CLINICAL PROFILE OF INTRACTABLE EPILEPSY IN CHILDREN

Submitted in partial fulfillment for

M.D. DEGREE EXAMINATION

MD BRANCH VII

PAEDIATRIC MEDICINE

Stanley Medical College, Chennai

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

CHENNAI, TAMILNADU.

APRIL 2012

CERTIFICATE

This is to certify that the dissertation entitled "**CLINICAL PROFILE OF INTRACTABLE EPILEPSY IN CHILDREN**" is a bonafide original work of **Dr. S. BHAGYALAKSHMI,** Post graduate student, Stanley Medical College submitted to The Tamil Nadu Dr. M.G.R. Medical University in partial fulfillment of the requirement for MD Degree (Paediatrics) during the academic year 2009 -2012.

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CERTIFICATE

This is to certify that the dissertation entitled "**CLINICAL PROFILE OF INTRACTABLE EPILEPSY IN CHILDREN**" is a bonafide original work of **Dr. S. BHAGYALAKSHMI,** Post graduate student, Stanley medical college under the guidance of **Professor Dr. S.VELUSAMY, MD, DM Neurology** submitted to The Tamil Nadu Dr. M.G.R. Medical University in partial fulfillment of the requirement for MD Degree (Paediatrics) during the academic year 2009 -2012.

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DECLARATION

I **Dr. S. BHAGYALAKSHMI,** declare that this dissertation entitled "**CLINICAL PROFILE OF INTRACTABLE EPILEPSY IN CHILDREN**" is a bonafide record of work done by me in the Department of Paediatrics, Institute of Social Paediatrics, Govt. Stanley Medical College and Hospital, Chennai submitted to The Tamil Nadu Dr.M.G.R. Medical University, Chennai in partial fulfilment of the University regulations for the award of **M.D. (Paediatrics) Branch – VII,** for the Examination to be held in April 2012.

Place :

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INTRODUCTION

INTRODUCTION

Intractable epilepsies constitute a small but a significant proportion of all epilepsies in childhood[1]. Intractable epilepsy is a major health problem in many areas of the world. Chronic uncontrolled epilepsy can have serious medical consequences including an increased risk of mood disorders, physical injuries and sudden unexpected death. Intractable seizures are a major economic burden to the society[29].

In majority of the children epilepsy remains a mild disorder with 60-80% remitting spontaneously or with treatment[25] .Seizure control remains poor in 10 - 20%[17]. A prompt diagnosis of refractoriness is of paramount importance for consideration of other therapies such as surgery. Early surgical intervention when successful might also prevent or reverse psychosocial consequences and cognitive impairment of uncontrolled seizures during critical periods of development[29].

REVIEW OF

LITERATURE

REVIEW OF LITERATURE

Epilepsy is a disorder of the brain characterized by enduring predisposition to generate epileptic seizures[16]. The prognosis of epilepsy is generally good, but 10 -20 % have persistent seizures refractory to drugs and these cases pose a diagnostic and management challenge[17]. These groups of patients are included as “treatment nonresponders”, “refractory”, “intractable” and “drug resistant”. All these terms are used interchangeably.

The epidemiology of refractory epilepsy is complicated by several issues:

1. There is no unifying definition of refractory epilepsy.

2. Patients do not necessarily become refractory at the time of diagnosis, nor do they remain refractory throughout the course of illness.

3. There is reasonable evidence from clinical trials that patients who are defined as refractory will respond readily, although not completely to therapy[22].

Intractable epilepsy is poorly defined. Some authors apply the term to cases that continue to be active despite “relevant therapy” but what constitutes relevant therapy varies considerably both in terms of agents used and duration of trials[21].

Berg et al defined intractability as failure of seizure control with more than 2 first line AED with an average of 1 seizure per month for 18 months and no more than a three months seizure free period during that interval[26].

Camfield et al defined intractability as at least one seizure each 3 months for the last year of follow-up with failure of at least 3 AED[6].

In an Indian study Chawla et al defined intractable epilepsy with "at least one seizure per month over the last 6 months[2].

The ILAE commission gave a consensus proposal that 'drug resistant epilepsy is defined as failure of adequate trials of 2 tolerated, appropriately chosen and used AED schedules whether as monotherapy or in combination to achieve sustained seizure freedom[23].

