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Paediatrics Section

Clinical Profile and Short Term Outcome of Acute Encephalitis Syndrome in Children: An Observational Study from a Tertiary Care Centre, Tripura, India

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ABSTRACT

Introduction: Acute Encephalitis Syndrome (AES) is a group of neurologic manifestation caused by wide range of microbes, chemicals and toxins. Japanese Encephalitis Virus (JEV) is the major cause of AES in India. Isolation of aetiological agent in AES cases presents a fundamental challenge to prevention and management. Lack of study on AES in the paediatric population of Tripura prompted the authors to take up this study.

Aim: To determine the clinical profile and short term outcome of children with AES from Tripura, India.

Materials and Methods: This hospital-based cross-sectional observational study was conducted from November 2017 to April 2019 in the Department of Paediatrics at Agartala Government Medical College (AGMC), Tripura, India. Total 100 children, from 1 month to 12 years of age, fulfilling definition of AES were enrolled in the study. All the cases were managed as per institutional treatment protocol and were followed-up at one and three months following discharge. Case record, patient profile records and reports of investigations were the study tools. Chi-square test and Fisher's-exact test were used as per applicability to test the significance of difference of proportions using Statistical Package for the Social Sciences (SPSS) version 15.0. The difference was considered significant for a p-value <0.05.

Results: Out of total, 30 patients (30%) were in 9-12 years age group, with slight male preponderance (1.1:1). Total 72 cases (72%) were from rural area. Common clinical features were fever, altered sensorium, seizures, irritability, abnormal movement, pallor, papilloedema, and lethargy. Abnormal laboratory parameters included leucocytosis (62%), anaemia (27%), hyponatremia (35%), and hypoglycaemia (16%) and elevated liver enzymes (15%). Immunoglobulin M (IgM) serology was positive for JEV (19%), scrub typhus (6%), herpes simplex virus (2%), dengue (2%), measles (1%), and enterovirus (1%). Magnetic resonance imaging brain was normal in 37% of the cases. About 54% of the cases recovered completely, 20% of the cases died and remaining 26% survived with sequelae.

Conclusion: The AES is common among older male children from the rural area. Serologically JEV is most common cause. Total 54% cases recovered completely. Proportion of death and residual sequelae were higher in the JEV category. The observations of the study indicate need of extensive studies and scaling up of JE vaccination.

Keywords: Glasgow coma scale, Herpes simplex virus, Japanese encephalitis virus, Varicella-zoster virus

INTRODUCTION

The Acute Encephalitis Syndrome (AES) is defined as acute onset of fever and a change in the mental status (e.g., confusion, disorientation, coma or inability to talk) and/or new onset of seizures (excluding simple febrile seizures) in a person of any age at any time of the year [1]. Viruses are the main cause of AES. Japanese Encephalitis Virus (JEV), Herpes Simplex Virus (HSV), Varicella Zoster virus (VZV), Influenza A virus, West Nile virus, Chandipura virus, Mumps, Measles, Dengue, Parvovirus B19, Enteroviruses, Epstein-Barr virus, Nipah virus, Zika virus and Rabies virus, Scrub typhus and Streptococcus pneumoniae are among the other causes of AES in India. Other causes such as bacteria, fungus, parasites (*Plasmodium falciparum*), spirochetes, and non infectious agents have also been reported. In a large number of AES cases aetiology remains unidentified [2]. The incidence of viral encephalitis in children is 3.5-7.4/1,00,000/per year [3]. Japanese Encephalitis (JE) is a mosquito borne viral encephalitis occurring in monsoon and post monsoon period in Japan, China, South-east Asia and India causing around 10,000 deaths per year [4].

