DISSERTATION ON

PROFILE OF CHILDREN ADMITTED WITH ACUTE ENCEPHALITIS SYNDROME

Dissertation submitted to

THE TAMILNADU DR. M. G. R. MEDICAL UNIVERSITY

In partial fulfillment of the regulations

for the award of the degree of

M.D. DEGREE IN PEDIATRIC MEDICINE

BRANCH – VII

GOVERNMENT THENI MEDICAL COLLEGE

THENI – 635531

THE TAMILNADU DR. M. G. R. MEDICAL UNIVERSITY

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CERTIFICATE

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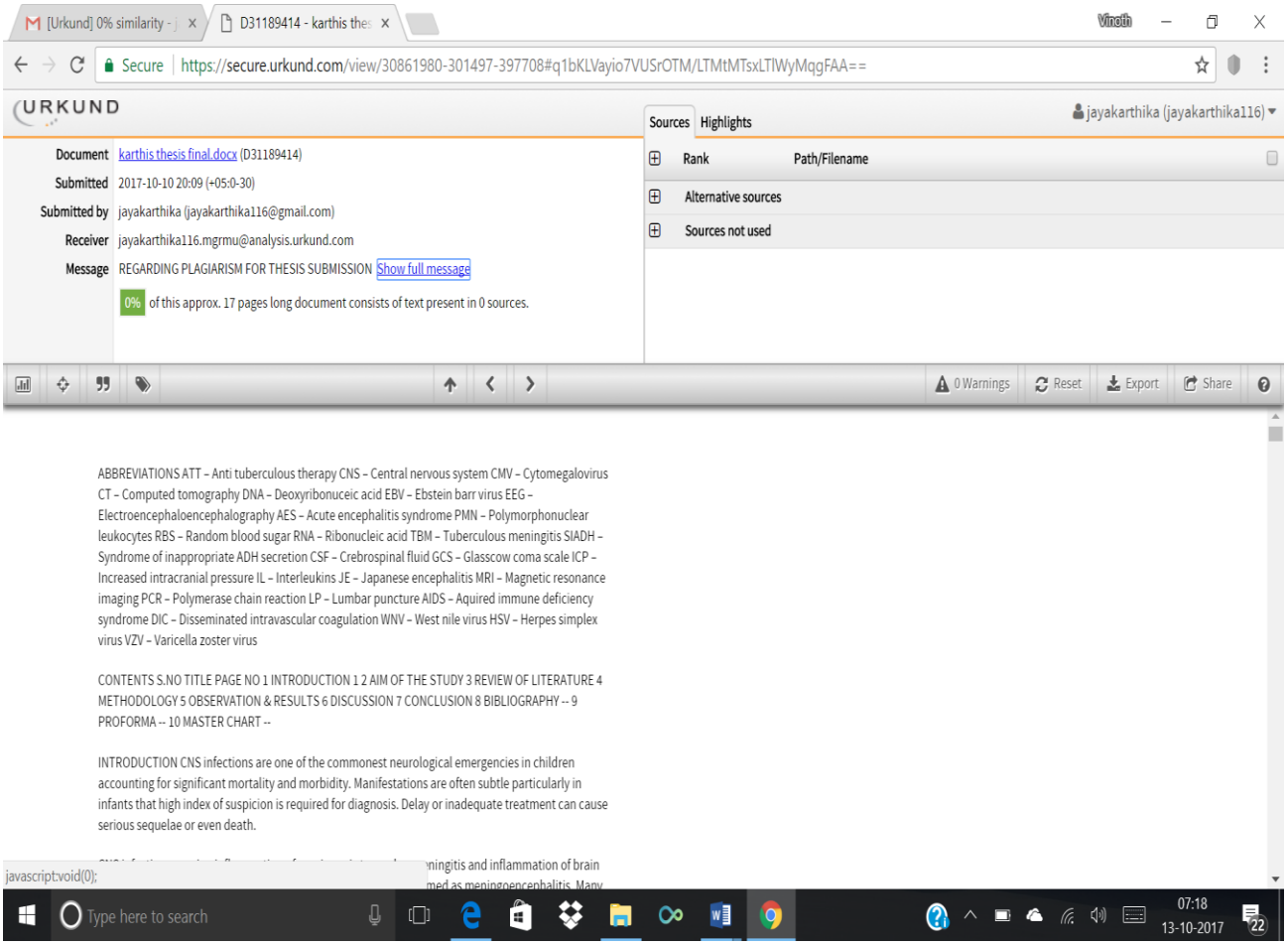
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ABBREVIATIONS ATT – Anti tuberculous therapy CNS – Central nervous system CMV – Cytomegalovirus CT – Computed tomography DNA – Deoxyribonuceic acid EBV – Ebstein barr virus EEG – Electroencephaloencephalography AES – Acute encephalitis syndrome PMN – Polymorphonuclear leukocytes RBS – Random blood sugar RNA – Ribonucleic acid TBM – Tuberculous meningitis SIADH – Syndrome of inappropriate ADH secretion CSF – Crebrospinal fluid GCS – Glasscow coma scale ICP – Increased intracranial pressure IL – Interleukins JE – Japanese encephalitis MRI – Magnetic resonance imaging PCR – Polymerase chain reaction LP – Lumbar puncture AIDS – Aquired immune deficiency syndrome DIC – Disseminated intravascular coagulation WNV – West nile virus HSV – Herpes simplex virus VZV – Varicella zoster virus
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INTRODUCTION CNS infections are one of the commonest neurological emergencies in children accounting for significant mortality and morbidity. Manifestations are often subtle particularly in infants that high index of suspicion is required for diagnosis. Delay or inadequate treatment can cause serious sequelae or even death.
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DECLARATION

I, Dr. R. JAYA KARTHIKA, solemnly declare that the Dissertation titled **"PROFILE OF CHILDREN ADMITTED WITH ACUTE ENCEPHALITIS SYNDROME"** is a bonafide work done by me in the Department of Pediatrics, Government Theni Medical College Hospital, Theni, during the period July 2016 – June 2017.

The Dissertation is submitted to **"The Tamilnadu Dr. M.G.R. Medical university, Chennai"**, Tamilnadu as a part of fulfillment for the requirement of **M.D**.Degree examinations-Branch-VII(Pediatrics) to be held inApril 2017.

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ABBREVIATIONS

AES – Acute encephalitis syndrome

ATT – Anti tuberculous therapy

AIDS – Acquired immune deficiency syndrome

CMV – Cytomegalovirus

CNS – Central nervous system

CSF – Cerebrospinal fluid

CT – Computed tomography

DIC – Disseminated intravascular coagulation

DNA – Deoxyribonucleic acid

EBV – Ebstein barr virus

EEG – Electroencephaloencephalography

GCS – Glascow coma scale

HSV – Herpes simplex virus

ICP – Increased intracranial pressure

IL – Interleukins

JE – Japanese encephalitis

LP – Lumbar puncture

MRI – Magnetic resonance imaging

PCR – Polymerase chain reaction

PMN – Polymorphonuclear leukocytes

RBS – Random blood sugar

RNA – Ribonucleic acid

SIADH – Syndrome of inappropriate ADH secretion

TBM – Tuberculous meningitis

VZV – Varicella zoster virus

WNV – West nile virus

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INTRODUCTION

Central nervous system infections are one of the commonest neurological emergencies in children accounting for significant mortality and morbidity. Manifestations are often subtle particularly in infants that high index of suspicion is required for diagnosis. Delay or inadequate treatment can cause serious sequelae or even death.[1]

CNS infections causing inflammation of meninges is termed as meningitis and inflammation of brain parenchyma is called encephalitis and most often they coexist termed as meningoencephalitis. Many microbes can cause Infection but they are also influenced by the age and immune status of the host and the epidemiology of the pathogen. In general viral infections of the CNS are more common than bacterial infections, which in turn are more common than fungal and parasitic infections. [2]

Aim of the study is to determine the profile of children admitted with acute encephalitis syndrome which includes etiology, clinical presentation, outcome and CSF analysis.

Acute encephalitis syndrome (AES) is a constellation of clinical signs and/ or symptoms, i.e. acute fever, with an acute change in mental status and/ or new onset of seizures. [6] It is a group of clinically similar illnesses caused by different viruses, bacteria, fungus, parasites, spirochetes, chemical/ toxins etc.

Acute Encephalitis Syndrome (AES) poses a great public health problem in India. It has been estimated to be around 50,000 cases and 10,000 deaths annually. [3] It occurs in both epidemics and sporadically. There is a seasonal and geographical variation in the causative organisms too. Viruses are the most common cause of acute encephalitis syndrome world wide. Where population based studies have been undertaken, the incidence ranges between 3.5 and 7.4 cases per 100,000 patient-years. [4]

Acute encephalitis can be associated with severe complications, including impaired consciousness, seizures, limb paresis or death. Japanese encephalitis (JE) has been

considered to be the most important cause of AES in our country. The outbreak of JE usually coincides with the monsoon and post monsoon period when the density of mosquitoes increases while encephalitis due to other viruses speciality entero-viruses occurs throughout the year since it is a water borne disease. The morbidity and mortality is very high among various viral encephalitis specially in JE or entero-virus encephalitis in various parts of India.

AES including JE is reported mainly from Assam, Bihar, Karnataka, Tamil Nadu and Uttar Pradesh which contributes approximately 80% of cases and deaths respectively with a case fatality rate ranging from 20 to 25%. [5] Specific anti-viral drug for AES including Japanese Encephalitis is not available till date and cases are managed symptomatically. Prompt and effective case management needed for better outcome. The clinical characteristics and outcomes in paediatric JE patients hospitalized with acute encephalitis syndrome (AES) are still poorly understood.

India introduced vaccination for JE in several states during 2006, resulting in a drop in cases. However, several areas of the country continue to experience large outbreaks of encephalitis that may be due in part to JE as well as other infectious and non- infectious diseases.

There are several other infectious agents; only few of them are treatable. Bacterial meningoencephalitis, most commonly caused by Streptococcus pneumoniae, Neisseria meningitides, and Haemophilus influenzae type B, are amenable to specific antibiotic treatment and can be prevented by the available vaccines. Tuberculosis also requires specific treatment. Scrub typhus caused by Orientia tsutsugamushi causes encephalitis that is difficult to diagnose, but can be treated easily. Enteric encephalopathy is not rare and needs different management. Malaria is endemic and cerebral malaria is common. Dengue encephalitis and neurological manifestations are commonly seen. [8] However, sufficient data is not available from India on these easily treatable causes of AES. [7]

Viruses that have been implicated in outbreaks of AES, but have not been studied countrywide include Chandipura virus, West Nile virus, Nipah virus, Kyasanur Forest Disease Virus, Enteroviruses and Adenoviruses. [9] consideration should be given to detection of these non-JE AES etiologies, as it will directly impact the formulation of health policies of AES in India.

Viral Encephalitis

Viral infections of the central nervous system (CNS) manifest as meningitis, meningoencephalitis, or encephalitis, in decreasing order of frequency. [10] Inflammation of the brain parenchyma is called encephalitis and disease manifest as neurologic dysfunction like altered sensorium, change in behavior, or personality, sensory or motor deficits, speech or movement disorder, seizure and hemiparesis. [11]

Etiology

Enterovirus: Acute encephalitis is most commonly caused by Enteroviruses. As of 2014, more than 70 serotypes of these small RNA viruses have been identified. The severity of disease varies from primarily meningeal involvement with self limited disease to severe encephalitis causing death or sequelae. Human enterovirus 68 has been associated with neurologic symptoms like Acute flaccid paralysis.

Herpes Virus: Herpes simplex virus (HSV) type 1 causes sporadic encephalitis in children and adults. Illness begins with fever, headache, malaise, vomiting and behavioral changes. Focal neurological signs include hemiparesis, dysphasia and visual field defects. Seizures occurs in 40% which is commonly partial seizures. Brain involvement is focal and if not treated disease progresses to coma and death

occurs in 70% of cases. Diffuse brain involvement with severe disease is seen in HSV type 2. It occurs in neonates who acquired the infection during delivery.