PREDICTIVE FACTORS OF INTRACTABLE EPILEPSY:

AGE OF ONSET OF SEIZURES:

This is probably the most consistent factor in most studies[3, 5]. Seizure in an immature brain of a child may result in nonpruning of neurons and contribute to high number of gap junctions, which lead to abnormal connectivity, the hyperconnected cortex leading to more epileptogenicity[24].

TYPE OF SEIZURES:

Tonic, myoclonic seizures are the types which are difficult to control[25]. Atypical absence[14], complex partial and even generalised tonic clonic seizures[11] have been identified in some studies. Typical absence seizures on the other hand are negatively correlated with intractability[25].

SEIZURE FREQUENCY:

High seizure frequency (>1/ month) occurring soon after the diagnosis of epilepsy either before or after treatment also correlates with refractoriness[26].

RESPONSE TO PREVIOUS AED:

Within a given epileptic syndrome the probability of achieving a good response to treatment is inversely proportional to the number of drugs to which the patient has previously not responded[27]. Absence of seizure freedom when 2 past AED proved insuffient is a crucial predictor of refractoriness[28].

EPILEPTIC SYNDROMES:

West syndrome, Lennox Gastaut syndrome, Progressive myoclonic epilepsy are the most common syndromes identified in this group[14].

STRUCTURAL CEREBRAL ABNORMALITIES:

The localization of the epileptogenic zone and type of structural cerebral abnormalities also seem to play an important role in refractoriness. The temporal lobe is the most common of focal epilepsy syndromes. The motor, sensorimotor cortex are other areas with low seizure threshold[29].

EEG:

The EEG finding useful for predicting refractoriness includes multifocal and frequent interictal spikes, interictal pattern like Hypsarrythmia and burst suppression[29].

FEATURES OF MEDICAL INTRACTABILITY:

ETIOLOGIES:

Perinatal Asphyxia, Neurocutaneus syndromes - Sturge Weber, Tuberous Sclerosis, developmental malformations, sequelae of cerebral infection, infarction, trauma, Mesial temporal sclerosis, cerebral tumors, idiopathic.

CATASTROPHIC EPILEPSIES:

The catastrophic epilepsies include West syndrome, Lennox – Gastaut syndrome, progressive myoclonic epilepsies.

COMMON CLINICAL FEATURES:

The common clinical features associated with intractable seizures in children include Mental retardation and focal neurological deficits [30].

EPILEPTIC SYNDROMES:

EARLY MYOCLONIC ENCEPHALOPATHY:

It has its onset in the neonatal period. It is characterised by occurrence of frequent, refractory generalised, focal or fragmentary myoclonia, focal clonic seizures and epileptic spasms. There is a high frequency of familial cases. EEG shows a pattern known as suppression – burst. It is highly resistant to treatment, carries a high mortality and survivors are nearly all severely retarded[32].

OHTAHARA SYNDROME:

It has its onset in the neonatal period. It is characterised by frequent tonic spasms. The etiology is heterogeneous but structural brain abnormalities are common. Seizures are highly resistant to treatment and there is an appreciable mortality with survivors nearly always being severely retarded[32].

WEST SYNDROME:

It consists of a triad of Hypsarrythmia, epileptic spasms and psychomotor retardation. Epileptic spasms involve contraction of the axial muscles causing flexion, extension or both. Typical Hypsarrythmia is defined more or less continuous abnormal EEG with high amplitude, irregular and asymmetrical slow wave activity across all leads with random sharp waves and spikes producing chaotic pattern. Tuberous Sclerosis is a common cause of infantile spasms. Other causes are brain malformations, chromosomal abnormalities, and neurodegenerative diseases, perinatal prenatal, postnatal destructive lesions, and brain tumors[32].

LENNOX-GASTAUT SYNDROME:

Children display a combination of frequent myoclonic and tonic seizures and when interictal slow waves are evident in EEG the seizure disorder is classified as Lennox-Gestaut syndrome. This syndrome is characterized by intractable seizures of various types, slow spike wave EEG during the awake state and mental retardation[17].