Acute encephalitis syndrome due to JEV was first diagnosed in 1955 in Tamil Nadu. During 2018, 10485 AES cases and 632 deaths were reported from 17 states like Assam, Bihar, Jharkhand, Karnataka, Manipur, Meghalaya, Tripura, Tamil Nadu, Uttar Pradesh with a case fatality rate of 6% [2,5]. There is no cure for JEV, and many of the children die and rest are left with life threatening sequelae [6]. Vaccination and vector control are the ways to protect against JE infection [6].

In India, JE vaccination has been initiated in endemic states and was subsequently included in the National Immunisation Schedule in 2014 [6]. Identifying the aetiological agent in AES cases presents a challenge to effective prevention and management [6]. There is no study on AES involving paediatrics population of Tripura. So, the present study was conducted to determine the clinical profile and short term outcome (complete recovery, recovery with sequelae, death, referral, sequelae at one month and three months) of AES in children.

MATERIALS AND METHODS

This hospital-based cross-sectional observational study was conducted from November 2017 to April 2019 in the Department of Paediatrics at Agartala Government Medical College (AGMC), Tripura, India. The Institutional Ethical Committee had approved the study {vide letter number F.4(6-9)/AGMC/Academic/IEC Committee/2015}.

Inclusion criteria: All admitted children aged 1 month to 12 years and fulfilling definition of AES [1] were included in the study.

Exclusion criteria: Non consenting parents, patients with non infectious Central Nervous System (CNS) disorders. Children above 12 years are not admitted in Paediatric Ward as per hospital

admission policy. Patients with non infectious CNS disorders such as epilepsy, electrolyte imbalance, trauma, vascular and demyelination disorders were excluded from the study (with the help of history, examination and relevant investigations).

Procedure

Case records, patient profile records and investigation reports were the study tools. Management of AES was initiated by assessment of airway, breathing, and circulation. Supplemental oxygen and ventilator support were provided as per requirement. Seizures were treated with anticonvulsants. Patients with shock were managed by intravenous fluids and inotropes. Following stabilisation, detail history was taken and clinical examination was done.

At admission blood samples were collected for complete blood count, Erythrocyte Sedimentation Rate (ESR), blood glucose, malarial parasite, electrolytes and blood culture. Blood sample for IgM viral serology was collected after four days of onset of illness. Lumber puncture was done following stabilisation and after excluding raised Intra Cranial Tension (ICT) by fundoscopy and non contrast computerised tomography of brain. Cerebrospinal fluid was studied for total and differential cell count, protein and sugar, gram staining, culture and Cartridge Based Nucleic Acid Amplification Test (CBNAAT) for *Mycobacterium Tuberculosis*. Magnetic Resonance Imaging (MRI) of the brain was done in stable patients with focal neurological deficits or worsening Glasgow Coma Scale (GCS). Raised ICT was managed with intravenous mannitol/ dexamethasone/oral glycerol. Temperature was controlled by tepid water sponging and paracetamol. Nutrition was managed by intravenous glucose and/or gavage feeding. Care of eyes, bowel, bladder and skin were extended to all patients. Specific therapy included antibiotics for bacterial meningitis, acyclovir for AES with Herpes Simplex Virus/Varicella Zoster Virus (HSV/VZV) and doxycycline for rickettsial infections. Rehabilitation in the form of physiotherapy, speech therapy etc., was extended to patients with residual disability. Outcome of the patients were recorded in terms of complete recovery, recovery with sequelae and death. Patients were followed-up at one and three months following discharge.

STATISTICAL ANALYSIS

Data were recorded, and analysed with computer using the Statistical Package for the Social Sciences (SPSS) 15.0 software. Raw data were grouped in frequency distribution tables like demographic profile, clinical features, laboratory parameters, outcome of the patients at discharge, outcome at follow-up etc., Contingency tables comparing the demographic profile, clinical features, laboratory parameters and outcome between JE and non JE categories was made. Subsequently, Chi-square test and Fisher's-exact test were used as per applicability to test the significance of difference of proportions using SPSS version 15. The difference was considered significant for a p-value <0.05.