Varicella Zoster Virus: Chicken pox caused by VZV is common in age group of 5 to 9 years and during months of winter. Affected person spreads the virus 2 days before and 5 days after the onset of rash. In children affected with chicken pox <0.1% experience neurological complications. Invasive infections are common in immunosuppressed children like AIDS. Varicella associated ataxia occurs 10 days after the onset of rashes. Cerebellar ataxia (most common manifestation) and behavioral disturbances are maximum at onset and gradually improve during next 4 to 8 weeks. Most of the children recover completely but some may have residual cerebellar or behavioral deficits. Varicella encephalitis occurs 3 to 7 days after the onset of rash and causes fever, headache, seizures or coma.

Parechoviruses: In infants it is an important cause of aseptic meningitis or encephalitis. Causes severe MRI lesions of the cerebral cortex. CSF pleocytosis may be absent at times.

Arboviruses: causes meningoencephalitis during months of summer. Most common vectors are mosquitoes and ticks which spreads the disease to humans. Common arboviruses are West Nile virus (WNV), La Crosse, Powassan, and St. Louis encephalitis viruses.

Cytomegalovirus: Causes various neurologic disorders like encephalitis, myelitis, infantile spasms and GBS. Normal infants and children do not experience the disease even if it occurs disease is self limited. Either it occurs as congenital infection or disseminated disease in immunocompromised hosts.

Epstein-Barr Virus: Causes encephalitis, GBS, acute ataxia, acute chorea and Alice in wonderland syndrome. Primary infections are asymptomatic or infectious mononucleosis can occur which is characterized by fever, malaise, headache, sore throat, lymphadenopathy or rash. In 5% of cases it can cause encephalitis. Alice in wonderland syndrome causes personality changes and illusions of distorted size, shape or distance (metamorphopsia).

Human Herpes Virus 6: causes roseola (exanthema subitem) which is characterized by high grade fever, lymphadenopathy, erythematous rash which appears after fever. HHV6&7 induced encephalitis causes fever with generalized

seizures and transient or permanent hemiparesis. Encephalitis occurs in immunocompromised hosts.

Mumps: Encephalitis by mumps virus is mild but deafness from damage of the 8th cranial nerve may occur as a sequelae.

Adeno Virus: URI, pneumonia, keratoconjunctivitis, encephalitis, aseptic meningitis are diseases caused. Rarely cases coma seizures and meningeal signs.

Picarno Virus: Most common neurologic manifestation of non polio entero virs is aseptic meningitis. Fever, headache, irritability, meningeal signs occur. seizures, coma, focal deficits occur in associated encephalitis.

Other viruses causing meningoencephalitis include respiratory viruses (adenovirus, influenza virus, parainfluenza virus), rubeola, measles, mumps, or rubella.

Pathogenesis

Neurologic manifestations occur in 2 ways

- Virus can directly invade brain tissue, as in viral encephalitis direct invasion of brain tissue occurs by extension from viral meningitis or spreads via nerves like in HSV or rabies. In these conditions virus can be cultured from the brain. [12]

- Other possibility is by initiating an autoimmune response following post infectious encephalitis, leading to acute disseminated encephalomyelitis (ADEM). In such situations a virus cannot be recovered from the brain.

Clinical Features

Virus induced neurologic disorders usually begin with nonspecific signs and symptoms like malaise, anorexia, vomiting, headache, fever, myalgia. Some viruses also produce rash, pharyngitis, diarrhoea, arthralgia, abdominal pain.

Common presentations are

1.Fever- low grade to 40 deg celcius or higher.

2.Seizures- occurs n 15-60% of infants. Partial or generalized. Partial seizures mainly occurs in herpes simplex encephalitis.

3.Altered sensorium-ranges from somnolence, irritability to coma.

Systemic features include erythematous skin rash and oral lesions in enteroviruses; Hepatoslenomegaly and lymphadenopathy in EBV,CMV.

Signs of meningeal irritation

1.Kernigs Sign- Extension of knee in supine position causes involuntary spasm of hamstring muscle.

2.Brudzinski Sign- Flexion of neck cases flexion of knees.

Above signs are often absent in young infants.

Examination shows

- Increased intracranial pressure- pupillary, respiratory and postural abnormalities.
- Focal deficit like aphasia or hemiparesis.
- Hyperreflexia
- Ataxia
- Cognitive disturbances.

Diagnosis

The diagnosis is based on the clinical presentation of CNS symptoms following a nonspecific prodrome with supporting evidence from CSF examination. Other tests

of importance include an electroencephalogram (EEG) and neuroimaging studies. The EEG typically shows diffuse slow-wave activity, usually without focal changes. Neuroimaging studies (CT or MRI) might reveal brain parenchymal swelling. In HSV encephalitis focal seizures along with focal findings on EEG, CT, or MRI involving the temporal lobes will be present.

Certain clues to etiology include

- Neutropenia – herpes viruses, measles, rickettsiae, rubella
- Thrombocytopenia – Ehrlichiosis, rickettsiae
- Eosinophilia – *Toxocara* , *Trichinella* , and other parasites
- Hyponatremia – Rickettsiae, Eastern equine encephalitis virus
- Syndrome of inappropriate antidiuretic hormone secretion – St. Louis encephalitis virus, HSV
- Hypoglycemia, acidosis, abnormal pH, and/or elevated ammonia – metabolic encephalopathy, inborn error of metabolism, toxic ingestion

Lumbar Puncture

Done in all patients with suspected encephalitis (unless contraindicated). Neuroimaging is required before LP in children with suspected encephalitis because they have altered levels of consciousness. MRI is not readily available but it is more sensitive and specific for encephalitis. An opening pressure should be documented. Samples of cerebrospinal fluid (CSF) should be sent for cell count and differential, glucose, protein, Gram stain, bacterial culture

Detection of viral DNA or RNA by polymerase chain reaction is the test of choice in the diagnosis of CNS infection caused by HSV, parechovirus and enteroviruses, respectively.

CSF evaluation

	NORMAL	**VIRAL MENINGOENCEPHALITIS**
PRESSURE(mm h2o)	50-80	Normal or slightly elevated(80-150)
LEUKOCYTES(mm3)	<5,>75% lymphocytes	Rarely >1000PMNs early but mononuclear cells predominate through most of the course
PROTEIN(mg/dl)	20-45	50-200
GLUCOSE(mg/dl)	>50(or 75% of serum glucose)	Normal or <40 n some diseases like mumps.

Bacterial Meningitis

Etiology

Common organisms beyond the neonatal period are Streptococcus pneumonia and Neisseria meningitides. In developed countries because of high vaccination coverage infections caused by H.influenza and S.pnuemoniae has significantly reduced.

Other infections depend mainly on host factors which include

- Immunodeficiency like HIV and anatomic defects- Staph aureus, Pseudomonas aeruginosa, CONS, Salmonella and Listeria monocytogens.
- Defects of complement or properdin system-recurrent meningococcal infections
- Splenic dysfunction or asplenia – H.influenza, pneumococci and sometimes meningococci.
- T lymphocyte defects (AIDS, Malignancy)- Listeria monocytogens.
- CSF leak- pneumococcal meningitis.
- Meningomyelocoele, lumbosacral dermal sinus-staphylococcal, anaerobic, gram-ve organisms.

Pathogenesis

Hematogenous spread of microorganisms from distant foci of infection is the common mode of spread. Infections in the skull or spine sometimes extend to the meninges. There can be preceding or concomitant bacteremia mostly through bacterial colonization of the nasopharynx. Associated viral upper respiratory tract infection also increase the pathogenicity of bacteria causing meningitis. Choroid plexus of lateral ventricles is the site of entry after which they reach meninges and then to subarachnoid space. Due to low antibody and complement concentrations in CSF bacteria multiply rapidly.

Pathophysiology

- Ventriculitis causing inflammation of ventricles leads to bacteria and inflammatory cells in CSF.
- Perivascular inflammatory infiltrates and disruption of ependymal membrane.
- Cerebral infarction**:** Inflammation, vasospasm, and thrombosis leading to vascular occlusion is common and size of the infarct greatly varies.
- Increased ICP occurs due to 3 mechanisms- cytotoxic cerebral edema, vasogenic cerebral edema and interstitial cerebral edema due to rise in hydrostatic pressure. Pressure may go beyond 300 mm H2O. Raised CP and

systemic hypotension both leads to impairment of cerebral perfusion. SIADH also contributes to elevated ICP.

- Oculomotor nerve palsy may occur due to raised ICP since the nerve is compressed during tentorial herniation. Abducent nerve palsy is a nonlocalizing sign in raised ICP.
- Hydrocephalus: Adhesions of the arachnoid villi around the cisterns at the base of the brain leads to communicating hydrocephalus. Obstructive hydrocephalus may sometimes occur due to gliosis of the aqueduct of Sylvius and foramina of Magendie and Luschka.
- Raised CSF Protein: Due to Increase in the permeability of the blood–brain barrier. This leads to loss of albumin-rich fluid from the capillaries.
- Hypoglycorrhachia: is defined as reduced glucose levels in CSF. This is due to reduced transport of glucose by the cerebral tissue.

Clinical Manifestations

Symptoms

Acute in onset with high grade fever, nausea, vomiting, headache, neck pain along with upper respiratory tract or gastro intestinal symptoms. In infants it is usually nonspecific like lethargy and irritability, anorexia, poor feeding and in elder children myalgia ,arthralgia can occur.

Signs

- Meningeal signs:
    - **Neck stiffness**-not able to place the chin over chest.
    - **Kernig's Sign**-Extension of knee in supine position causes involuntary spasm of hamstring muscle.
    - **Brudzinski Sign**-Flexion of neck cases flexion of knees.
- Increased ICP:

Bulging anterior fontanel, separation of sutures, 3rdor 6th nerve palsies, hypertension, bradycardia, apnea, hyper ventilation, decorticate or decerebrate posturing, stupor and coma can occur.

- Altered level of consciousness:

Child may be obtunded or comatose which are associated with poor outcomes.

- Seizures:

Multiple causes like cerebritis, infarction, electrolyte disturbances contribute to seizures.

Persistence after the 4th day are difficult to treat.

Complications

- Systemic complications like shock, DIC, myocarditis and SIADH
- Seizures and status epilepticus
- Subdural effusion or empyema
- Brain abscess
- Deafness
- Hydrocephalus
- Ventriculitis and arachnoiditis
- Mental retardation
- Focal neurological deficits like hemiplegia, aphasia, ocular palsy, hemianopsia

Diagnosis

Initial tests include complete blood count with differential count, RBS, blood urea, creatinine and blood culture. Analysis of CSF is of utmost importance in diagnosing cases of bacterial meningitis. CSF is tested for cell count including differential count, sugar, protein, gram stain, culture and sensitivity.

	NORMAL	ACUTE BACTERIAL MENINGITIS
PRESSURE(mm h2o)	50-80	Elevated (100-300)
LEUKOCYTES(mm3)	<5,>75% lymphocytes	100-10000, usually 300-2000 PMNs predominate
PROTEIN(mg/dl)	20-45	100-500
GLUCOSE(mg/dl)	>50(or 75% of serum glucose)	Decreased usually <40 or < 50% of serum glucose

- Gram Stain

Characteristic morphology of common pathogens:

- Gram-positive diplococci - *S. pneumoniae*
- Gram-negative diplococci - *N. meningitidis*
- Small pleomorphic gram-negative coccobacilli - Hib
- Gram-positive cocci or coccobacilli - group B streptococcus
- Gram-positive rods and coccobacilli - *L. monocytogenes*

- Culture

Positive cultures confirm the diagnosis of bacterial meningitis.

- Rapid diagnostic tests

Antigen tests are reserved for cases where the initial CSF Gram stain is negative and CSF culture is negative after 48 hours of incubation.

- Other tests

  - Elevated serum procalcitonin (>0.5 ng/mL) helps to distinguish bacterial from viral meningitis.
  - The presence of tumor necrosis factor may distinguish bacterial from viral meningitis.
  - The presence of IL-1 or IL-10 correlate with meningitis, but whether these indicators are sensitive and specific enough to accelerate the diagnosis remains to be determined.