RASMUSSEN SYNDROME:

Rasmussen encephalitis is characterized by intractable focal motor seizures, often evolving into epilepsia partia continua, cognitive decline and progressive hemiparesis. Recent findings of glutamate receptors antibodies in some patients with Rasmussen encephalitis implicate an autoimmune pathology[33].

IMMATURE BRAIN AND PROPAGATION

THE HYPERCONNECTED CORTEX:

Seizures of the immature brain may lead to failure of pruning or apoptosis, imprinting abnormal connectivity termed as Hyperconnected cortex enhancing epileptogenesis.

GAP JUNCTIONS:

Neuronal gap junctions are abundant in the immature brain, which harbours transient and extensive coupling between neurons. Epileptic activity in childhood may preserve the quantity of gap junctions contributing to abnormal network or Hyperconnected cortex enhancing epileptogenesis.

The above mechanisms are two among the possibly many discovered or yet undiscovered mechanism that not only enhance epileptogenecity but also confound clinical and laboratory analysis of these patients[31].

SOME FACTORS AUGURING INTRACTABILITY

GENERALISED EPILEPSIES:

1. Onset in infancy or early childhood.

2. High initial seizure frequency.

3. Failure of initial appropriate AED

4. EEG showing multifocal bisynchronous spikes, abnormal background activity.

FOCAL EPILEPSIES:

1. Region – temporal, occipital, primary motor cortex, supplementary sensory motor area.

2. Etiology – Mesial temporal sclerosis, cortical dysplasias, hemorrhagic lesions[31].

EVALUATION AND MANAGEMENT OF INTRACTABLE EPILEPSY

Patients with intractable epilepsy should be referred to an epilepsy specialist for diagnostic evaluation, to confirm refractoriness, optimization of pharmacotherapy and consideration of other therapies such as epilepsy surgery.

The evaluation should be done to

- Establish a diagnosis of epilepsy-rule out pseudo refractory seizures
- Define Electroclinical syndrome- EEG (routine EEG is useful for clinical diagnosis of epilepsy and elucidation of the underlying syndrome).
- Establish etiology of epilepsy
- Evaluate medical treatment- proper choice of AED and side effect profile
- Select ideal surgical candidates[29].

DIFFERENTIAL CONSIDERATIONS IN INTRACTABLE EPILEPSY

ERRORS IN DIAGNOSIS:

- Failure to identify a seizure syndrome or causative condition
- Incorrect seizure classification (partial or generalised)
- Non-epileptic seizures (syncope, pseudoseizures)

ERRORS IN DRUG CHOICE OR MANAGEMENT:

- Wrong drug for the seizure type or seizure syndrome
- Inadequate dose of medication.

POOR MEDICATION COMPLIANCE:

- Inadequate patient instructions or education
- Too frequent or complex dosing schedules
- Intolerable adverse effects of the medication.

TRUE PHARMACOLOGICAL INTRACTABILITY[30].

INVESTIGATIONS:

EEG:

The most commonly performed neurodiagnostic study in the evaluation of patients with seizures is EEG. Routine EEG lasting for 20-30 minutes has a low diagnostic yield. A more prolonged recording including sleep may be helpful in identifying potentially epileptogenic activity that is not evident on awake-only recording. The most reliable abnormalities on EEG are the primary generalised spike and wave discharge and focal spike or sharp wave discharges on the frontal or temporal lobes. These are highly epileptogenic findings and clinically greater than 85% of individuals with these findings experience clinically significant seizures[30].

VIDEO EEG:

The limitations of standard EEG have led to the expanded use of prolonged EEG recording with or without concurrent video recording. The combined use of EEG and video recording improves the sensitivity and specificity of EEG alone. Prolonged recording of EEG is an extremely helpful tool in evaluation of medically intractable seizures. It can be performed in an inpatient or outpatient basis. Video EEG monitoring has been demonstrated to accurately differentiate epileptic and nonepileptic seizures, to distinguish between generalised and partial seizures, seizure onset, localisation and lateralization[30].

