evaluation of these three critical areas must proceed simultaneously. Specific diagnosis must be treated appropriately but there are key

general principles to coma management that must be dealt with sequentially.

The most important cause for non-traumatic coma in developing countries is CNS infections.^{2,3,4,5,6} The other common causes are status epilepticus, hepatic encephalopathy, hypoxia and ischemia, various metabolic disorders and intoxications. The age specific incidence of non-traumatic coma is notably higher in 1st year of life. The presenting symptoms are very wide from CNS related to specific to another organ system. CNS specific presentation become commoner with increasing age. In spite of newer advanced modalities of investigations in some patient's aetiology remains unknown. Design of appropriate and efficient protocol of investigations for non-traumatic coma require an understanding of the relative frequencies of the various potential aetiologies. Going through review of literature very few studies were done up till now in India and abroad.

Prognosis of non-traumatic coma in children varies from normal outcome to severe disability or death. The likelihood of death in patients of non-traumatic coma with modified Glasgow coma scale score less than 8 is much higher.^{4,7} In spite of advanced modalities of investigations and

Financial or Other, Competing Interest: None.
Submission 20-05-2019, Peer Review 28-05-2019,
Acceptance 04-06-2019, Published 10-06-2019.

Corresponding Author:

Dr. Pratibha Kale,
#22, Laddha Plot, Near RTO, Camp,
Amravati- 444602, Maharashtra.
E-mail: drpvkale@gmail.com
DOI: 10.18410/jebmh/2019/328



management, morbidity and mortality remain high in non-traumatic coma.

The present study has been undertaken to ascertain the clinical profile of non-traumatic coma in a view to study incidence, aetiology and immediate outcome.

METHODS

The present study was carried out at tertiary care center over a period of two years.

Inclusion Criteria- any child (1 month to 12 years old).

- 1) From paediatric ward /PICU with MGSC score less than 12 for more than 6 hours.
- 2) First 100 patients were included.

The study was conducted in the following manner

- 1) A detailed clinical history was taken in each case.
- 2) All the patients were examined thoroughly including special attention to CNS
- 3) Daily assessment of patient's progress and complications during course of illness monitored
- 4) All the possible investigations like haematological, biological, microbiological, radiological, CSF, CT scan, EEG, were performed as and when required
- 5) Modified Glasgow coma scale score were assessed on admission and repeated in each case after 6 hours, 24 hrs, 48 hrs, 72 hrs and seventh day of admission.
- 6) Management:^{8,9,10,11}
 - a) To normalize the respiration and circulation: the basics of neurological stabilization including the ABC's of resuscitation and maintenance of adequate oxygenation done in every patient. The decision to intubate the trachea and institute mechanical ventilation was determined by the need to control the airway. Circulation was normalized, with the aim of optimizing perfusion to all tissues. If after appropriate fluid resuscitation the patient still has poor perfusion, inotropic agents like dopamine to enhance cardiac output was used. Once the patient's cardiac output was stabilized, modest fluid restriction done to avoid fluid overload and attendant hypervolemia.
 - b) To reduce raised intracranial pressure:¹²
 - Endotracheal intubation and monitoring of the blood gases to ensure appropriate oxygenation and ventilation to keep PaCO₂ at 30-35 mmHg done as and when required.
 - Ventriculostomy has been placed for periodic removal of CSF to reduce ICP.
 - Diuretics like mannitol and furosemide and intravenous steroids were used as and when required.
 - c) To control seizures- injectable diazepam, phenobarbital and phenytoin were used. Continuous intravenous drip of midazolam used in refractory seizures.¹³
 - d) Treatment of infection was done with broad spectrum antibiotics

- e) Initially and after culture reports according to sensitivity pattern.
- f) Correction of acid base and electrolyte imbalance done.
- g) Specific antidotes were used as and when required

Data was collected on 100 printed proformas and later tabulated on computer software.