Treatment

- Empirical therapy includes inj. vancomycin 60 mg/kg/day divided 6th hrly, 3rd generation cephalosporin cefotaxime (300 mg/kg/24 hr, given every 6hrly) or ceftriaxone (100 mg/ kg/24 hr given OD or 50 mg/kg/dose, given every 12hr). N
- In children who are allergic to β-lactam antibiotics and >1 mo of age chloramphenicol, 100 mg/kg/24 hr, given every 6 hr can be given.N
- In suspected *L. monocytogenes* infection, like in young infants or children with a T-lymphocyte deficiency, ampicillin (200 mg/kg/24 hr,in 4 divided doses) is also given because cephalosporins are not active against *L. monocytogenes.* Alternative is Intravenous trimethoprimsulfamethoxazole.
- For Gram-negative bacterial meningitis and in immunocompromised children ceftazidime and an aminoglycoside or meropenem is given as initial therapy.

Duration of treatment

- Uncomplicated penicillin-sensitive *S. pneumoniae* meningitis - 10-14 days (third-generation cephalosporin or iv penicillin)
- Resistant to penicillin and third-generation cephalosporin- treat with vancomycin.
- No identifiable pathogen, but evidence of an acute bacterial infection is present- continue treatment with ceftriaxone or cefotaxime for 7-10 days.

- Gram-negative bacillary meningitis treatment should be given for 3 weeks.

Corticosteroids

Rapid killing of the bacteria releases toxic cell products causing cytokine-mediated inflammatory cascade which may worsen the condition. To prevent this Intravenous dexamethasone 0.15 mg/kg/ dose given every 6 hr for 2 days,(1^{st} dose before starting antibiotics) is given for acute bacterial meningitis caused by *H. influenzae* type b. It also decreases duration of fever, reduces CSF protein and lactate levels, and decreases incidence of sensorineural hearing loss.

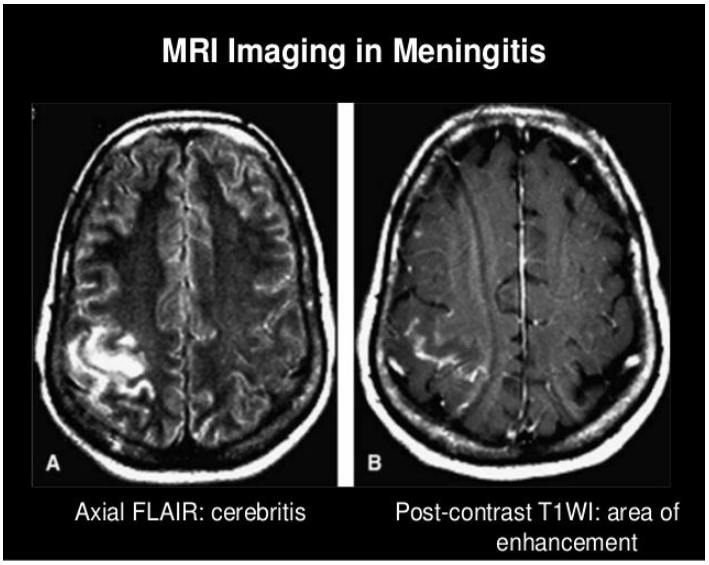
Supportive care

- Increased intracranial pressure.
  - Mannitol 20% I/V.
  - Injection Lasix I/V. 1 mg /kg upto 40 mg can be given.
- Convulsions – Benzodiazepine followed by phenytoin/phenobarbitone
- Fluid restriction in cases of SIADH
- Nursing care

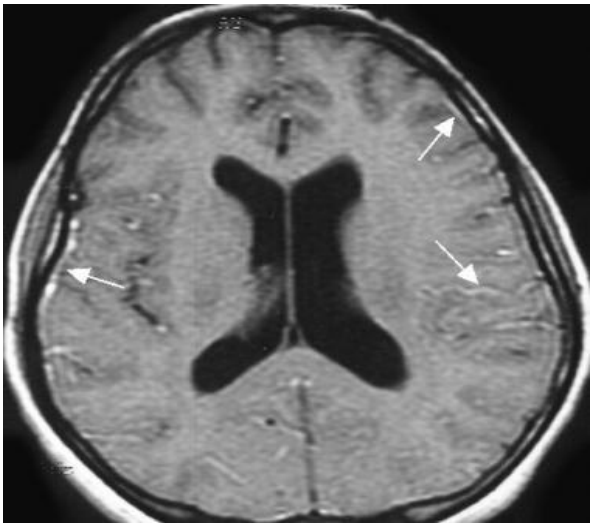
Treatment of complications

- Subdural empyema – drainage along with intensive antibiotic therapy
- Internal hydrocephalus – Ventriculo peritoneal shunt.

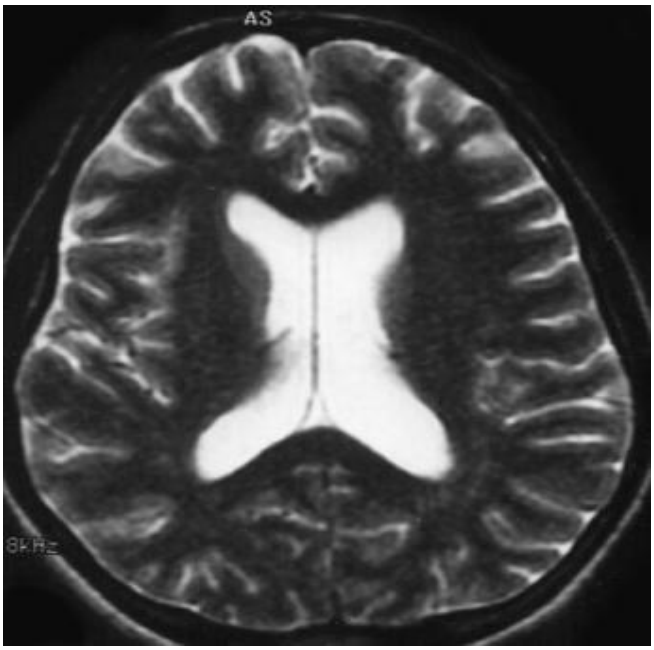
Bacterial meningitis:



Cerebritis and areas of enhancement



Contrast enhanced T1 mri showing leptomeningeal enhancement(arrows)



Axial t2 mri showing mild ventriculomegaly

Tuberculous meningitis

TBM is the most common and most dangerous form of neurotuberculosis. It occurs secondary to primary extracranial tuberculosis particularly pulmonary and it is more common in children compared to adults. [13]

Epidemiology

- **Age**

Common age group affected are children between 6 months – 4 years of age. Disease occurs during primary infection with tuberculosis or with miliary tuberculosis. Tuberculous meningitis occurs in 0.3% of untreated tuberculosis infections in children. In children with tubercular disease TBM is main cause of death and disability. [14]

Forms of neurotuberculosis

1. **Intracranial:**
    - TBM
    - TBM with military tuberculosis

- Tuberculous vasculopathy
- Space occupying lesions- tuberculomas, tuberculous abscess.

2. **Spinal:**
    - Pott's spine and pott's paraplegia
    - Tuberculous arachnoiditis
    - Spinal meningitis
    - Non-osseous spinal tuberculoma

Pathogenesis

- The organism reaches the meninges through hematogenous route. Other modes of spread are cranial lymphatics or the cervical lymph nodes. Reaching the meninges or the cerebral cortex metastatic caseous lesion develops and releases tubercle bacilli into the subarachnoid space.
- The bacilli proliferate and cause perivascular exudation followed by caseation, gliosis and giant cell formation. (21)
- Tuberculous meningitis may occur as part of generalized miliary tuberculosis with tubercles in the choroids plexus directly infecting the meninges.

Pathology

- Meningeal exudate which is composed of fibrin and inflammatory cells lies in the subarachnoid space.
- At the level of basal cisterns or 4th ventricle or aqueduct of sylvius, obstruction of CSF pathway occurs leading to hydrocephalus.
- Cerebral infarcts form around the sylvian fissure and basal ganglia. [15]
- Inflammation of blood vessel occurs because of surrounding exudates leading to endarteritis.
- Because of ischemia and infarcts brain parenchyma gets damaged.S.
- On cut section ventricles are dilated, ependyma is inflamed, congested and granular.
- The choroid plexus is congested, edematous and studded with tubercles (22)

Clinical manifestations

PATHOLOGICAL EVENT	CLINICAL PRESENTATION
Meningeal exudate	Meningeal signs Hydrocephalus Cranial nerve involvement
Brain parenchyma involvement	Clouding of consciousness Seizures
Arteritis and vascular obstruction	Focal neurological deficit
Hypersensitivity response	Massive brain edema, Raised ICP

Clinical stages

- **First stage:**

No definite neurological symptoms. Patient is fully conscious and alert.

Lasts for 1-2 weeks. Nonspecific symptoms such as fever, head ache, irritability, drowsiness and malaise may be present.

- **Second stage:**

Signs of meningitis, drowsiness or lethargy, cranial nerve palsies occur.

- **Third stage:**

  Severe clouding of consciousness, stupor, coma, convulsions, gross paresis or paralysis occur. [16]

Diagnosis

1.CSF analysis

	NORMAL	**TUBERCULOUS MENINGITIS**
PRESSURE(mm h2o)	50-80	Usually elevated
LEUKOCYTES(mm3)	<5,>75% lymphocytes	10-500 PMNs early, but lymphocytes predominate most of the course
PROTEIN(mg/dl)	20-45	100-3000
GLUCOSE(mg/dl)	>50(or 75% of serum glucose)	<50 in most cases

CSF- microbological examination:

- Staining with fluorescent stains (auramine or rhodamine) is a rapid screening method and ziehl nielson staining is necessary for diagnosis.
- Culture of CSF for TB takes about 6-8 weeks. Positivity rates ranges from 25 to 70%.
- Liquid media- BACTEC system detects growth of AFB in 8-14 days by measuring release of Co2.
- Culture of other body fluids like gastric juice, urine helps in confirming the diagnosis.

2.Neuroimaging

- **skiagram of skull**- separation of sutures will be seen in infants with hydrocephalus. Meningeal calcification if present may be noted.
- **CT brain**-Basilar exudates appear as enhancing areas in basal cisterns described as spider leg appearance. Infarcts are seen mainly in the thalamus, basal ganglia and internal capsule.49S.
- **MRI brain**– Contrast enhanced MRI detects diffuse and focal granulomatous lesions in meninges.

3.Nucleic acid tests

PCR testing is done when there is clinical suspicion to start empiric therapy and AFB stains of the initial samples are negative. The assay MTBDRplus also detects rifampin and isoniazid resistance mutations.

4.Mantoux

Non reactive in up to 50% of cases

5.Chest X-Ray

20- 50% have normal chest X-ray

Treatment

1. Anti tuberculous drugs along with steroids is used

Under RNTCP, Category I is used with slight modification in which streptomycin is added in the intensive phase and maintenance phase is for 6-9 months (28)

2. Supportive treatment

3. Surgical treatment for hydrocephalus

Complications

- **Immediate**

  · Cerebral edema

  · Convulsions

  · Fluid and electrolyte imbalance

  · Vascular thrombosis of cerebral vessels

  · Focal neurological deficits

  · Adverse effects of ATT

- **Late**

  · Motor deficits

  · Mental retardation

  · Optic atrophy

  · Partial high tone deafness

  · Movement disorders

  · Hypothalamic syndromes

  · Hydrocephalus

Prognosis

Prognosis depends on younger age, malnutrition status, extent and severity of infection, recurrent seizures, level of elevated CSF protein, low CSF glucose, associated miliary tuberculosis and intercurrent infections. [17] [18] [19]

REVIEW OF LITERATURE

In a study conducted by Bhaswati Bandyopadhyay, Debijit Chakraborty et al [20] on Epidemiological Investigation of an outbreak of Acute Encephalitis Syndrome in Malda district of WestBengal collected data from cases admitted in Malda medical college and Kaliachak BPNC and stated that all children were of age group 9 months to 10 years and belonged to lower socio economic group. The main presenting features were sudden onset of convulsions (100%) in the early hours of dawn followed by rapid progression to unconsciousness (100%) and decerebrate rigidity (47%). Clinical samples subjected to molecular and serological testing, were all found negative for known viruses causing acute encephalitis.

In another study conducted by Y. R.Khinchi, A. Kumar, S.Yadav [21] in Department of Pediatrics and Neonatology, College of Medical Sciences, Bharatpur, Nepal concluded that encephalitis was documented significantly more in males as compared to females whereas meningitis was more commonly observed in females. Serology for JE IgM (ELISA) was positive in 11cases as per documented reports received from WHO field office out of 61 total cases of AES.

