

# Factors Affecting Survival in Children with Acute Viral Encephalitis

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## Abstract

**Introduction:** In India, the incidence of encephalitis is unknown as diagnosis of viral infection is difficult, specially in resource limited settings. Also wide variety of CNS disorders, both infectious and non-infectious can mimic the illness. In the view of large burden of Viral Encephalitis in pediatric age group and limited available data, this study has been planned. This hospital based prospective, observational, longitudinal study was performed between October 2019 and May 2021 in pediatric department. **Methodology:** 176 patients between the age group of 1 month to 12 years, diagnosed as having Acute Viral Encephalitis were enrolled into the study. They were evaluated for factors affecting survival like GCS at the time of admission, presence of shock, presence of severe anemia and presence of MODS. **Results:** GCS<8 at the time of admission, presence of shock, presence of severe anemia and presence of MODS were found to be statistically significant by applying chi-square test with P value of <0.05 being considered as significant. **Conclusion:** Clinical variables: GCS <8, presence of shock, presence of severe anemia and presence of MODS were found to be significant for predicting mortality in subjects of AVE.

**Keywords:** Acute Viral Encephalitis (AVE); Glasgow Coma Scale (GSC); Multiorgan Dysfunction Syndrome (MODS)

## Introduction

“Acute febrile encephalopathy” is a term commonly used to define the condition in which altered mental status accompanies a short febrile illness. <sup>[1]</sup> The incidence of encephalitis is unknown in India, as diagnosis of viral infection is difficult, specially in resource limited settings. Also various CNS disorders, both infectious and non-infectious can mimic the illness. <sup>[2]</sup>

More than 150 viruses can lead to acute encephalitis. <sup>[3]</sup> AVE can occur in sporadic form or epidemic form. <sup>[4]</sup> Japanese encephalitis is the single largest cause of AVE in the world today. The incidence has been reported to be high among children with high mortality (30%). <sup>[5]</sup> HSV encephalitis is a common cause of sporadic encephalitis in the world. <sup>[6]</sup> The viruses have varied presentations in children and many factors affect survival in patients of AVE. <sup>[6,7]</sup>

In the view of large burden of AVE in pediatric age group and limited available data, this study has been planned. Factors affecting survival in these patients were studied. These factors will help in triaging patients according to the severity and also will help in their prognostication.

## Materials and Methods

This hospital based prospective, observational study was performed between October 2019 and May 2021 in pediatric department at Shalinitai Meghe hospital and research centre, Wanadongri in collaboration with Jawaharlal Nehru medical college, Datta Meghe institute of medical sciences, Sawangi

Meghe, Wardha, Maharashtra. Before start of study, ethical clearance was taken from institutional ethical committee. Informed written consent was obtained from all the study subjects enrolled in the study.

176 patients between the age group of 1 month to 12 years, diagnosed as having AVE were enrolled into the study. Patients were categorized as per the age of child into four groups: 1 month-3 years, >3 years-6 years, >6 years-9 years and >9 years-12 years. Detailed history and examination was done. GCS scale was applied to all subjects at the time of admission. Relevant laboratory investigations and radio-imaging studies like chest X-ray, head CT scan, MRI brain were done. They were evaluated for factors affecting survival like GCS at the time of admission, presence of shock, presence of severe anemia and presence of MODS in patients of AVE. They were observed and managed with specific treatment like antivirals along with appropriate supportive measures. They were also evaluated for outcome during the hospital stay and at follow up appointments of 15 days after discharge from hospital among the survivors.

Statistical analysis was conducted using STATA version 10.0. Mean and standard deviation were used to express descriptive

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statistics. Fisher's exact test and Chi-Square test were used to test categorical variables between two or more groups. The level of  $P < 0.05$  was considered as being significant.

## Results

Out of 176 subjects, 34.09% were from the age group of >3 years-6 years, and lowest number of patients, 19.31% were from the age group of >9 years-12 years. Out of 176 subjects, 59.65% were males and 40.34% were females. The mean age was  $5.77 \pm 3.22$  years with range of 0.3 years-11.8 years. In all the age groups, males dominate over females. But mortality was higher in females in present study. After establishing diagnosis, out of 176 subjects, 46.59% subjects were diagnosed to have viral encephalitis. Among total subjects with viral encephalitis, 54.74% survived without morbidity, 31.92% survived with morbidity and 44.11% subjects died. Maximum mortality, 40.55% was seen in the age group of 1 month to 3 years and maximum morbidity, 29.50% was seen in the age group of >6 years-9 years. Totally 26.70% subjects were discharged with morbidity, out of which 63.82% were males and 36.17% were females [Table 1].

The above table shows that, 28.72% subjects with  $GCS < 8$  at the time of admission died. Subjects with  $GCS < 8$  had 4.08 times higher risk of death (odds ratio: 4.32). This was found to be statistically significant after applying Chi-square test with P value: 0.0007 (CI: 1.68-12.43). 25.53% subjects with shock died. Subjects with shock had 2.46 times higher risk of death (odds ratio: 2.46). This was found to be statistically significant after applying Chi-square test with P value: 0.0254 (CI: 1.04-6.19). 25.80% subjects with severe anemia died. Subjects with severe anemia had 2.54 times higher risk of death (odds ratio: 2.54). This was found to be statistically significant after applying Chi-square test with P value: 0.0210 (CI: 1.07-6.37). 27.53% subjects with MODS died. Subjects with MODS had 2.33 times higher risk of death (Odds ratio: 2.33). This was found to be statistically significant after applying Chi-square test with P value: 0.0266 (CI: 1.01-5.37) [Table 2].