Modified Glasgow coma scale^{5,7,14} (pain as nail bed pressure with pencil, score best response)

Score	>1 year	<1 year
4	Spontaneously	Spontaneously
3	To verbal command	To shout
2	To pain	To pain
1	No response	No response
Eye Opening		

Score	>1 year	<1 year
6	Obeys	Spontaneous
5	Localizes pain	Localizes pain
4	Flexion withdrawal	Flexion withdrawal
3	Flexion abnormal	Flexion abnormal
2	Extension	Extension
1	No response	No response
Best Motor Response		

Score	>5 years	2-5 years	<2 years
5	Oriented and converses	Appropriate words and phrases	Smiles, cries appropriately
4	Disoriented and converses	Inappropriate words	Cries, consolable
3	Inappropriate words	Persistent cries and smiles	Persistent inappropriate crying or screaming
2	Incomprehensible sounds	Grunts	Grunts, agitated or restless
1	No response	No response	No response
Best Verbal Response			

The minimal MGCS score is 3 and the maximum score is 15. The patient with MGCS score of 8 or less may require aggressive management, including mechanical ventilation and intracranial pressure monitoring.

RESULTS

In this study commonest cause is CNS infection comprising 54% followed by metabolic disorders (18%), epilepsy (13%), intoxication (08%) and hypoxic ischemic group (07%).

No.	Disease	No. of Patients (n=100)	Percentage
1.	CNS infection	54	54%
2.	Epilepsy	13	13%
3.	Metabolic disorder	18	18%
4.	Hypoxic-ischemia	07	07%
5.	Intoxication	08	08%
	Total	100	100%

Table 1. Incidence of Nontraumatic Coma in Childhood

The maximum number of cases of nontraumatic coma due to CNS infection i.e. 18 cases (33.33%) were seen in infants while that of epilepsy 5 cases (38.46%) in school

going children, metabolic disorders 8 cases (44.44%) in pre-schoolers and hypoxic-ischemic encephalopathy 5 cases (71.42%) in infants.

CNS infection was the most common aetiology of nontraumatic coma in infants. However, it was the predominant cause in other age groups also. Epilepsy was most common in (18.75) toddlers.

The mortality rate was much higher in CNS infection and hypoxic-ischemic encephalopathy while no mortality occurred in intoxication group.

Mortality was highest in infants (55.56%) while lowest in pre-schoolers i.e. 20.68%.