Ajit Rayamajhi, Imran Ansari et al [22] study conducted in Kanti Children's Hospital, Maharajgunj, Kathmandu, Nepal stated that AES patients of suspected viral aetiology more frequently had a bad outcome than those with bacterial or

plasmodium infection. JE patients more frequently had a bad outcome than those with AES of unknown viral etiology.

Another study conducted by Sneha Kamble and Bellara Raghvendra [23] at the Department of pediatrics, VIMS, Bellary stated that higher proportion of subjects were toddlers (30.1%), followed by pre-school children (26.5%). Majority of them being males 88 (64.7%) and 44 (32.3%) were females. The predominant presenting feature was fever, followed by convulsions 102 (75%) and vomiting 85 (62.5%). Among the 136 study AES cases, 115 (84.5%) were suspected for viral etiology (JE and dengue).

In Uttarpradesh a study done by Pramit Shrivastava, Dhirendra Kumar Shrivastava et al [24] in cases discharged after treatment at BRD Medical College, Gorakhpur stated that maximum number of deaths was seen in 0-1 year age group and maximum severe sequelae was seen in age group 1-5. The sequelae was more in forms of behavioral problems (77.6%), low intellect in school or routine task (57.2%), poor speech (20.4%), hearing (14.3%), motor and locomotion (8.9%).

Another study conducted in Uttarpradesh, from Kushinagar district by Manish Kakkar, Elizabeth T. Rogawski [25] and others reviewed AES surveillance data and

a total of 812 AES case records were identified, of which 23% had illogical entries. AES incidence was highest among boys <6 years of age, and cases peaked during monsoon season.

Saumyen De, Sanjana Samanta et al [26] conducted a study in Children with AES upto12 years of age who were admitted in pediatric ward of NRS Medical College & hospital (West Bengal, India) concluded that out of 24 cases of AES, 6 patients (25%) were JE and 18 patients (75%) were non-JE. The predominant age group affected was 4 to 12 years and the youngest child affected was 9 months old. Majority of the patients (85%) were from the rural area and belonged to low socioeconomic group (72%).

In a study by Rathore k et al [27] at ICMR Odisha among 526 cases Herpes simplex virus (HSV; types I or II) was most common (16·1%), followed by Measles (2·6%), Japanese encephalitis virus (1·5%), Dengue virus (0·57%), Varicella zoster virus (0·38%) and Enteroviruses (0·19%). Rash, paresis and cranial nerve palsies were significantly higher with viral AES.

In a study by Jain et al [28] at King George Medical University Lucknow out of a total of 500 cases JEV was the most commonly detected (16.2%), followed by DV

(10.8%), HSV (9.3%), Measles virus (8.9%), Mumps virus (8.7%), VZV (4.4%), and Enterovirus (0%). Co-positivity with more than 1 virus was observed in 12 patients. Maximum mortality was caused by JEV infection, while patients with HSV infection had maximum residual neuro-psychiatric disability.

In a study done by Rakesh Kumar et al [29] in the department of Medicine at BRD Medical College, Gorakhpur concluded that the most common presenting symptoms were fever and altered sensorium. Mean GCS at the time of admission was found to be 8.95 in AES cases. Viral etiology was confirmed in 86.5% of cases, bacterial in 8.5% and cerebral malaria in 5%.

STUDY

Title:

PROFILE OF CHILDREN ADMITTED WITH ACUTE ENCEPHALITIS SYNDROME

Aims and objectives:

1. To study the etiological profile of children with acute encephalitis syndrome
2. To identify the most common pattern of clinical presentation in children with acute encephalitis in Govt Theni Medical College Hospital, theni.
3. To study the Immediate outcome of children with AES.

Study design:

Descriptive study

Study place:

Paediatric ward, Department of Microbiology, Govt Theni Medical College Hospital.

Study population:

Children aged 1 month to 12 years admitted in pediatric ward, Govt theni medical college as acute encephalitis syndrome.

Study duration:

June 2016 to August 2017

Materials and methods

Inclusion Criteria:

All infants and children aged 1 month to 12 yrs of age admitted with provisional diagnosis of acute encephalitis syndrome in department of paediatrics Govt Theni Medical College Hospital Theni during the study period were consecutively recruited in the study.

AES is defined as a person of any age at any time of the year with acute onset of fever and atleast one of

1. Change in mental status (confusion, disorientation, coma or inability to talk)
2. New onset of seizures (excluding simple febrile seizures)

(Guidelines by Directorate of National Vector Borne Diseases Control Programme and WHO)

Exclusion Criteria:

1. Simple Febrile seizures
2. Seizure disorder

3. Traumatic encephalopathy

4. Metabolic encephalopathy

Children admitted as acute encephalitis syndrome during the one year study period were consecutively recruited into the study after getting informed consent from the parents.

All children included in the study had the following done:

1. Detailed history

2.Detailed examination

3.Serum and CSF samples for analysis

4.Neuro imaging

Investigations:

1. Complete hemogram
2. Blood glucose

3. Serum electrolytes
4. Renal function test
5. CSF analysis
6. Serum:
    a. IgM measles & Mumps
    b. IgM Herpes simplex virus
    c. IgM Japanese encephalitis
    d. IgM varicella
    e. IgM Adeno virus
7. Blood culture
8. Neuroimaging –CT/MRI

Lumbar puncture:

General indications:

- Suspected CNS infection

- Suspected subarachnoid hemorrhage
- Instillation of chemotherapy
- Injecting contrast for imaging
- Removal of CSF in treatment of psuedotumor cerebri.

Contraindications:

- Increased intracranial pressure
- Bleeding diathesis
- Thrombocytopenia
- Cardiopulmonary instability
- Infection at the site of puncture site

Procedure:

Antiseptic solution and alcohol is used to clean the site.

Size of the needle depends on the age:

- <2 yrs - 1.5 inches (3.75 cm)
- Between 2 to 12 years, 2.5 inches (6.25 cm)
- 12 years, 3.5 inches (8.75 cm)

LP needle with stylet has to be inserted at the level of cauda equina distal to the spinal cord

An imaginary line drawn from posterior-superior iliac crests crosses the spine at 4th lumbar vertebra. This landmark helps to locate the L3-L4 and L4-L5 interspaces.

In older children, LP can be performed from the L2-L3 interspace to the L5-S1 interspace because these interspaces are below the termination of the spinal cord. LP in children younger than 12 months must be performed below the L2-L3 interspace.

Positioning:

The lateral recumbent or the sitting position is used for LP.

Complications:

- Postspinal headache - most common complication following lumbar puncture is Postspinal headache. But it is less common compared to adults.
- Using small possible needle and placing the bevel of the needle parallel to the long axis of the spine may prevent or lessen postspinal headache.
- Epidermoid tumor - It may be caused by epidermoid tissue that is transplanted into the spinal canal during LP without a stylet, or with one that is poorly fitting.

- Infection - Meningitis can be induced if the LP is performed through cellulitis or soft tissue infection at the site of puncture.
- Cerebral herniation - This can occur when LP is performed in a patient with increased intracranial pressure (ICP).
- Computed tomography (CT) of the head should be performed before LP for children who are at increased likelihood of elevated ICP.
- Spinal hematoma - Spinal hematoma is a complication after LP that usually occurs in patients with uncorrected bleeding disorders,

Stylet is removed on reaching the subarachnoid space. CSF collected in 3 sterile tubes one for bacterial culture, one for cytology and biochemistry and 3rd for viral identification, sent to the laboratory and processed.

Transport of specimen:

Collected samples are sent to the laboratory with requisition form containing relevant information. Sample chosen for bacterial culture is not refrigerated.

Remaining samples are refrigerated and analysed for cytology, biochemistry, antibody detection by serological method and molecular study.

Processing of CSF:

Centrifugation:

For samples <1ml- vortex 30 seconds.

For samples more than 2 ml-3000 rpm for 20 minutes.

Wet mount examination:

For bacteria, pus cells and RBCs.

To identify capsulated organisms india ink staining is used.

Grams stain:

Smear is prepared with 1-2 drops of CSF, air dried and fixed with methanol or heat. It is examined for pus cells and bacteria.

Culture:

Blood agar, chocolate agar, macConkey and RCM broth were used. Then incubated for 48 hrs at 37 degree celcius and examined at 24 hrs for macroscopic evidence of growth.

Data analysis

Above data was analysed according to etiology, clinical presentation and immediate outcome studied.

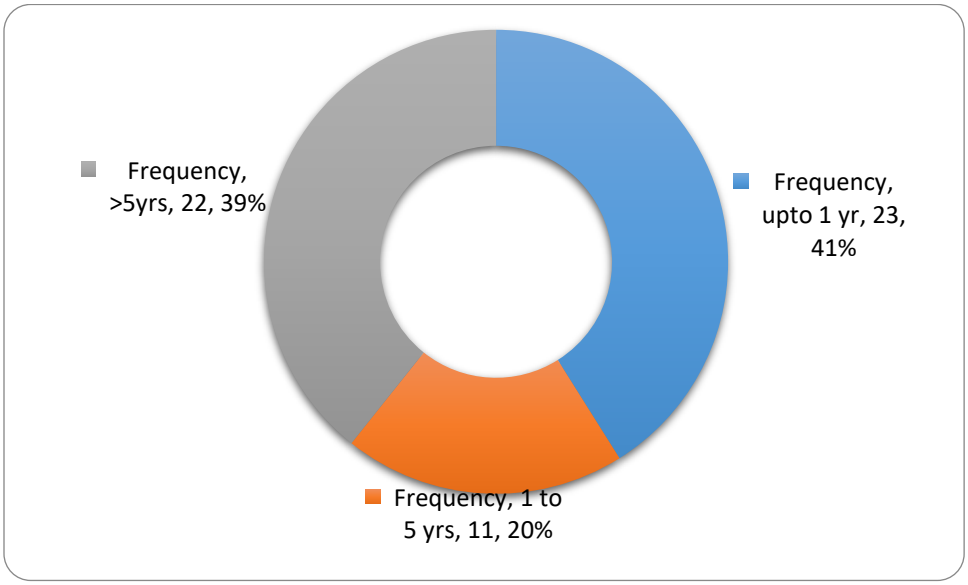
Data entered in excel sheet and analysed using SPSS progam.

RESULTS AND OBSERVATIONS

During the period of July 2016 to June 2017 a total of 5400 patients were admitted in the pediatric ward in theni medical college hospital among which 56 children were suspected as acute encephalitis syndrome based on the clinical presentation. The prevalence of acute encephalitis syndrome was 1.03% in this study.