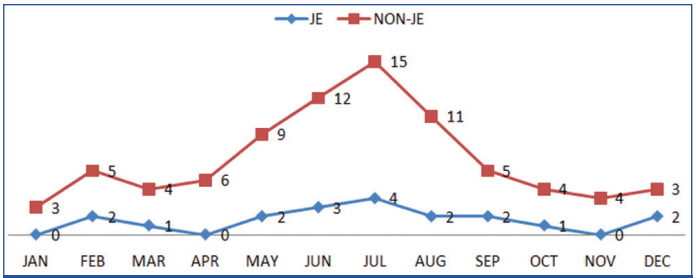
RESULTS

A total of 100 children were enrolled in the study. Most of the patients (30%) were in 9-12 years age group. Male:female ratio was 1.1:1. Total 72% of the cases were from rural area. About 60% of the cases were among the tribal population and 40% cases were from the rest of the population. However, demographic variables did not differ significantly between the JE and Non JE groups [Table/Fig-1]. Number of cases was more between May and August with a peak in July for both JE and Non JE cases [Table/Fig-2].

Common clinical features observed were fever, altered sensorium, seizures, irritability, abnormal movement, pallor, papilloedema and lethargy in order of descending frequency. Proportion of irritability, papilloedema, lethargy and abnormal movements were significantly higher among the JE patients [Table/Fig-3].

Parameter	Japanese encephalitis (n=19)	Non Japanese encephalitis (n=81)	Total (n=100)	p-value
Age (years)				
0-1	0	12	12	0.116
>1-3	1	17	18	0.183
>3-6	4	19	23	1.000
>6-9	5	12	17	0.306
>9-12	9	21	30	0.094
Gender				
Male	10	43	53	1.000
Female	9	38	47	1.000
Habitat				
Rural	11	61	72	0.158
Urban	8	20	28	0.158
Community				
Tribal	12	48	60	0.801
Non tribal	10	30	40	0.298

[Table/Fig-1]: Demographic details.



[Table/Fig-2]: Number of cases of Japanese Encephalitis and non Japanese Encephalitis distribution in a year.

Clinical features	JE (%) (n=19)	Non JE (%) (n=81)	Total (n=100)	p-value
Fever	19 (19%)	81 (81%)	100	1.000
Altered sensorium	19 (19%)	81 (81%)	100	1.000
Seizure	19 (20.65%)	73 (79.34%)	92	0.345
Irritability	19 (43.18%)	15 (34.09%)	34	<0.001*
Aggressive behaviour	0	1 (100%)	1	1.000
Pallor	5 (26.32%)	22 (27.16%)	27	1.000
Vomiting	1 (100%)	0	1	0.190
Neck stiffness	2 (100%)	0	2	0.181
Loose stools	0	4 (100%)	4	1.000
Papilloedema	8 (44.44%)	10 (55.55%)	18	**0.005***
Shock	0	2 (100%)	2	1.000
Congestive cardiac failure	0	4 (100%)	4	1.000
Lethargy	6 (42.85%)	8 (57.14%)	14	**0.024***
Abnormal movements	12 (54.54%)	10 (45.45%)	22	**0.00001***

[Table/Fig-3]: Clinical features.
*Fischers-exact test: p-value <0.05 was considered as statistically significant

Leucocytosis was observed in 62 (62%) and anaemia in 27 (27%) patients. Other laboratory parameters were hypoglycaemia (16%), hyponatremia (35%), hypokalemia (9%) and elevated liver transaminases (17%). Plasmodium falciparum was detected in 14% of the patients [Table/Fig-4].

Cerebrospinal fluid study was done in 80 patients showing increased protein (81%), low glucose (15%), lymphocytosis (11%), neutrophilia (5%) and raised pressure (5%). CSF culture, Ziehl-Neelsen staining and CBNAAT did not demonstrate any pathological agent. In four cases, CSF was suggestive of bacterial meningitis [Table/Fig-4].