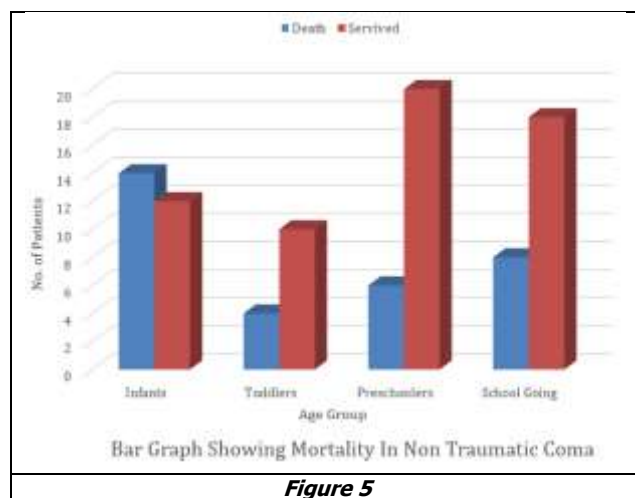
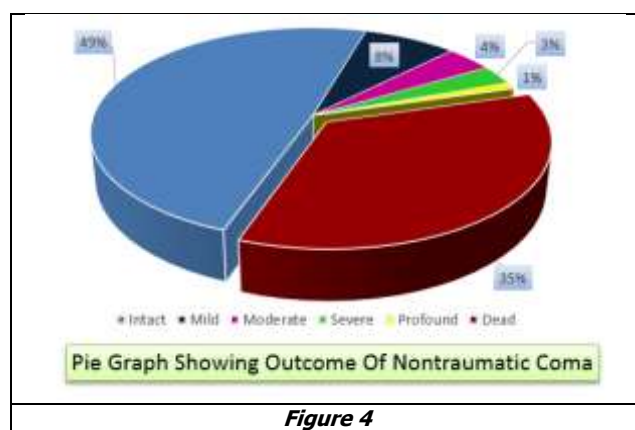
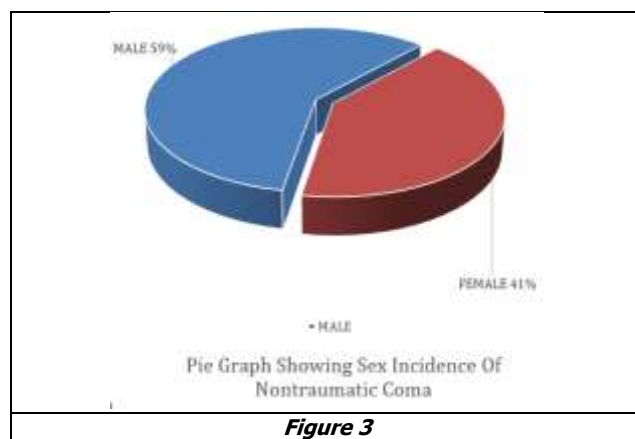
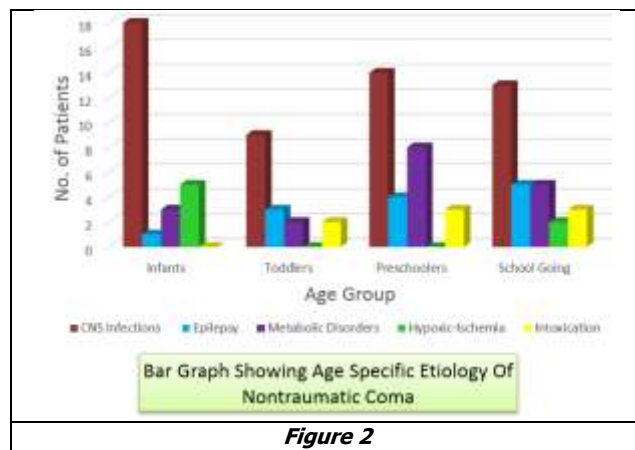
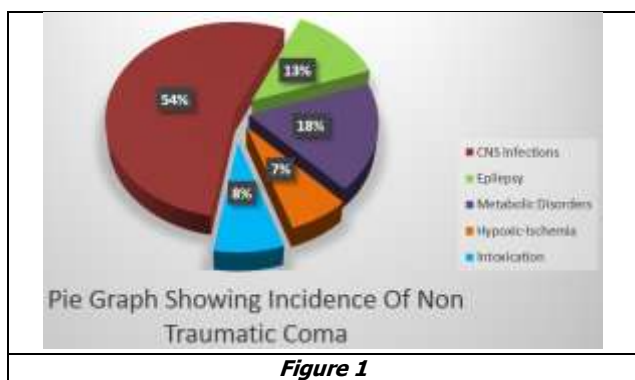
There is very wide variation in the incidence of various aetiologies causing coma in different studies as shown in table no. 7.

Intoxication was more common in pre-schoolers and school going children i.e. 3 cases each (37.5%). The results of present study are not much different from the study of P.C. Nayana Prabha et al⁵ and Pushpa Chaturvedi et al⁷ as shown in the table no. 8.

Table no. 9 gives detail overview of distribution of age specific aetiology in which 4 age groups were done. In the present study CNS infection was the most common aetiology of nontraumatic coma in infants. However, it was also the predominant cause in other age groups. These findings are consistent with the study of Wong CP et al¹ and PC Nayana Prabha et al.⁵ However, other important causes of nontraumatic coma like epilepsy, metabolic disorders, intoxication and hypoxic ischemic encephalopathy shows little variation in age specific aetiology as shown in table no. 9.

Table no. 10 depicts male preponderance in different subgroups of study population. 59 male and 41 females were affected. Similar results were shown in various studies.

In present study, male preponderance was noted in all the subgroups of nontraumatic coma.