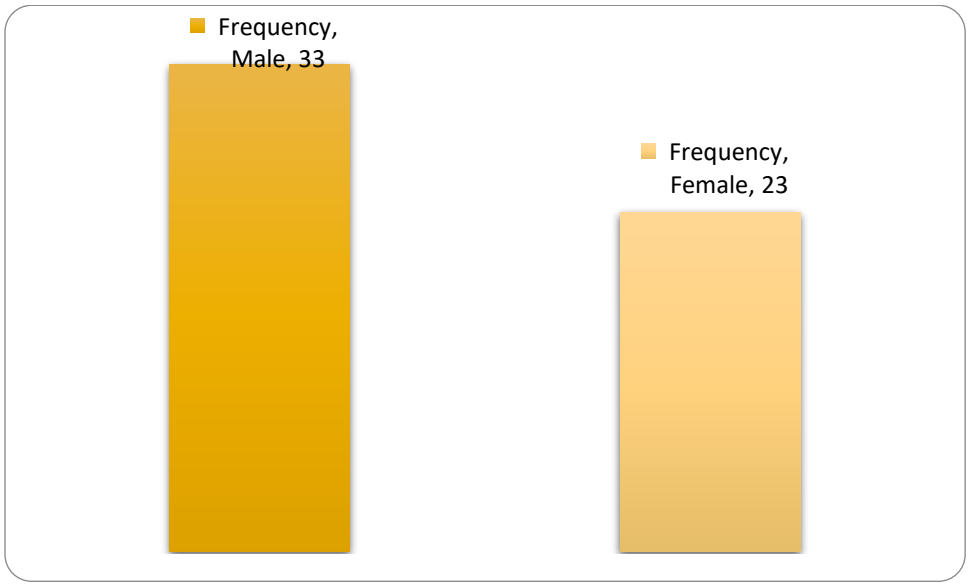
Age distribution

Age	Frequency	Percent
Up to 1 yr	23	41.1
1 to 5 yrs	11	19.6
>5yrs	22	39.3
Total	56	100



Gender distribution

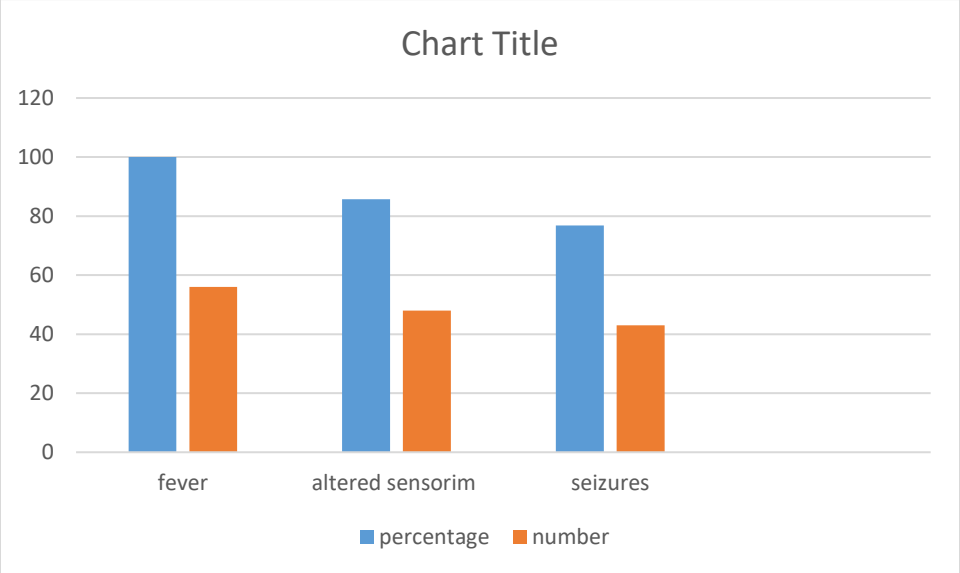
Gender	Frequency	Percent
Male	33	58.9
Female	23	41.1
Total	56	100



A total of 56 patients in the age group of 1 month to 12 years with a clinical diagnosis of acute encephalitis syndrome were included in the study of which 33 patients were male(58.9) and 23 patients were female(48.1) with male female ratio of 1.4:1.

Symptomatology

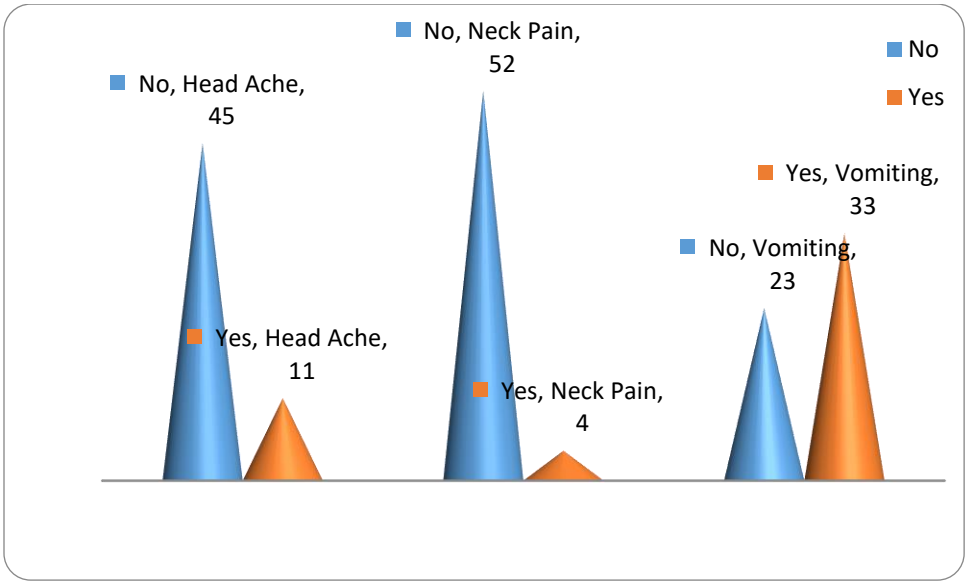
Symptoms	Fever	Altered Sensorium	Seizures
Yes	56 (100%)	48 (85.7%)	43 (76.8%)
No	-	8 (14.3%)	13 (23.2%)



The commonest presenting symptom was fever (100%). The next common symptom was altered sensorium (85.7%) followed by seizures (76.8%).

Meningeal symptoms

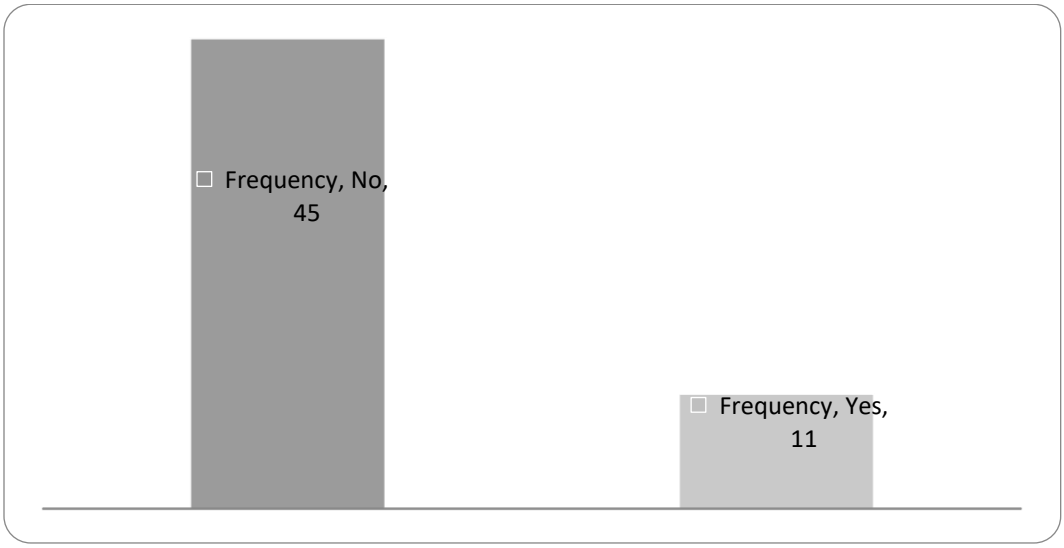
Symptoms	Head Ache	Neck Pain	Vomiting
Yes	11 (19.6%)	4 (7.1%)	33 (58.9%)
No	45 (80.4%)	52 (92.9%)	23 (41.1%)



In this study total of 18 patients presented with features of meningeal irritation of which vomiting was the most common complaint (58.9%) followed by headache (19.6%) and neck pain (7.1%)

Development history

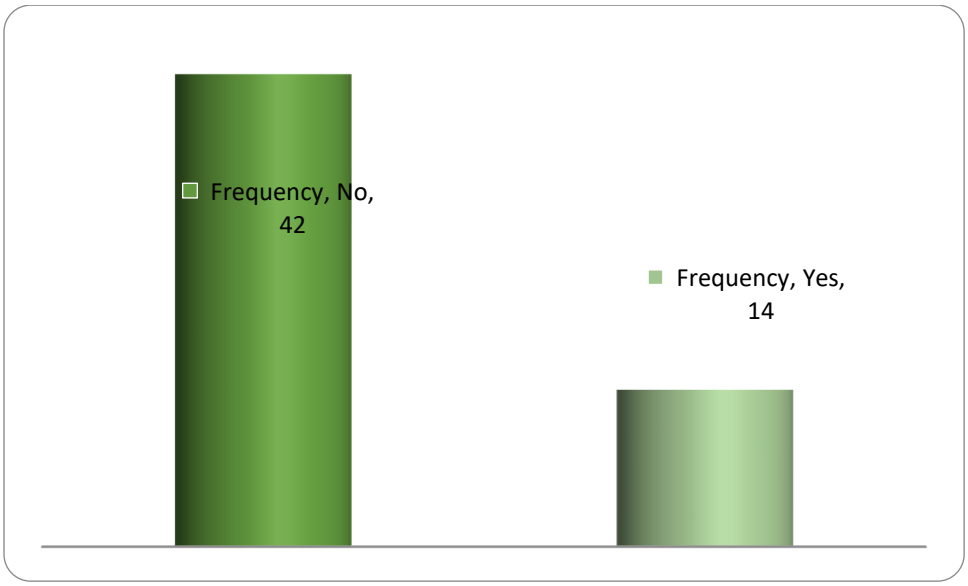
Developmental delay	Frequency	Percent
Yes	11	19.6
No	45	80.4
Total	56	100



Out of 56 cases 11 children (19.6%) had history of developmental delay and 45 (80%) were developmentally normal children.

Prehospital antibiotic therapy

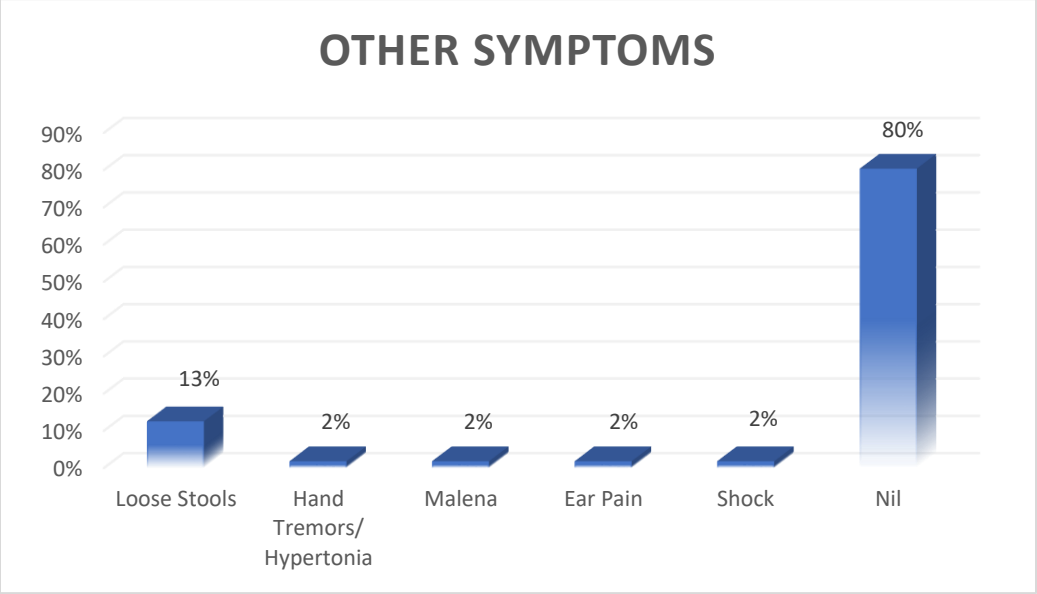
Pre Hospital Antibiotic therapy	Frequency	Percent
Yes	14	25
No	42	75
Total	56	100



Among 56 children 14 patients (25%) received antibiotics prior to admission and 42 children (75%) did not receive any medications prior to hospital admission.

