INTRODUCTION
Acute encephalopathy refers to a state of rapid deterioration of brain function, usually presenting as an alteration in state of consciousness, with or without focal neurological signs.[1] Acute febrile encephalopathy is a common and severe neurological syndrome that is associated with significant morbidity and mortality in children. The etiologies differ according to geographical regions. Appropriate and efficient protocols for investigations and management require proper understanding of various potential etiologies. Acute encephalopathy denotes a diffuse and nonspecific brain insult manifested by a combination of coma, seizures and decerebration, and is an important cause of morbidity and mortality in young hospitalized children. Various causes such as viral encephalitis, cerebral malaria, bacterial meningitis, Reye's syndrome etc. have been implicated in etiology and the proportionate contribution of each varies according to the geographical area. Despite so many epidemiological reports and investigations, the presentation with acute onset fever and altered sensorium has often remained a mystery especially in Bihar, Uttar Pradesh and West Bengal.[2-4] There has not been any comprehensive, systematic study of the etiology of childhood febrile encephalopathy in Bihar, India. The present study was conducted to Pediatrics Department, Jawaharlal Nehru Medical College and Hospital, Bhagalpur to find out the etiological pattern and clinical presentation of acute febrile encephalopathy in children.

MATERIAL AND METHODS
In the present study, all children (aged between 1 month and 14 years) presenting to the Department of Pediatrics, Jawaharlal Nehru Medical College and Hospital with fever (> 38 degree Centigrade) of less than 2 weeks duration with altered sensorium with or without seizure were prospectively investigated for etiological cause. The investigations included blood and CSF counts, blood and CSF cultures, peripheral smear and serology for malarial parasite, and serology for Japanese encephalitis (JE) virus. Other investigations included EEG and CT or MRI wherever indicated.

RESULTS
The most common presenting complaints apart from fever and altered sensorium were headache and vomiting. Convulsions, neck rigidity, hyperpyrexia, brisk deep tendon reflexes, extensor plantar response and focal neurological signs were seen in 50%, 57%, 28% and 39.3% and 9.3% of the subjects, respectively. The diagnoses based on clinical presentation and laboratory findings were pyogenic meningitis in 90 (42%), non JE viral encephalitis in 52 (25%), JE in 38 (18%), cerebral malaria in 16 (7%), herpes encephalitis and tubercular meningitis in 8 (4%) each, and typhoid encephalopathy in 2 cases.

Conclusion: Pyogenic meningitis and viral encephalitis including JE are the most common causes of acute presentation with fever and encephalopathy in Eastern Bihar. Preventive strategies towards this disease must be directed by the Health Department, so that this deadly disease and its sequelae can be prevented.

KEYWORDS: Viral encephalitis, Encephalopathy, Japanese encephalitis.

RESULTS
Two hundred and thirty four children were admitted with a diagnosis of acute febrile encephalopathy during the study period. 20 children could not be included in the study as they left against medical advice after admission before the detailed work up could be completed. Two third of the cases were more than 5 years of age whereas the rest one third were below the age of 5 year. Only 18 (8.4%) cases of acute febrile encephalopathy occurred in infants. Almost two thirds (138 out of 2114; 64.5%) of the subjects were male. Majority (78.5%) of the cases belonged to Kahalgaon and Ekchari. The most common presenting complaints apart from fever and altered sensorium were headache and vomiting. In one third (35.5%) of the cases, the duration of the fever was less than 72 hr. The duration of central nervous system (CNS) features was even shorter with headache and altered sensorium being present for less than 72 hours in 81.3% and 96.3% children, respectively. The mean (± SD) Glasgow coma score (GCS) was 9.6 (± 3.2). Convulsions were reported in 108 (50%) subjects. Neck stiffness and Kernig's sign were present in 122 (57%) and 94 (43.9%) cases, respectively. Hypertonia was present in 48 (22.4%) patients whereas brisk reflexes and extensor plantar response were present in 60 (28%) and 84 (39.3%) subjects, respectively. Focal neurological deficits at presentation were present in only 20 (9.3%) children. Leucocytosis (TLC> 14,000) was seen in 48.6% children.