Age Group	CNS Infection (n=54)		Epilepsy (n=13)		Metabolic Disorders (n=18)		Hypoxic Ischemia (n=07)		Intoxication (n=08)		Total (n=100)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Infants (n=27)	18	66.66	1	3.70	3	11.11	5	18.51	0	0	27	100
Toddlers (n=16)	9	56.25	3	18.75	2	12.5	0	0	2	12.5	16	100
Pre-schoolers (n=29)	14	48.27	4	13.79	8	27.58	0	0	3	10.34	29	100
School going (n=28)	13	46.42	5	17.85	5	17.85	2	7.14	3	10.71	28	100

Table 3. Age Specific Aetiology of Nontraumatic Coma

Sex	CNS infection (n=54)		Epilepsy (n=13)		Metabolic Disorder (n=18)		Hypoxic Ischemia (n=07)		Intoxication (n=08)		Total (n=100)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Male	29	53.70	8	61.53	12	66.66	4	57.14	6	75.00	59	59.00
Female	25	46.29	5	38.46	6	33.33	3	42.85	2	25.00	41	41.00
Total	54	100	13	100	18	100	7	100	8	100	100	100
M:F	1.1:1		1.6:1		2:1		1.3:1		3:1		1.4:1	

Table 4. Sex Incidence of Nontraumatic Coma in Childhood

Outcome	CNS Infection (n=54)		Epilepsy (n=13)		Metabolic Disorders (n=18)		Hypoxic Ischemia (n=07)		Intoxication (n=08)		Total (n=100)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Intact (I)	19	35.18	10	79.92	11	61.11	3	42.85	6	75	49	49
Mild (II)	4	7.40	1	7.69	-	-	1	14.28	2	25	8	8
Moderate (III)	3	5.55	-	-	1	5.55	-	-	-	-	4	4
Severe (IV)	3	5.55	-	-	-	-	-	-	-	-	3	3
Profound (V)	1	1.85	-	-	-	-	-	-	-	-	1	1
Dead (VI)	24	44.44	2	15.38	6	33.33	3	42.85	-	-	35	35

Table 5. Outcome of Nontraumatic Coma by Aetiology

Sr. No.	Age Group	Mortality	
		No.	%
1.	Infants (n=27)	15	55.56
2.	Toddlers (n=16)	5	31.25
3.	Pre-schoolers (n=29)	6	20.68
4.	School going (n=28)	9	32.14

Table 6. Mortality in Nontraumatic Coma by Age Groups

Aetiology	Studies in Percentage			
	Present Study	Wong CP et al ¹	PC Nayana Prabha et al ⁵	Pushpa Chaturvedi et al ⁷
CNS infections	54%	37.9%	80.7%	64.58%
Epilepsy	13%	9.6%	-	-
Metabolic disorder	18%	5.0%	9.3%	-
Hypoxic ischemia	7%	-	1.85%	-
Intoxication	8%	10.3%	2.96%	-
Congenital	-	8.2%	-	-
Accident	-	6.7%	-	-
Enteric encephalopathy	-	-	3.7%	-
Hypertensive encephalopathy	-	-	1.48%	-
Cerebral malaria	-	-	-	12.5%
Unknown	-	14.5%	-	-
Others	-	7.8%	-	22.91%

Table 7. Incidence of Nontraumatic Coma in Various Studies

Age Group	Present Study		P.C. Nayana Prabha et al ⁵ (n=270)		Pushpa Chaturvedi et al ⁷ (n=48)	
	No.	%	No.	%	No.	%
Infants (1 month to 12 months)	27	27%	100	37.03%	4	8.3%
Toddlers (13 to 36 months)	16	16%			20	41.7%
Pre-schoolers (37-72 months)	29	29%	74	27.40%	9	18.8%
School going (73 months-12 years)	28	28%	96	35.55%	15	31.2%