MRI SCAN:

MRI scans have greatly enhanced the ability to visualize intraparenchymal brain structures. This modality provides some of the sensitive and specific neuroimaging data for localization of the epileptogenic zone. The newer techniques in MRI are innovative. Use of thin contiguous cuts of 1.5 to 1.6 mm in multiple sections has allowed detection of hippocampal atrophy as well as identification of small areas of focal cortical dysplasia. Quantitative volumetric analysis has resulted in determination of unilateral or bilateral hippocampal atrophy. FLAIR technique (fluid attenuated inversion recovery imaging) highlights lesions such as mesial temporal sclerosis and malformations of cortical development and identifies small previously unidentifiable lesions. Diffusion tensor imaging is an MRI imaging technique that helps in identifying white matter tracts that may be disrupted in cortical dysplasia[33].

CT SCAN:

CT scan may complement MRI scan in those with calcified lesions and bony abnormalities[30].CT scan is still used in special etiologies where there are calcifications like tuberous sclerosis or cysticercosis which is difficult to detect on MRI scan[34].

FUNCTIONAL NEUROIMAGING:

This includes single photon emission computed tomography (SPECT), positron emission tomography (PET), functional MRI (fMRI) and Magnetic Resonance spectroscopy (MRS). All these are aimed at identifying seizure onset zone. MRS is useful in patients who have otherwise normal MRI[29].

TREATMENT:

Medical and surgical treatment options for epilepsy have improved in the past decade. The risk of potential benefits of curative or palliative surgery must be weighed against the chance of improvement and potential side effects of additional medical therapy

OPTIMISATION OF PHARMACOTHERAPY:

Using a systematic protocol in treatment of refractory epilepsy using new AED might improve seizure control in a substantial proportion of cases[29]. The nihilistic view that intractability is inevitable if seizure control is not obtained in a few years of onset of therapy is incorrect[35]. Refractory epilepsy can be managed systematically with AED until maximal dose is reached; if no response replace

AED; if there is a partial response add another AED which should be differ from the mechanism of action of the first AED[36].

Intractable generalised epilepsy is treated with lamotrigine with 60% children showing some response. There seem to be synergism with valproate and up to 35% become seizure free when both are used. Dose escalation should be very gradual because there is a risk of Steven Johnson syndrome. Topiramate seems to be effective though some evidence suggests better control of partial seizure than generalised seizures[37]. Vigabatrin and gabapentin are best avoided because of the tendency to exacerbate myoclonic seizures[38, 39]. Vigabatrin is useful in infantile spasms due to Tuberous Sclerosis.

Newer AED which are available like clobazam, vigabatrin, topiramate, lamotrigine and gabapentin can be used for intractable partial seizures. Clobazam, vigabatrin and topiramate are the most effective[39, 40, 41,42].

ELEMENTS OF SUCESSFUL TREATMENT

- Classify the seizure disorder correctly
- Maximize monotherapy over polytherapy
- Balance the maximal effective dose with minimal side effects
- Choose dosing to maximize compliance
- Treat the patient's symptoms, not the EEG findings or the serum levels

The goal of treatment should be to achieve complete seizure control without side effects[30].

SURGERY:

Surgery for epilepsy is more complicated. It is often difficult to wait with medical management as childhood epilepsies can be unpredictable at times with a small but definite remission rate[5].

The common surgical procedures are

Temporal lobectomy:

This procedure is performed in adolescents and adults. It involves temporal lobectomy and amydalo-hippocampectomy because the removal of the mesial temporal structures is associated with a good surgical outcome.

Cortical resection:

Cortical resection is commonly performed in children, often involving extensive lobar or multilobar resection. The extent of resection depends on the extent of the lesion.

Hemispherectomy:

It is performed in young children. It is done for catastrophic epilepsies in which the substrate of epilepsy is limited to one hemisphere. Epileptic syndromes which meet these criteria include Sturge-Weber syndrome, hemimegalencephaly and Rasmussen's encephalitis.

Multiple subpial transections:

Multiple subpial transection is a newer surgical treatment which involves disruption of the horizontal fibers when the epileptogenic zone overlies a functional cortex.

Corpus callosotomy:

It can reduce seizures in selected patients and is used in children with Lennox-Gastaut syndrome[33].