Other Symptoms

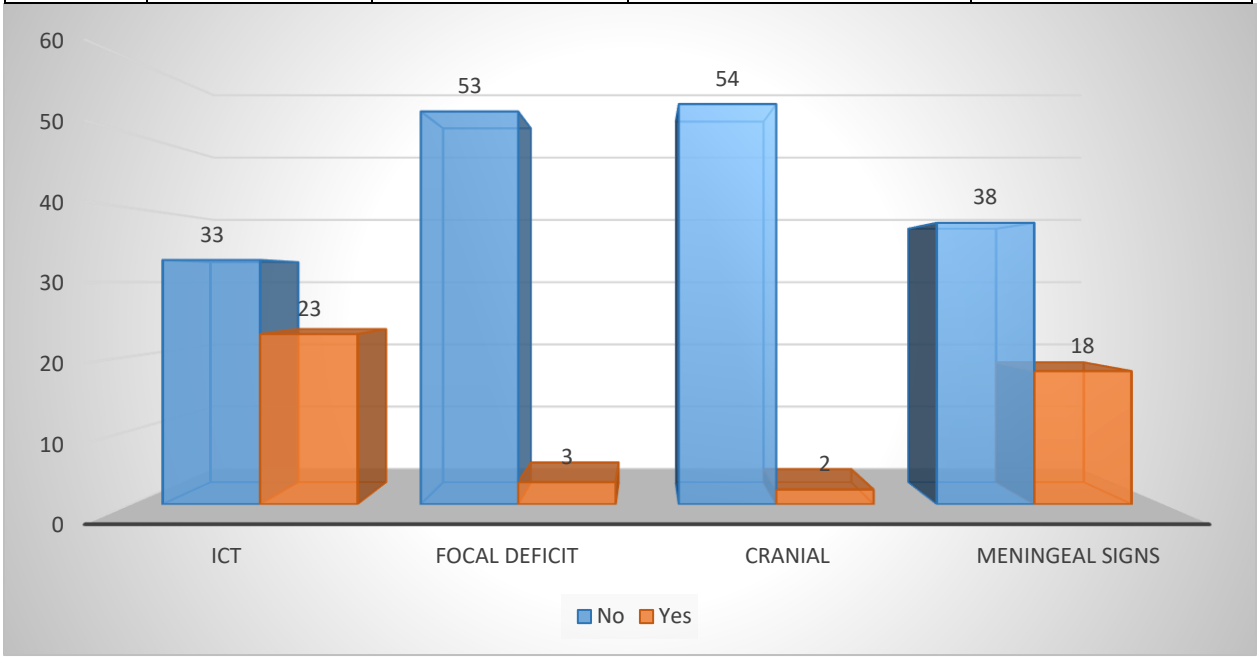
Others	Frequency	Percent
loose stools	7	12.5
hand tremors/hypertonia	1	1.8
Malena	1	1.8
Ear pain	1	1.8
Shock	1	1.8
Nil	47	83.9



Some rare presentations include loose stools, malena, hypertonia and tremors. History of loose stools was present in significant no of cases (12.5%).

Signs

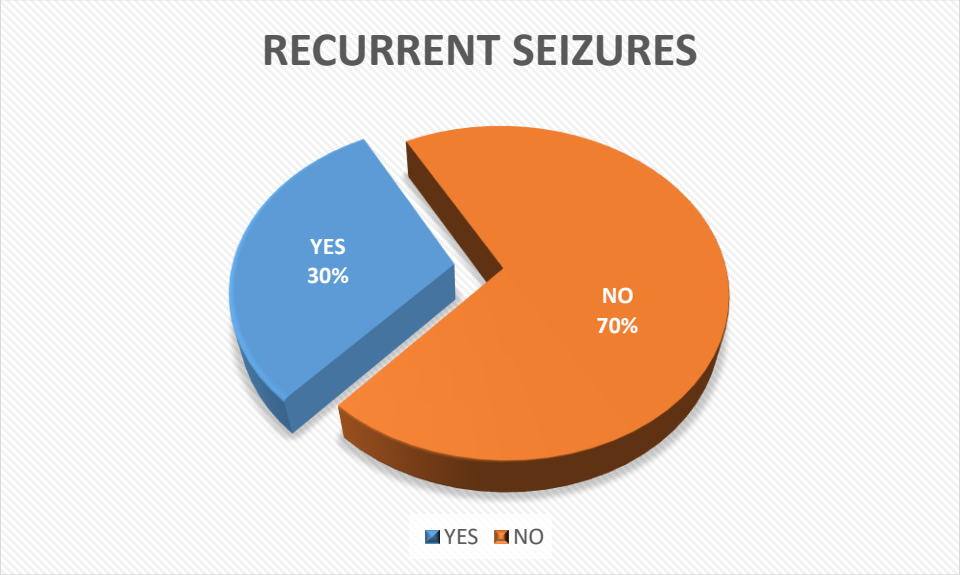
	ICT	Focal Deficit	Cranial nerve palsies	Meningeal Signs
Yes	23 (41.1%)	3 (5.4%)	2 (3.6%)	18 (32.1%)
No	33 (58.9%)	53 (94.6%)	54 (96 .4%)	38 (67.9%)



Out of 56 cases 23 children (41.1%) had features of raised ICT which was the most common sign. Meningeal signs were present in 18 (32.1%) children. Focal neurological deficit was present in 3 (5.4%) children and cranial nerve palsies in 2 (3.6%) children.

Recurrent seizures

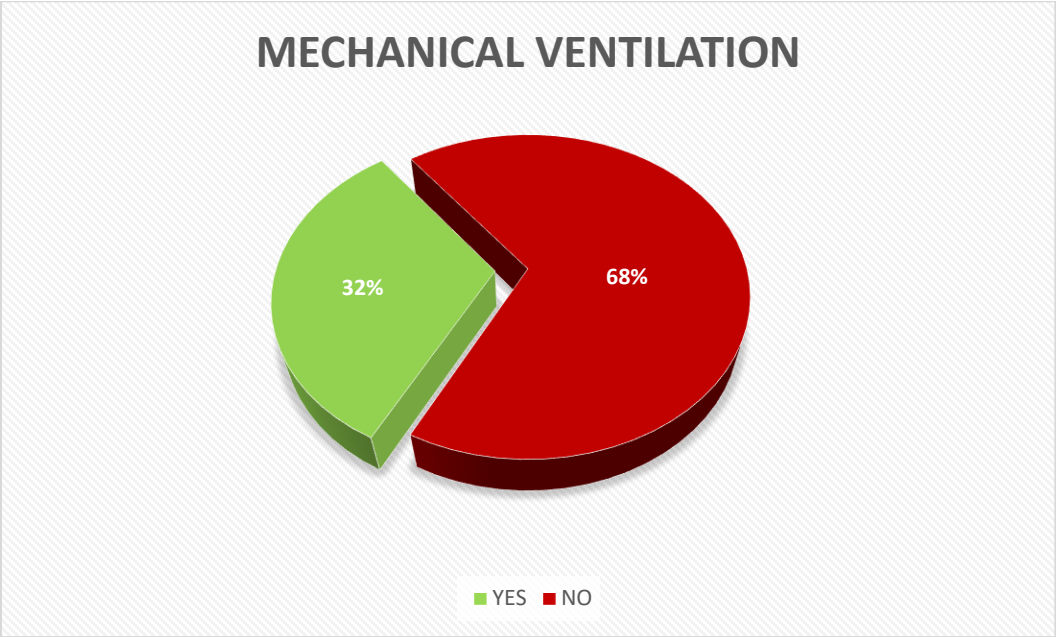
RECURRENT SEIZURES	FREQUENCY	PERCENT
YES	17	30.4%
NO	39	69.6%



Out of 56 children 17 cases (30.4%) had recurrent seizures during hospital stay.

Need for mechanical ventilation

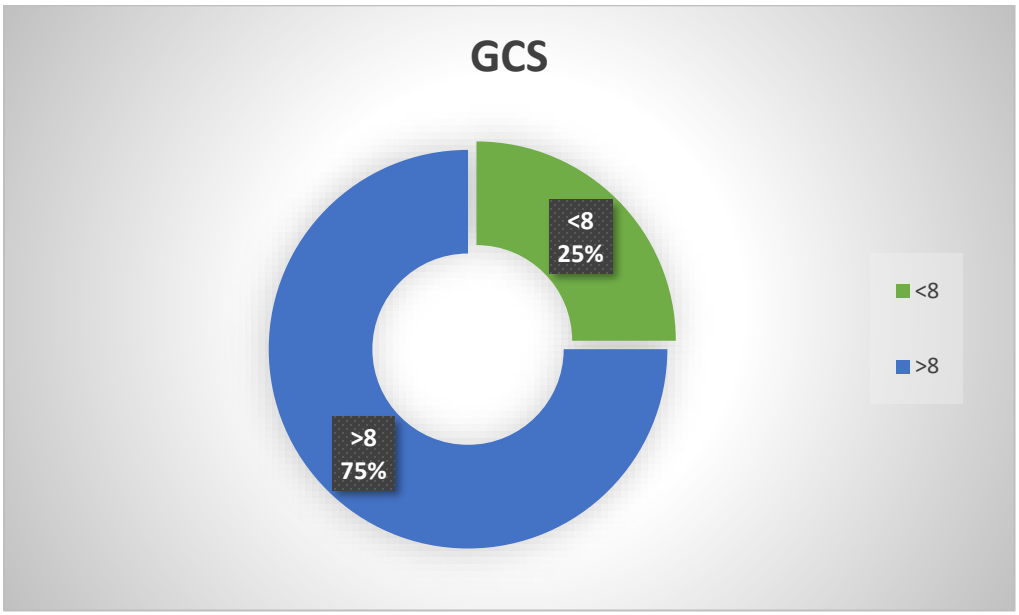
MECHANICAL VENTILATION	FREQUENCY	PERCENT
YES	18	32.1%
NO	38	67.9%



Out of 56 cases 18 cases required mechanical ventilation for various reasons.

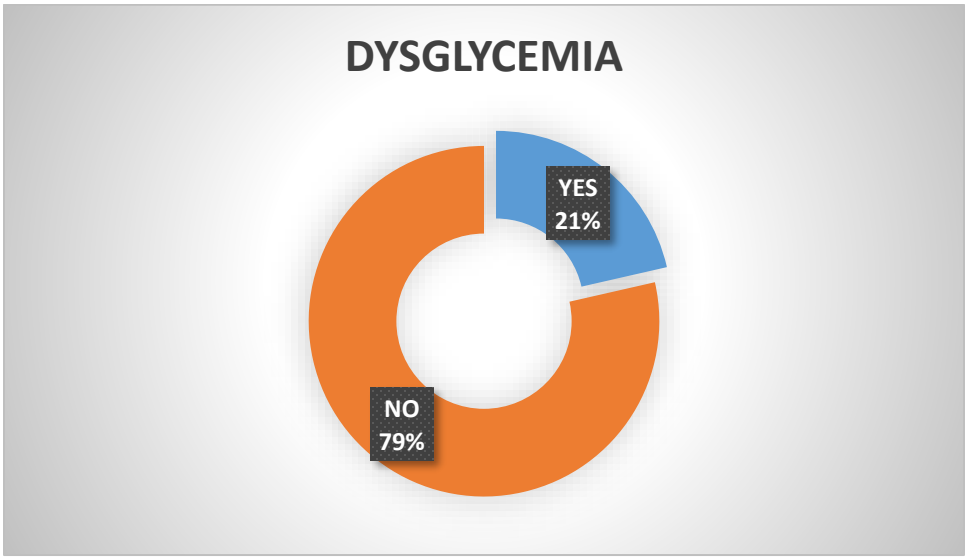
GCS

GCS	FREQUENCY	PERCENT
<8	14	25
>8	42	75



Dysglycemia

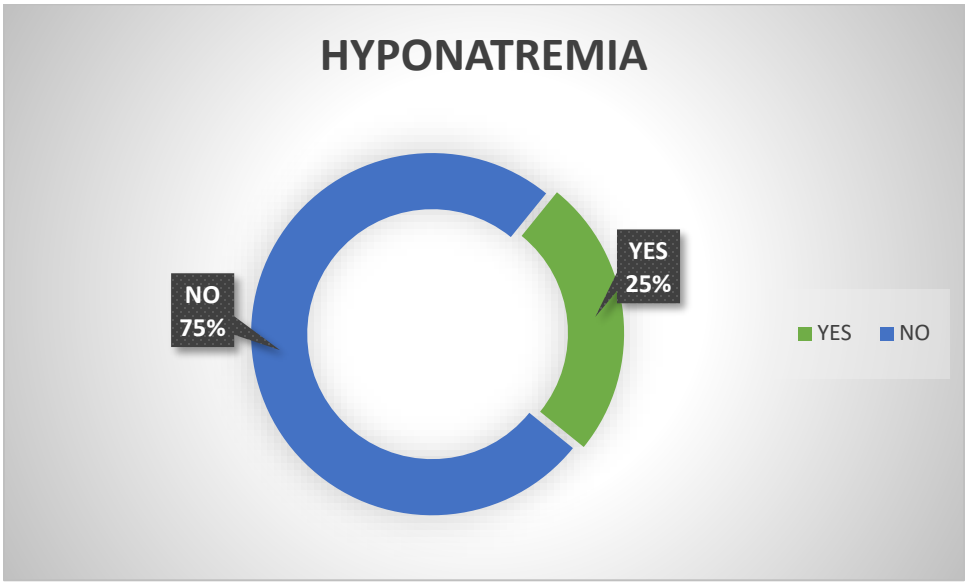
DYSGLYCEMIA	FREQUENCY	PERCENT
YES	12	21.40%
NO	44	78.60%



In our study 2 children (3.5%) had hypoglycemia and 10 children(17.8%) had hyperglycemia at the time of admission of admission.