Table 8. Age wise Incidence of Non-Traumatic Coma in Various Studies

Age Group	CNS Infections		Epilepsy		Metabolic		Intoxications		Others		Total
	Present Study	Wong CP et al ¹	Present Study	Wong CP et al ¹	Present Study	Wong CP et al ¹	Present Study	Wong CP et al ¹	Present Study	Wong CP et al ¹	
Infants	66.66	50.5	3.7	4.3	11.11	4.3	-	-	18.51	40.9	100
Toddlers	56.25	33.7	18.75	13.5	12.5	6.7	12.5	10.1	-	36	100
Pre-schoolers	48.27		13.79		27.58		10.34		-		100
School going	46.42	31.5	17.85	16.7	17.85	5.6	10.71	7.4	7.14	39	100

Table 9. Age Specific Aetiology in Various Studies

Sex	Present Study (n=100)		Wong CP et al ¹ (n=278)		Pushpa Chaturvedi et al ⁷ (n=48)		P.C. Nayana Prabha et al ⁵ (n=270)	
	No.	%	No.	%	No.	%	No.	%
Male	59	59	155	55.75	26	54.16	142	52.59
Female	41	41	123	44.25	22	45.83	128	47.40
M: F	1.4:1		1.26:1		1.18:1		1.1:1	

Table 10. Sex Incidence of Non Traumatic Coma in Various Studies

Age Group	Present Study	Pushpa Chaturvedi et al ⁷
Infants	55.56	14.3
Toddlers	31.25	50
Pre-schoolers	20.68	14.3
School going	32.14	21.4

Table 11. Mortality by Age Groups in Various Studies

DISCUSSION

Childhood non traumatic coma is a nonspecific consequence of variety of serious pathological processes.^{8,13} It is important source of morbidity and mortality in paediatric age group. It represents as an acute emergency and quick diagnosis is utmost importance.¹⁴ Thus, it is important to try to identify cases who are likely to survive with intensive care so that they could be referred to tertiary care center without delay. In present study, 100 cases of non-traumatic coma with MGCS score less than 12 for more than 6 hours were studied. They are categorized into CNS infection, epilepsy, metabolic disorder, hypoxic-ischemic encephalopathy and intoxication depending upon their history, clinical presentation, examination and specific investigations.

It is well known that coma is recognized to be nonspecific sign with a wide potential differential diagnosis.

As shown in above table distribution of aetiology of coma in various studies is quite different, in all studies CNS infections was the commonest cause.^{15,16,17}

Table no. 8 gives detail overview of distribution of study population with respect to age. Maximum number of patients of CNS infections were noted in infants. This can be explained on the basis that in the first few months of life infants are protected by maternal antibodies hence bacterial infections are less common below 3 months of age. These bactericidal activities start declining and reach its lowest level between 6 months to 2 years and then increases linearly between 2-12 years. Hence rate of infections peaks 6-12 months.

The maximum number of epilepsy cases were noted in pre-schoolers 4 cases (30.76%) and school going children, 5 cases (38.46%). In metabolic disorder commonest age group affected was in pre-schoolers, 8 cases (44.44%).

Hypoxic- Ischemic encephalopathy was more common in infants. As brain growth occurs more rapidly during this period which is more vulnerable to hypoxic ischemic damage due to shock, pulmonary or cardiac failure, near drowning and carbon monoxide poisoning.

Male preponderance in the study might be due to cultural factors, as parent seek medical advice frequently and promptly for a male child particularly in poor families and rural areas.

Out of 27 infants, 15 died (55.56%) while out of 16 toddlers 5 (31.25%) died. In pre-schoolers out of 29, 6 died (20.68%) while out of 28 school going children 9 (32.14%) died.