The most common illness presenting as fever with altered sensorium was viral encephalitis seen in 98 (45.8%) cases. The cause of viral encephalitis was established as Japanese encephalitis in 38 (17.7%) patients and herpetic encephalitis in 8 (3.7%) patients. Pyogenic meningitis was second most common diagnosis responsible for 90 (42%) cases. Cerebral malaria was documented in 16 (7.5%) children and tubercular meningitis in 8 (3.7%) children presenting as acute febrile encephalopathy. Typhoid fever was a cause of encephalopathy.
in one subject. Blood culture was positive only in 20 (22.2%) cases of pyogenic meningitis and CSF culture positivity was even less (14 out of 90; 15.5%). Among 38 cases of JE, 30 were older than 5 years. Only 2 cases of JE occurred in infancy. The duration of the symptoms of fever, headache and altered sensorium in these cases were comparable to the non-JE cases. Similarly, the proportion of cases having convulsions (52.6% vs. 50%), hypertonia (36.8% vs. 19.3%), extensor plantar response (36.8% vs. 39.8%) and focal neurological deficits (10.5% vs. 9.1%) in JE was comparable to the other cases of acute febrile encephalopathy. Neck rigidity, however, was more commonly seen in JE (64.2% vs. 51.1%; P< 0.01).

**DISCUSSION**

In our study, viral encephalitis was the most common cause (46%) of acute febrile encephalopathy. 40% of cases (38 out of 98) of viral encephalitis could be attributed to Japanese encephalitis. Overall, JE was responsible for 18% of cases of acute febrile encephalopathy in children from our region. Pyogenic meningitis was the second most common diagnosis after viral encephalitis in children presenting with febrile encephalopathy. Earlier studies from several regions of India have documented the pyogenic meningitis to be the most common diagnosis in such children. A study by Kumar et al. from Lucknow, India in children with acute encephalopathy showed pyogenic meningitis and JE to be responsible for 18% and 12% of cases, respectively.[5] Mehrotra et al. found pyogenic meningitis in 49.1% and viral causes in 11.4%. [6] In comparison to these studies, viral encephalitis was more common in the present study. This could be due to the fact that most patients in our hospital were referred from other places. This raises the possibility of enrolling more patients who did not respond to the usual treatment thus increasing the proportion of cases of viral encephalitis. This pattern could also be related to the catchment area of our hospital i.e. Eastern Bihar, where periodic outbreaks of JE and other viral encephalitis are common.

In one-fourth of the cases included in our study, no specific etiology was found and these were labeled as viral encephalitis due to other viruses. It is possible that a more detailed diagnostic work up such as serology and antigen detection by PCR for other viruses could have picked more etiologies. Cerebral malaria was the diagnosis in only 116 (7.5%) children in the study. Thus, it was an uncommon cause of fever presenting with encephalopathy in the present study area. Kumar et al. in their study on 740 children with acute encephalopathy also found cerebral malaria in only 4 (0.5%) cases. [5] A prospective study of Thai children identified dengue virus in maximum number of cases, followed by Japanese encephalitis, herpes simplex, human herpes virus 6, mumps, enterovirus, varicella zoster virus and rabies. [7] Empirical treatment with quinine is very frequently used in children when they present with fever and encephalopathy in malaria endemic areas. However, the present study and similar other studies from South East Asia show that cerebral malaria is a relatively uncommon cause of acute febrile encephalopathy in children. The resistance to quinine and other antimalarial drugs is slowly increasing in these countries. [8,9] This could be related to the empirical use of this drug in conditions where it is not warranted.

Thus, quinine should be offered to children with acute febrile encephalopathy only if there is documentation of infection with P. falciparum. All efforts however must be made to diagnose cerebral malaria by examining peripheral smear repeatedly and also by using serological tests in cases where index of suspicion is high.[10] In the present study, Gram stain positivity was seen in almost two-thirds of patients with pyogenic meningitis whereas the blood and CSF culture positivity were relatively low. This could be due to antibiotic being given outside prior to admission in our hospital in many patients. Most clinical features of JE in the present study were similar to those seen with other causes of acute febrile encephalopathy. This suggests that serology should be done in all cases of acute febrile encephalopathy to make the diagnosis of JE as the clinical presentation alone is not specific for this diagnosis. The proportion of children having seizures and focal neurological deficits in the present study was lower in comparison to an earlier study from Kumar et al. [11], India which seems to be related to more virulent mutant strains of viruses in the place of their study.

**CONCLUSION**

Finally depending upon the findings of our study it was concluded that viral encephalitis was the most common cause of acute febrile encephalopathy in children from this region followed closely by pyogenic meningitis. Amongst children having viral encephalitis, JE was responsible for 2 out of 10 cases. Cerebral malaria was relatively uncommon cause of acute febrile encephalopathy. Limitations of our study is that being a hospital based study, done in a tertiary care center; the incidence observed in this study may not reflect the actual incidence of acute febrile encephalopathy of the entire population. The causes and risk factors for high prevalence of viral encephalitis need to be urgently explored in order to initiate preventive strategies. Vaccination against JE has already been started in this part of Bihar based on preliminary findings from the present study. Other studies need to be conducted in different geographical areas to find out usefulness of such a program. Preventive strategies towards this disease must be directed by the Health Department, so that this deadly disease and its sequelae can be prevented.

**REFERENCES**