The IgM Serology was positive for JE, Scrub typhus, HSV, Dengue, Measles, and Enterovirus in 19%, 6%, 2%, 2%, 1% and 1% of the

Parameters	Japanese encephalitis (n=19)	Non Japanese encephalitis (n=81)	Number of patients (n=100)	p-value
Blood test				
Leucocytosis	8 (12.90%)	54 (87.09%)	62	0.066
Thrombocytopenia	0	3 (100%)	3	1.000
Anaemia (Haemoglobin <8 gm/dL)	8 (29.62%)	19 (70.37%)	27	0.149
Hypoglycaemia	7 (43.75%)	9 (56.25%)	16	0.011*
Hyponatremia	12 (34.28%)	23 (65.71%)	35	0.007*
Hyperkalemia	1 (25%)	3 (75%)	4	0.576
Hypokalemia	2 (22.22%)	7 (77.77%)	9	0.729
Serum glutamate oxalate transaminase >2 times of normal	3 (17.64%)	14 (82.35%)	17	1.000
Serum glutamate pyruvate transaminase >2 times of normal	2 (13.33%)	13 (86.66%)	15	0.729
Malaria parasite	0	14 (100%)	14	0.066
Cerebrospinal fluid findings	**JE (n=15)**	**Non JE (n=65)**	**Number of patients (n=80)**	**p-value**
Raised pressure	1 (25%)	3 (75%)	4	0.572
Lymphocytosis	3 (33.33%)	6 (66.66%)	9	0.358
Neutrophilia	0	4 (100%)	4	1.000
Protein >50 mg/dL	13 (20%)	52 (80%)	65	0.724
Decreased sugar	3 (25%)	9 (75%)	12	0.688
Culture	0	0	0	1.000
Gram staining	0	0	0	1.000
Ziehl-Neelsen staining	0	0	0	1.000
Serology	**JE (n=19)**	**Non JE (n=81)**	**Number of patients (n=100)**	**p-value**
Japanese encephalitis virus	19 (100%)	0	19	1.000
Herpes simplex virus	0	2 (100%)	2	0.999
Measles	0	1 (100%)	1	1.000
Dengue	0	2 (100%)	2	1.000
Enterovirus	0	1 (100%)	1	1.000
Scrub typhus	0	6 (100%)	6	0.592
Unidentified	0	69 (100%)	69	0.999

[Table/Fig-4]: Laboratory parameters.
*Fischers-exact test: p-value <0.05 was considered as statistically significant

cases, respectively. In 69% of the cases serology was negative [Table/Fig-4]. Among all the laboratory parameters hypoglycaemia and hyponatremia were significantly higher in the JE category.

Magnetic Resonance Imaging (MRI) brain was performed in 35 patients and was found normal in 37.1% of the cases. Bilateral basal ganglia T-2 hyperintensities (25.7%), bilateral temporal lobe T-2 hyperintensities (11.4%), multifocal T-2 hyperintensities (11.4%) were the common findings [Table/Fig-5]. However, bilateral basal ganglia lesions were significantly more in the JE category.

Outcome of the patients were recorded as discharged without sequelae (57.4%), discharged with sequelae (14.8%) and death in hospital (27.7%). Six patients were lost from the study (five patients left against medical advice and one patient was referred). Mean hospital stay was calculated to be 9 days. Besides proportion of death and residual sequelae were higher among JE category in comparison to Non JE category but the difference was not significant [Table/Fig-6].

Fourteen patients were discharged with single or multiple sequelae. At discharge 3 (4.4%) patients had hypotonia, 3 (4.4%) had abnormal movements, 8 (11.8%) had speech impairment, 3 (4.4%) had cranial nerve palsy and another 2 (2.9%) had paresis. At 1 month follow-up speech impairments {6 (9.5%)}, abnormal movements and cranial nerve palsy {3 (4.7%)} were the most common residual sequelae. At 3rd month follow-up too, speech impairments {4 (6.5%)}, abnormal movements and cranial nerve palsy {2 (3.2%)} continued to be the most common residual sequelae [Table/Fig-7].