OTHER MODALITIES OF TREATMENT

Ketogenic diet:

The Ketogenic diet is a high fat, adequate protein, low carbohydrate diet used in treating refractory epilepsy in pediatric patients. As there is low carbohydrate in the diet the liver convert's fat into fatty acid and ketone bodies. The ketones replace glucose as the energy source in the brain. An elevation of ketones in the blood known as ketosis leads to reduction in frequency of epileptic seizures[16].

Vagal nerve stimulation:

Electrical impulses are sent to the left vagal nerve in the neck via the lead wire implanted under the skin. A 50% seizure reduction has been reported in one third of the patients[29].

Anne .T. Berg et al performed a case control study to identify the early predictors of medically intractable epilepsy in children. Cases were children who had an average one seizure or more a month over a 2 year period and who during that time had failed trials of three different drugs. Controls were children who had epilepsy who has been seizure free for two years and who never before becoming seizure free met the definition of intractable epilepsy. Strong univariate association was noted between intractability and infantile spasms, remote symptomatic epilepsy, history of status epilepticus, neonatal seizures, microcephaly. Cases were significantly younger than controls. With multiple logistic regressions independent predictors of intractability were infantile seizures, age at onset with a decreasing risk with increasing age, remote symptomatic epilepsy[3].

Manoj Gulabrao et al conducted a prospective case control study on the clinical profile, aetiopathogenesis, outcome and clinical predictors of intractable epilepsy. 38 children met criteria of intractable epilepsy while remaining 55 had well controlled epilepsy. All patients were analysed by taking a detailed history of prenatal events, seizure semiology and detailed antiepileptic therapy. Demographic profile revealed that 90% of children were above 4 years, there was a significant male preponderance in both age groups. 60% subjects had onset less than 1year. Remote symptomatic aetiology was the main aetiology (71%).Univariate analysis showed that factors that predict intractabilility were early onset seizures, myoclonic, neonatal or mixed seizures, initial high seizure frequency, perinatal asphyxia, neurological impairment, microcephaly, neuroimaging, EEG abnormalities. Multivariate analysis revealed early onset of seizures, mixed seizures, neurological impairment microcephaly had independent intractability[1].

Chawla et al performed a case control study comprising 50 cases and 50 controls to determine the etiology and clinical predictors of epilepsy. Patients included children who had one seizure per month over the last 6 months. Controls include children with epilepsy who had been seizure free for more than 6 months. A detailed history and clinical examination was done. Epilepsy in study group was caused by perinatal problems (48%), sequelae of CNS infection (24%) and idiopathic (20%). In the control groups epilepsy was idiopathic (72%), calcified granuloma 22% and perinatal problems 6%.On univariate analysis strong association was evident between intractable epilepsy and several factors including age of onset of seizures, remote symptomatic epilepsy, initial seizure type, history of neonatal seizures, high initial seizure frequency, microcephaly and neurological impairment. On multivariate analysis neurological impairment, age of onset <1 year, myoclonic seizures / infantile spasms, remote symptomatic epilepsy were independent Predictors of IE[2].

Javad Akhondian et al performed a study in children less than 15 years at Paediatric Neurology clinic of Imam Reza Hospital. There were two groups. Group 1 consisted of 51 patients with refractory seizures. Group 2 consisted of 80 well controlled patients who were seizure free for past 6 months. Age of onset <1 year, multiple seizures before starting treatment, male gender, myoclonic seizures, neurological defects, neonatal seizures, daily seizures and first abnormal EEG & CT Scan are the factors affecting occurrences of refractory seizures[4].

Huttenlocher et al performed a study with145 children who had refractory seizures for two years and they were followed for 5 to 20 years after onset .Majority of them (61%) were mentally retarded and many of them had age of onset less than

2 years of age (73%). Age of onset was a little later in the group with borderline to normal intelligence.

Follow up showed remission of seizures in children with borderline to normal intelligence, with a linear decrease of percentage with persistent seizures at the rate of 4% per year. Remission of seizures was much less in the group with mental retardation (1.5%). Seizure type had some effect on outcome. Children with focal atrophic brain lesion did not worse more than those without definable pathology of brain imaging studies[5].