Hyponatremia

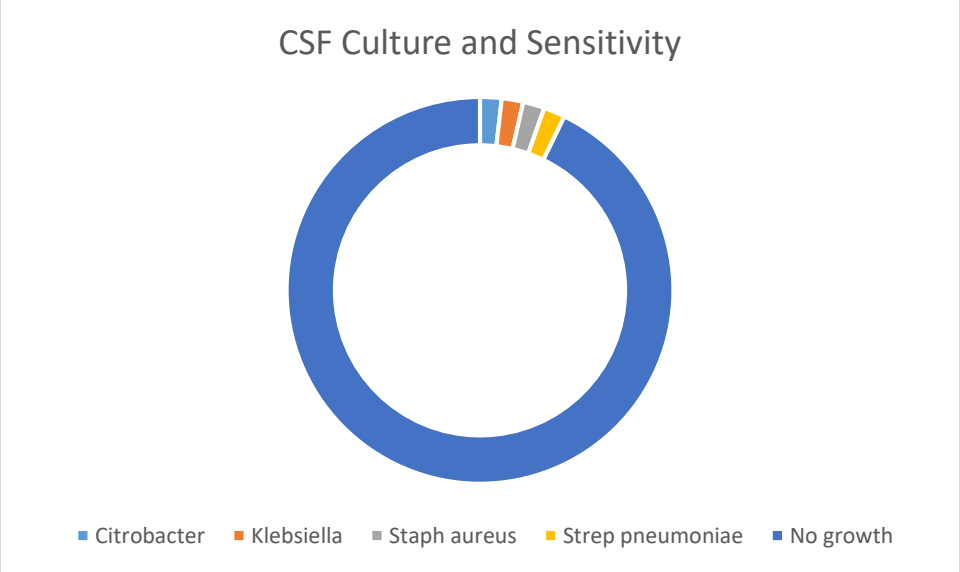
HYPONATREMIA	FREQUENCY	PERCENT
YES	14	25
NO	42	75



Incidence of hyponatremia was 25% in this study.

CSF culture and sensitivity pattern

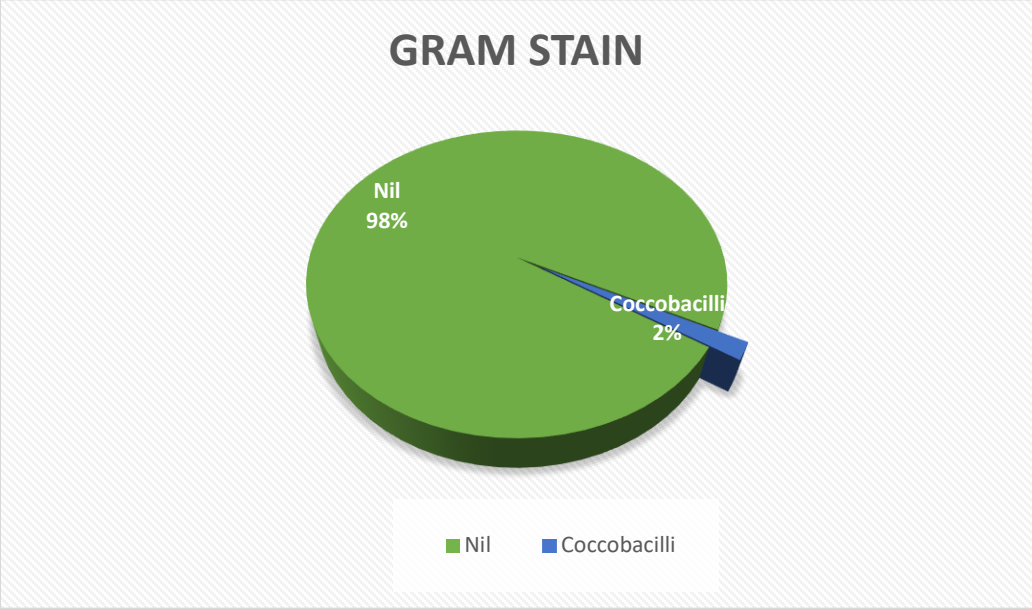
C/S	Frequency	Percent
Citrobacter	1	1.8
Klebsiella	1	1.8
staph aureus	1	1.8
Streptococus pneumonia	1	1.8
No Growth	52	92.9
Total	56	100



In this study out of 56 cases 5 cases were turned out to be bacterial meningitis. Among the 5 cases, 4 cases (7.1%) were confirmed by CSF culture and one by gram staining (1.8%).

Gram staining

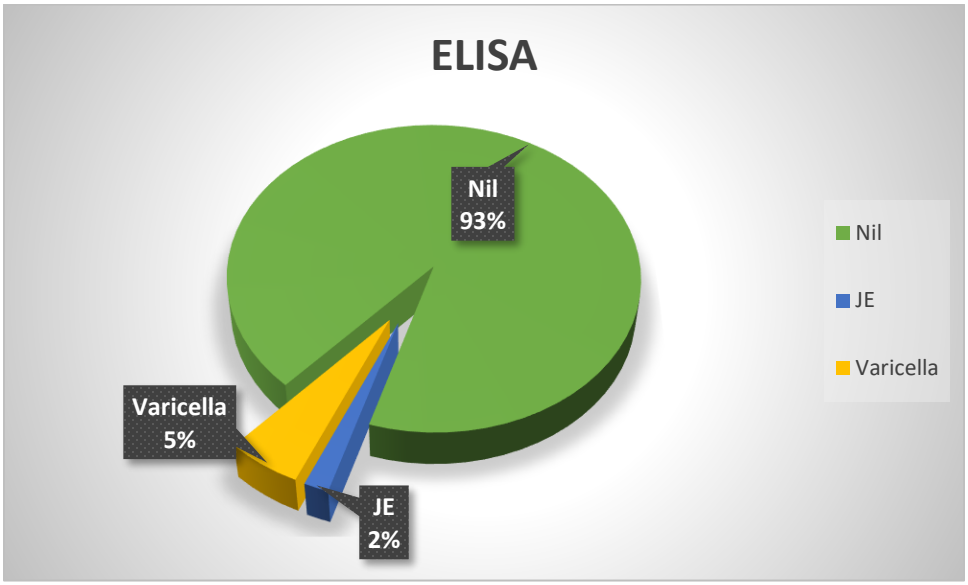
Gram Stain	Frequency	Percent
Coccobacilli	1	1.8
Total	56	100
Nil	55	98.2



Out of 56 cases gram stain was positive in 1 case (1.8%).

ELISA results

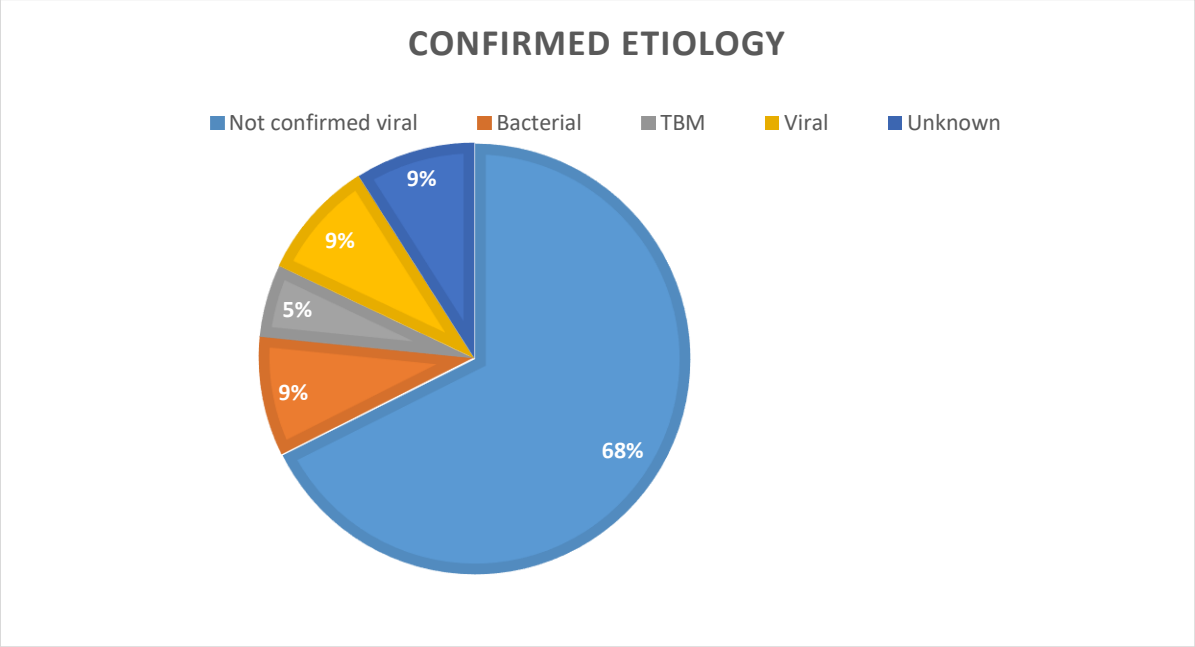
ELISA	Frequency	Percent
JE	1	1.8
Varicella	3	5.4
Nil	52	92.9
Total	56	100



IgM capture ELISA was done in 56 suspected cases of viral encephalitis. Out of 56 cases ELISA turned out to be positive in 3 (5.4%) and equivocal result for JE obtained in one case (1.8%).

Confirmed etiology

Etiology	Frequency	Percent
Not conformed viral	38	67
Bacterial	5	8.9
Tuberculous	3	5.4
Viral	5	8.9
Total	56	100



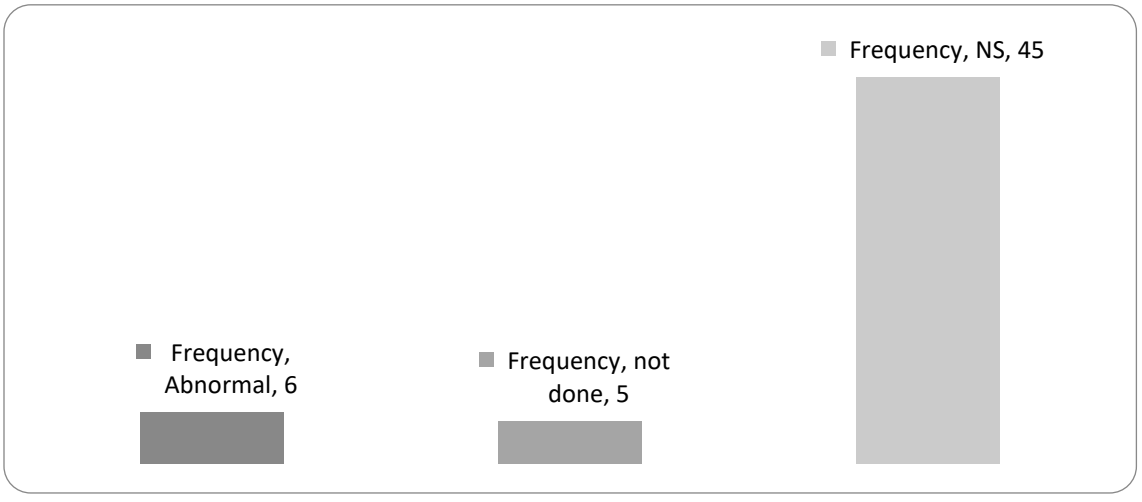
Out of 56 cases etiology was confirmed in 13 cases (23.2%). Out of which bacterial etiology was found in 5 cases (8.9%) and viral was fond in 5 cases (8.9%) followed by tuberculous etiology in 3 cases (5.4%). Among the 5 viral cases 3 cases were

turned out to be varicella encephalitis and 2 cases were suspected JE based on MRI findings and ELISA results.