As shown in table no 11 in present study mortality was highest in infants.^{5,18} This finding is consistent with the study of P. C. Nayana Prabha et al.⁵ In Pushpa Chaturvedi et al⁷ mortality was highest in toddlers (50%). Mortality in present study is not much different from the other studies.^{19,20}

CONCLUSIONS

From this study it can be concluded that CNS infection is the commonest cause of non-traumatic coma in childhood. Age specific incidence was notably higher in the first year of life and has male preponderance. Non-traumatic coma even in the presence of advanced life support still causes high mortality and crippling morbidity. The rate of complications and neuro-deficit was highest in CNS infections; hence early diagnosis and proper management can improve outcome in CNS infections. Mortality was highly dependent on aetiology from 0 to 44.44%. Age wise mortality was highest in infants, overall series mortality was 35%. Mortality and morbidity of patients in nontraumatic coma was due to delay in referral of cases, hence early and timely referral to tertiary care center can improve morbidity and mortality.

REFERENCES

[1] Wong CP, Forsyth RJ, Kelly TP, et al. Incidence, aetiology and outcome of non-traumatic coma: a population-based study. Arch Dis child 2001;84(3):193-199.

- [2] Awasthi S, Moin S, Iyer SM, et al. Modified Glasgow Coma Scale to predict mortality in children with acute infections of the central nervous system. *Nat Med J India* 1997;10(5):214-216.
- [3] Bharucha PE, Bharucha EP. Coma in childhood. *Indian Pediatr* 1973;10(9):523-530.
- [4] Ramesh S, Singh S, Singhi P. et al. Profile of non-traumatic coma in childhood. MD thesis, Department of Paediatrics, PGI, Chandigarh, Dec. 1997.
- [5] Nayana Prabha PC, Nalini P, Tiroumourougane Serane V. Role of Glasgow coma scale in paediatric non-traumatic coma. *Indian Pediatr* 2003;40(7):620-625.
- [6] Bates D, Caronna JJ, Cartlidge N, et al. A prospective study of non-traumatic coma: methods and results in 310 patients. *Ann Neurol* 1977;2(3):211-220.
- [7] Chaturvedi P, Kishore M. Modified Glasgow coma scale to predict mortality in febrile unconscious children. *Indian J Pediatr* 2001;68(4):311-314.
- [8] Taylor DA. Coma in paediatric patient: evaluation and management. *Indian J Pediatr* 1994;61(1):13-26.
- [9] Dicarolo JV, Frankel LR. Neurologic stabilization. In: Behrman RE, Kriegman RM, Jensen HB, eds. *Nelson's textbook of paediatrics*. 17th edn. Philadelphia: WB Saunders Co. 2003:309-311.
- [10] Kappy MS, Bajaj L. Recognition and treatment of endocrine/metabolic emergencies in children: part 1. *Adv Pediatr* 2002;49:245-272.
- [11] Liao YJ, So YT. An approach to critically ill patient in coma. *West J Med* 2002;176(3):184-187.
- [12] Yu PL, Jin LM, Seaman H, et al. Fluid therapy of acute brain edema in children. *Pediatr Neurol* 2000;22(4):298-301.
- [13] Appleton R, Choonara I, Martland T, et al. The treatment of convulsive status epilepticus in children. *Arch Dis Child* 2000;83(5):415-419.
- [14] Singh PD, Singh SC. The comatose child. In: Singh M, eds. *Medical emergencies in children*. 3rd edn. New Delhi: Sagar Publications 2005:2008-2018.
- [15] Prober CG. Central nervous system infection. In: Behrman RE, Kriegman RM, Jensen HD, eds. *Nelson's textbook of paediatrics*. 17th edn. Philadelphia: WB Saunders Co 2003:2038-2047.
- [16] Choudhry P, Kumar P, Puri PK. Childhood morbidity and mortality in large hospital over the last four decades. *Indian Paediatrics* 1991;28:249-254.
- [17] Rossor M. Coma in children. In: Donaghy M, ed. *Brain's disease of the nervous system*. 11th edn. Oxford University Press 2001:727-728.
- [18] Kirkham FJ. Non traumatic coma in children. *Arch Dis Child* 2001;85(4):303-312.
- [19] Trubel HK, Novotny E, Lister G. Outcome of coma in children. *Curr Opin Pediatr* 2003;15(3):283-287.
- [20] Bates D. The prognosis of medical coma. *J Neurol Neurosurgery Psychiatry* 2001;71(Suppl 1):120-123.