**Table 1: Age and sex wise distribution of study population.**

Age and Sex wise distribution	Distribution (n=176)	
	Number	Percentage
Age		
1 month-3 years	37	21.14
>3-6 years	60	34.09
>6-9 years	45	25.56
>9-12 years	34	19.31
Total	176	100
Sex		
Male	105	59.66
Female	71	40.34
Total	176	100

**Table 2: Outcome distribution of subjects according to GCS at the time of admission, shock, severe anemia, and MODS.**

Parameters	Deaths	Survivors	Odds ratio	P value	95% CI
GCS<8	27 (28.72%)	67 (71.28%)	4.32	0.0007	1.68-12.43
Shock present	24 (25.53%)	70 (74.46%)	2.46	0.0254	1.04-6.19
Severe anemia present	24 (25.80%)	69 (74.19%)	2.54	0.021	1.07-6.37
MODS present	19 (27.53%)	50 (72.47%)	2.33	0.0266	1.01-5.37

## Discussion

Pediatric coma is being considered as an enigma with only few studies and inclusive information. [8] In children, acute central nervous system infection is the most common cause of fever associated with brain involvement. [9] Often a provisional diagnosis of 'viral encephalitis' is made as no definitive cause can be established. During the study period, diagnosis of AVE was established in 176 patients.

In studies, done by Ahmed et al. on non-traumatic coma in pediatric population: Etiology and predictors of outcome, and Bansal et al. Non-traumatic coma in 100 patients, males dominated over females. [10,8] But in another study, done in Iran by Khodapanahandeh et al. on etiology and outcome of non-traumatic coma in children admitted in pediatric intensive care unit, female outnumbered males. [11]

In the present study, maximum number of subjects was from the age group of 3 years-6 years (34.09%) and minimum were in age group of 9 years-12 years (19.42%). Mean age of this study was 69.17 months  $\pm$  38.67 months. Bansal et al. found that maximum patients were from the age group of 4 years-5 years. [8] Buch et al. on the study on outcome predictors of non-traumatic coma with infective etiology in children found mean age of 35.6 months. [12] Mortality was higher in the age group of 1 month to 3 years. This was in accordance with the study done by Khodapanahandeh et al. Iran. [11] Other studies such as a population based study done by Wong et al. on incidence, etiology and outcome of non-traumatic coma and study by Bansal et al. on non-traumatic coma also showed higher mortality younger age group. [13,8]

In the present study, it was found that mortality rate was higher in female as compared to males. This was in accordance with the studies like the study Ahmed et al. from Karachi on non-traumatic coma in pediatric patients: Etiology and predictors of outcome (2011) showed higher mortality in females *i.e.* 71.2%. [10] Similar result was found in study done by Bansal et al. in which mortality was 57.14% in females and 42.85% in males; while in other studies, such as Khodapanahandeh et al., Wong et al. showed no sex difference. [8,11,13]

It is believed that severity of coma affects its prognosis. In the present study, modified GCS recorded at the time of admission of patient had significant association with the outcome. Mortality rate progressively decreased with decreasing GCS. In the present study, 28.72% subjects with  $GCS < 8$  died. This result was in accordance with the studies such as study done by Bansal et al. and Ahmed et al. [8,10] Shock at time of presentation was a poor prognostic sign. In the present study, subjects who had shock at the time of presentation had 2.46 times more risk of death than those subjects without shock. This was in accordance with other studies such as study done by Bansal et al. where he

found that subjects with hypotension had 5.1 times more risk of mortality than those subjects without hypotension which was statistically significant with P value of 0.002. [8] Ahmed et al. also found that hypotension was significantly associated with mortality in non-traumatic comatose children with P value of 0.002. [10] Buch et al. also found significant association of shock with mortality with P value of 0.001. [12-14]

In the present study, 25.80% subjects with severe anemia died with 2.54 times higher risk of death. This risk was found to be significant with P value of 0.0210 (CI: 1.07-6.37). This was in accordance to the study done by Buch et al. with statistically significant risk with odds ratio of 3.89 and P value of 0.0001. [12] In the present study, 27.53% subjects with MODS died. Subjects with MODS had 2.33 times more risk of death than other subjects without MODS. This risk was found to be significant with P value of 0.0266 (CI: 1.01-5.37). Similar results found in a study done by Tasker et al. [15,16] The present study shows that shock, severe anemia, MODS and GCC<8 were found to be significant on multivariate regression analysis.

### Conclusion

1. Maximum subjects of AVE were from the age group of >3 years-6 years and males dominate over females.
2. Mortality was more in females and in the age group of 1 month-3 years.
3. Clinical variables: GCS<8, presence of severe anemia, presence of shock and presence of MODS were found to be significant for predicting mortality in subjects of AVE.
4. This study helps in triage of patients with AVE, which helps in better survival.

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