MRI brain findings	Japanese encephalitis (%) (n=10)	Non Japanese encephalitis (%) (n=25)	Number of patients (%) (n=35)	p-value
Normal	3 (23.07%)	10 (76.92%)	13 (37.1%)	0.709
Bilateral basal ganglia T-2 hyperintensities	6 (66.66%)	3 (33.33%)	9 (25.7%)	**0.007***
Bilateral temporal lobe T-2 hyperintensities	0	4 (100%)	4 (11.4%)	0.303
Multifocal T-2 hyperintensities+ meningeal enhancement	0	4 (100%)	4 (11.4%)	0.303
T2-hyperintense lesions plus haemorrhage	1 (50%)	1 (50%)	2 (5.7%)	0.496
T2-hyperintense lesions plus hydrocephalus	0	2 (100%)	2 (5.7%)	1.000
Hypoxic ischaemic encephalopathy	0	1 (100%)	1 (2.8%)	1.000

[Table/Fig-5]: Magnetic Resonance Imaging (MRI) brain.
*p-value <0.05 was considered as statistically significant

Outcome at discharge	Number of patients			p-value
	Total (n=94)*	JE (n=18)	Non JE (n=76)	
Discharged without sequelae	54 (57.4%)	5 (27.8%)	49 (64.5%)	**0.0072****
Discharged with sequelae	14 (14.8%)	5 (27.8%)	9 (11.8%)	0.1342
Death in hospital	26 (27.7%)	8 (44.4%)	18 (23.7%)	0.0872

[Table/Fig-6]: Outcome at discharge.
*6 patients were lost from the study. **p-value <0.05 was considered as statistically significant

Outcome		Number of patients
At 1 month (n=63)*		
No sequelae		54+2#=56 (88.9%)
Sequelae	Hypotonia	2 (3.2%)
	Paresis	2 (3.2%)
	Abnormal movements	3 (4.7%)
	Cranial nerve palsies	3 (4.7%)
	Speech impairments	6 (9.5%)
At 3 month (n=61)*		
No sequelae		56+1$=57 (93.44%)
Sequelae	Hypotonia	1 (1.6%)
	Paresis	1 (1.6%)
	Abnormal movements	2 (3.2%)
	Cranial nerve palsies	2 (3.2%)
	Speech impairments	4 (6.5%)

[Table/Fig-7]: Follow-up Outcome.
*Some patients had multiple sequelae
#Two patients improved; $One patient improved

DISCUSSION

This was a prospective cross-sectional study involving 100 children aged 1 month to 12 years with AES admitted as per hospital admission policy in the Department of Paediatrics, AGMC, Tripura.

Majority of the cases were aged 9-12 years suggesting higher incidence of AES in late childhood. Kakoti G et al., (Dibrugarh, India) reported higher incidence among 5-12 years age group [7]. A male:female ratio of 1.1:1 was reported by Jain P et al., (Uttar Pradesh, India) [8]. It was found that most of the patients were from rural areas (72%). Similar observations were reported by Kakoti G et al., from Assam [7]. In this study, number of both JE and non JE AES cases was more between May and August, with

a peak in July. A study from Darjeeling, West Bengal, too reported maximum number of cases in July [9].

In this study, fever (100%), altered sensorium (100%), seizures (92%) were the leading clinical features. Kakoti G et al., also reported fever (100%), altered sensorium (83.58%) and seizures (82.08%) as most common [7]. In the present study, proportion of irritability, papilloedema, lethargy and abnormal movements were significantly higher among the JE patients. Whereas, Mittal M et al., (Gorakhpur, Uttar Pradesh, India) described significantly higher proportion of headache (25.8% vs 10.74%) in the JE category, and generalised oedema (6.5% vs 24.8%) in the non JE category [10].