Neuro imaging in acute encephalitis syndrome

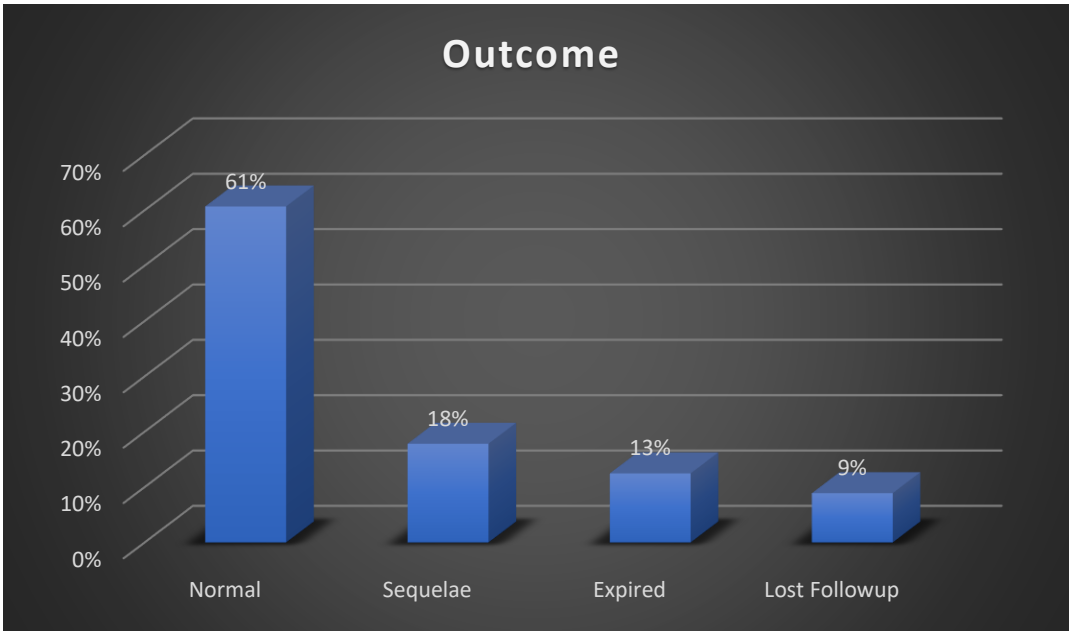
Neuro Imaging	Frequency	Percent
Abnormal	6	10.7
Not done	5	8.9
Normal study	45	80.4
Total	56	100

Among the 56 cases Neuro imaging was found to be normal in 45 cases (80.4%). Abnormal imaging documented in 6 (10.7%)of the cases. Imaging could not be performed in 5 cases (8.9%) because of poor GCS.



Distribtion of outcome

Outcome	No. of Patients	Percentage
Normal	34	61%
Sequelae	10	18%
Expired	7	13%
Lost Followup	5	9%



Out of 56 cases, outcome was normal in 34cases (61%). 7 children expired (12.5%) and 10(18%) were discharged with sequelae 5(9%) cases didn't turn up for follow up.

VENTILATON	Normal	Expired	Sequale	Total	Chi Sq	P
No	36	0	2	38	17.06	**0.001**
Yes	10	7	1	18		
Total	46	7	3	56		

Neuroimaging	Normal	Expired	Sequale	Total	Chi Sq	p
Abnormal	4	0	2	6	51.19	**0.001**
NS	42	2	1	45		
not done	0	5	0	5		
Total	46	7	3	56		

GCS	No	Expired	Sequale	Total	Chi Sq	P
4	2	1	1	4		
5	1	2	0	3		
6	3	2	0	5		
7	1	1	0	2		
8	6	1	0	7		
9	15	0	0	15	30.77	0.03
10	9	0	0	9		
11	6	0	1	7		
12	2	0	1	3		
13	1	0	0	1		
Total	46	7	3	56		

DISCUSSION

Age distribution

STUDY	COMMON AGE GROUP AFFECTED
Manish Kakkar et al	< 5 yrs
Baswati et al	9month to 10 yrs
Sneha et al	1 to 3 yrs
Saumyen de et al	4 to 12 yrs
Present study	<1 yr

Most common age group affected in our study is <1 yr.

Gender distribution of cases

STUDY	MALE	FEMALE
Khinchi et all	54%	45%
Manish kakkar et al	59.3%	40.7%
Gorakpur	51.3%	48.7%
Sneha et al	64.7%	32.3%
Present study	58.9%	41.1%

In our study results are similar to other studies.

Symptomatology pattern

STUDY	FEVER	ALTERED SENSORIUM	SEIZURES
Khinchi et al	100%	100%	90%
Gorakpur	100%	100%	47%
Bhaswati Bandyopadhyay et al	32%	100%	100%
Present study	94.6%	85.7%	76.8%

In our study results are similar to other studies.

Signs pattern in acute encephalitis syndrome

STUDY	ALTERED SENSORIUM	MENINGEAL SIGNS	FOCAL NEUROLOGICAL DEFICIT
Khinchi et al	100%	49.1%	16.2%
Gorakpur	100%	90%	2%
Present study	85.7%	32.1%	5.4%

In our study results are similar to other studies.

Dysglycemia

STUDY	PERCENT
Ekambaranath sambasvam et al	39.9%
Present study	21.4%

In our study 21.4% children had dysglycemia. Among them most of the patients had sugar levels more than 140 which may be considered as stress related hyperglycemia.

Hyponatremia

STUDY	PERCENT
Ekambaranath sambasvam et al	33.3%
Present study	25%

Results are comparable to previous studies and hyponatremia associated with adverse outcome in our study.

Glasgow coma scale

STUDY	GCS<8
Khinchi et al	29.5%
Gorakpur	54%
Ekambaranath sambasvam et al	56.6%
Present study	25%

Results are similar to previous studies and among the children with GCS <8 on admission the CFR was 12.5%.

CSF profile in acute encephalitis

	Viral encephalitis	Bacterial menngitis	TBM	Normal
Sneha et al	69%	75.1%	3.7%	4.4%
Khinchi et al	36%	40.9%	-	22.9%
Present study	76%	8.9%	5.4%	8.9%

Above results were predicted based on cell count, sugar and protein in CSF and were found to be similar to previous studies.

CSF culture and sensitivity pattern in acute encephalitis syndrome

STUDY	POSITIVE CULTURE
Rakesh kumar et al	3.5%
Present study	8.9%

In our study results are similar to other studies.

Final etiology

STUDY	RESULT
Bhaswati Bandyopadhyay et al	None
Khinchi et al	Japenese Encephalitis(18%)
Sneha et al	Viral-JE & Dengue (84.5%) Pyogenic,TB & varicella(9.5%) Unknown(5.8%)
Rakesh kumar et al	Viral-JE(29%) Viral-Non JE(57.5%) Bacterial(8.5%) Cerebral Malaria(5%)
Jain et al	JE(16.2%) Dengue(10.8%) HSV(9.3%) Measles(8.9%) VZV(4.4%)

Joshi et al	Non viral(16.9%) Viral(11.2%) Unknown(79.6%)
Rathore k et al	HSV(16.1%) Measles(2.6%) JE(1.5%) VZV(0.38%)
Present study	Pyogenic(8.9%) TBM(5.4%) VZV(5.4%) Probable JE(3.5%) AES unknown etiology(67%)

In our study conducted on 56 cases, bacterial etiology was confirmed in 5 cases by CSF culture and sensitivity, TBM in 3 cases by Gene expert and viral etiology in 5 cases. Out of these 5 viral cases, 3 cases turned out to be positive for VZV by IgM ELISA, 1 case showed equivocal result for JE IgM ELISA and 1 case had MRI features suggestive of JE. So these 2 cases were concluded to be probable JE cases.

Distribution of immediate outcome

STUDY	NORMAL OUTCOME	SEQUELAE	DEATH
Rakesh kumar et al	72.5 %	10.5 %	13%
Present study	61%	18%	13%

Predictors of poor outcome in our study

1. Poor GCS (<8) at the time of admission
2. Need for mechanical ventilation
3. Hyponatremia and
4. Abnormal neuroimaging.

CONCLUSION

Acute encephalitis syndrome (AES) is one of the common CNS disease which is difficult to diagnose, manage, and study. Though there are more than 100 known causes AES, in most of the cases of encephalitis neither a pathogenic mechanism nor the aetiology is identified. We studied 56 cases of acute encephalitis syndrome among 5400 patients admitted in our hospital during study period.

- The prevalence of AES in this study was 1.03%.
- Most common age group affected is below 1 year.
- Male children are more affected than females with a ratio of 1.4:1
- Most common presenting symptom was fever with altered sensorium (85.7%).
- Meningeal symptom was present in 33(58.9 %).
- 23 patients (41.1%) had features of raised ICP. Meningeal sign was present in 18 patients (32.1%).
- Focal neurological deficit was present in 3 (5.4%).
- Mechanical ventilation was needed in18 patients (32.1%).
- GCS was < 8 in 14(25%) of patients.
- Dysglycemia was found in 12 patients (21.4%).
- 25% of patients had hyponatremia at presentation.

- Abnormal neuroimaging was found in 6(10.7%) of cases.
- Out of 56 cases aetiology was confirmed in 13 cases (23.2%). Out of which bacterial aetiology was found in 5 cases (8.9%) followed by tuberculous aetiology in 3 cases.
- Among 5 viral aetiology 3 cases were found to be varicella encephalitis.
- Out of 56 patients 34 (61%) were recovered fully, 10 patients (12.5%) had sequelae, 7 children (12.5%) expired.
- The predictors of the poor outcome were
    - Poor GCS at presentation.
    - Need for mechanical ventilation.
    - Hyponatremia.
    - Abnormal neuro imaging.

In 68% of cases the etiology is not known. Consideration should be given to detection of these AES etiologies. This will directly impact the formulation of health policies of AES in India. Which includes identifying targets for immunization, chart preventive strategies and implement appropriate control measures, especially in outbreak situations and formulating other public health interventions.

LIMITATIONS

- Sample size was small so result cannot be generalized to general population as data was collected from a single hospital of the city.
- Follow up was done only for a period of 4 weeks. Long term outcome was not studied.
- Due to financial constraints and non availability of confirmatory tests like PCR, viral etiology was not confirmed in most of the cases.
- Other causes like malaria and scrub typhus were not studied.

FUTURE IMPLICATONS

Further research is needed to understand the factors that underlie bad outcome in AES including a more systematic investigation of the influence of supportive measures.

To ensure best outcomes for the children, follow-up is extremely important to assess recovery, identify new problems that may develop, and manage the rehabilitation process. In addition, routine documentation of the extent of disability after AES could be very useful as part of disease surveillance programme

conducted by health departments, to help better understanding of the extent of AES disease burden, and enable advocacy for support measures for these children.

In most of the Cases no causative agents were found. In such situations possibility of autoimmune encephalitis should be in the differential diagnosis since they can resemble infectious encephalitis and sometimes triggered by infectious disorders like HSV.

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PROFORMA

- Name : Ip No :
- Age : Place :
- Sex :
- Complaints:
- Fever
  Seizures
  Vomiting
  Headache
  Altered sensorium-
    a.Lethargy
    b.Irritability
    c.Behavioural changes
    d.Stupor
  Respiratory symptoms
  Rash
  Past h/o seizures
  Family h/o seizures
  Neurodevelopmental h/o
  Contact h/o
  H/o prehospital antibiotic therapy

EXAMINATION

Vitals:

- Heart rate Blood pressure Spo2
- Respiratory rate Temperature

CNS:

- Sensorium
- GCS
- Tone
- DTR
- Focal deficit
- Cranial nerve palsy
- Meningeal signs
- Fundus

INVESTIGATIONS

- Blood glucose
- Serum electrolytes
- Renal function tests
- CSF ANALYSIS

- ✓ PCR- Viral markers
- ✓ Macroscopic examination
- ✓ Cell count- Total count and Differential count
- ✓ Sugar and protein
- ✓ Gram stain
- ✓ Culture and sensitivity
- • Serum -IgM measles & Mumps
  -IgM herpes simplex
- • Blood culture

NEUROIMAGING:

CT/MRI

TREATMENT GIVEN:

Antibiotics
Antivirals
Anticonvulsants
Antiedema
Others

OUTCOME :