Common laboratory findings were leucocytosis (62%), hyponatremia (35%), low haemoglobin (27%), raised SGPT (17%) and raised SGOT (15%). Kumar R et al., (Uttar Pradesh, India) found 15.6% cases had thrombocytopenia, 47.2% had elevated transaminases, 3.3% had elevated blood urea [11]. In this study, proportion of hypoglycaemia and hyponatraemia were significantly higher in non JE category. Mittal M et al., (Gorakhpur, Uttar Pradesh) also found higher proportion of hypoglycaemia (4% vs 4.5%), and hyponatraemia (4.2% vs 6%) in non JE category, but the difference was not statistically significant [10].

In this study, CSF analysis of 80 patients showed lymphocytosis in nine, and neutrophilia in four, elevated CSF protein in 65, low CSF glucose in 12, and raised CSF pressure in four patients. CSF study was not done in 20 patients (eight patients were in a critical condition and 12 patients did not give consent). All CSF sample were negative for bacterial culture. Virological studies with CSF were not possible in the study. Kakoti G et al., and Kumar R et al., observed lymphocytosis in 77% and 26% cases and elevated CSF protein in 52.5% and 36% cases, respectively [7,11].

In the present study, 19% of the patients were seropositive for JE IgM. Jain A et al., observed 16.2% of their patients to be seropositive for JE, 10.8% for Dengue, 9.3% for HSV, 8.9% for measles, 8.7% for mumps, and 4.4% for VZV [12]. In present study, 14 cases were positive for Plasmodium falciparum. Deepthi C et al., observed 9.5% of the enrolled patients to have cerebral malaria [13].

In the present study, MRI brain was done in 35 patients. Long waiting time and expense were the limiting factors. Among those who underwent MRI brain, 37% patients had normal findings. Predominantly, bilateral basal ganglia T-2 hyperintensities were found in 26% cases and bilateral temporal lobe T-2 hyperintensities in 11.4% cases, suggesting JE and HSV encephalitis respectively. Ghosh MK et al., observed that MRI brain was normal in 62.9% of the cases. Basal ganglia involvement and cortical involvement were found in 16.1% and 4.5% [14]. The difference in observation is likely due to regional variations in aetiologies.

Six patients could not be followed-up, in this study. Of the remaining, 57.4% patients were discharged following complete recovery, 14.8% were discharged with residual sequelae, and remaining 27.7% died. Patients discharged with sequelae had speech impairment, cranial nerve palsies, hypotonia, abnormal movements and paresis. Kakoti G et al., reported that 21.13% JE patients had neurological sequelae at discharge, while 14.7% had died in the hospital [7]. Kumar R et al., reported 66.7% children with JE had dystonia [11]. Avabratha KS et al., reported 40.85% of the cases recovered completely and others had speech disturbance (47.61%), motor deficits, behavioural disturbance, involuntary movements, and seizures [15] [Table/Fig-8] [7,9,10,13,15].

All discharged patients (68) were followed-up at one and at three months. Five of them were lost to follow-up at one month. Out of 63 patients followed-up at one month, two recovered, 9.5% had speech impairment, 4.8% had abnormal movements, 4.8% had cranial nerve palsy, 3.2% had hypotonia and 3.2% had paresis. Two patients were lost to follow-up at three month. Of the remaining,

Parameters	Kakoti G et al., [7]	Datta D and Karmakar BC [9]	Mittal M et al., [10]	Deepthi C et al., [13]	Avabratha KS et al., [15]	Present study
Place of study	Dibrugarh, Assam, India	Darjeeling, West Bengal, India	Gorakhpur, Uttar Pradesh, India.	Eluru, Andhra Pradesh, India.	Bellary, Karnataka, India	Agartala, Tripura
Year of study	2012-2013	2013-2018	2012-2014	2011-2013	1995-1997	2017-2019
Common age group affected	5 to 12 years	1-5 years	Median age 5 (3,8) years	6-14 years	5-12 years	9-12 years
Gender ratio	1:1.09	1.74:1	1.16:1	1:0.64	1.33:1	1.1:1
Seasonality	-	May-July	-	-	-	May-August
Geographic distribution	90% cases were from rural area	-	-	-	85.54% cases were from rural area	72% rural
Common clinical features	Fever, altered sensorium, seizures	-	Fever, seizures, altered sensorium, vomiting	-	Fever, seizures, altered sensorium	Fever, altered sensorium, seizures, irritability
Common laboratory findings	Leucocytosis 77%, Elevated CSF protein 52.5%	-	Low haemoglobin 55%, Leucocytosis 35.4%, raised transaminases 69.3%, Elevated CSF protein 57.3%,	-	Elevated CSF protein 74.67%	Leucocytosis 62%, hyponatremia 35%, anaemia in 27%, elevated CSF protein in 65 cases.
Common serological findings	30% JE, 70% non JE	63.1% positive for JE IgM	JE (n=31) Non JE AES (n=447)	-	55.36 % JE	19% JE, 81% non JE
Common neuro imaging finding	-	-	Normal MRI 46.9%, MRI suggestive of meningitis 16.52% , encephalitis 13.04%	-	-	MRI - normal in 13 cases. Bilateral basal ganglia T-2 hyperintensities in 9 patients,
Common sequelae	21.3% had neurological sequelae at discharge.	-	-	Persistent seizures, Hemiparesia, Cranial nerve palsy, Bulbar palsy, Hydrocephalus, Dysarthria	Speech disturbance, motor deficit, behavioural disturbance, cranial nerve deficit and involuntary movements.	Speech impairments, abnormal movements and cranial nerve palsy.
Short term outcome	Recovered completely 63.9%, neurological sequelae 21.3%, Death 14.7%.	Died 21.9%, Discharged 78.1%.	Full recovery 62.3%, Death 32.4% and Leave Against Medical Advice (LAMA) 5.2%.	Expired (12%), discharged with sequelae (22.6%), complete recovery (65.4%).	Complete recovery 25.75%, residual sequelae 37.33%, death 22.74%, and LAMA 14.15%.	Discharged without sequelae (57.4%), discharged with sequelae (14.8%) and death in hospital (27.7%).

[Table/Fig-8]: Comparison with other studies [7,9,10,13,15].

only one patient improved and the rest had persistent sequelae like speech impairment (6.6%), abnormal movements and cranial nerve palsy (3.3% each). Avabratha KS et al., reported motor deficits and speech disturbances in 25.68% and 22.01% cases, respectively, at one year follow-up [15]. Ooi MH et al., followed-up enrolled patients for a median duration of 52.9 months. During follow-up, 31 patients experienced improvement but 15 patients deteriorated. More than half of the patients had residual neurological sequelae and behavioural disorders [16].

In this study, proportion of death and residual sequelae were higher among the JE category. Verma A et al., reported similar observation [17]. Extent and duration of sequelae varied between studies possibly due to differences in the extent of neurological damage.

Limitation(s)

This single centre small sized observational study has its inherent limitations. Besides because of technical difficulties examination of paired sera, comparison on the basis of immunisation status and MRI brain for all cases could not be done. All these add to its limitations. However, the observations in the study demands further extensive studies in this field and scaling up of JE vaccination in the state.

CONCLUSION(S)

Acute encephalitis syndrome is common among 9-12 years, male children from the rural area. Serologically, JE was the most common cause found in this study. Fever, altered sensorium and seizure were present in almost all patients. Leucocytosis, hyponatremia, raised transaminases and low haemoglobin were most commonly encountered laboratory findings. One out of three patients had normal neuroimaging. Total 54% cases recovered completely. Proportion of death and residual sequelae were higher in the JE category. These observations of the study indicate need of further extensive studies and scaling up of JE vaccination.

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