Camfield et al performed a population based study to find which child epilepsy will remit. EEG allowed identification of all children from Nova Scotia 1977-1985. Children were followed over an average of 7 years. On the basis of clinical characteristics multivariate analysis was used to develop a scoring scheme to predict remission. At diagnosis the best predictors of remission were age of onset less than 12 years, normal intelligence, no prior neonatal seizures, they concluded that 55% of childhood epilepsy will remit[6].

Atlunbasak et al studied the prognosis of the patients with seizure onset from 1-24 months of age. They also studied predictive factors regarding unfavourable prognosis.75 patients were retrospectively analyzed. Mental retardation, neurological abnormality, infantile spasm, use of > 1 antiepileptic drug, epileptic activity on EEG, status epilepticus, symptomatic etiology, seizure frequency > 1 per week, H/o perinatal anoxia and neonatal seizures were significant risk factors regarding epilepsy prognosis. On multivariate analysis perinatal anoxia, infantile spasms, status epilepticus were significant for epilepsy prognosis. Status epilepticus and anoxia are unfavourable predictive risk factors regarding prognosis of patients with seizures that have an onset between 1 – 24 months of age[7].

Singhvi et al performed a study to find out the profile of intractable epilepsy .100 patients among whom 67 males, 33 females, attending epilepsy clinic were evaluated. Detailed history, examination, EEG, CT and details regarding pharmacotherapy were analysed. The age of the patients ranged from 5-70 years. Commonest seizure type was partial seizures. 50 patients had one or more abnormal predictors. 57 patients were in the symptomatic group with CNS infection being the major cause. EEG was abnormal in 69% of the cases, CT abnormal 41% cases. The presence or absence other predictors does not predict the severity of the epilepsy. Addition of third drug only increased adverse effects[8].

Malik et al studied 325 (74%) children with intractable epilepsy who had seizures even after 2 years of adequate treatment. They were compared with 117 (26%) controls who did not have seizures for >1 year. Adequate treatment was described > 3 AED's with proper compliance and dosage. Male gender, seizure frequency in infancy, myoclonic seizures, neonatal seizures, abnormal EEG, cryptogenic epilepsy and head trauma were factors associated with intractable epilepsy[9].

Aithala et al performed a cases control study in the United Arab Emirates with 55 children with intractable epilepsy and 50 children as controls. Age of onset <1 year, high seizure frequency at onset, positive history of neonatal seizures, developmental delay, status epilepticus, neurological deficits and abnormal neuroimaging were found to be more significantly associated with the cases. Symptomatic localization related epilepsy was more common in children in the cases[10].

AIMS & OBJECTIVES

AIMS AND OBJECTIVES

(1) To study the clinical profile of intractable seizures.

(2) To determine the clinical predictors of intractable seizures.

STUDY JUSTIFICATION

STUDY JUSTIFICATION

Identification of predictors of intractable epilepsy is important to identify cases early in the course of the disease. The clinical characteristics of intractable seizures are poorly understood and current managements are unsatisfactory. However there are very few studies on intractable seizures. Identification of predictors early in the course of the disease can help in selecting appropriate antiepileptic drugs and select children who are appropriate candidates for surgery.

A long term follow up of children with intractable seizures was done by Berg et al[26] and his colleagues[3]. As there is no unifying definition for intractable seizures, we have used Berg et al[26] definition for identification of the cases. Intractability for an individual child is difficult to predict before several years of antiepileptic drug treatment. Intractability appears to decrease with prolonged follow-up, although the burden of this wait and see approach is substantial. Failure of a first antiepileptic drug is a risk factor for intractability but nonetheless many remit[33].

STUDY MATERIALS &

METHOD

MATERIALS AND METHODS

STUDY DESIGN:

Prospective case control study

PERIOD OF STUDY:

Jan 2010 - Aug 2011

PLACE OF STUDY:

Institute Of Social Pediatrics

Stanley Medical College

STUDY POPULATION:

Children with seizures aged 1-12 years

INCLUSION CRITERIA:

Children aged 1 -12 years who met the definition of intractable seizures

Both sexes

EXCLUSION CRITERIA:

Children with poor compliance to AED

Parents not willing to participate

CASE DEFINITION:

Intractable epilepsy is when seizures continue to occur despite maximally tolerated doses of more than two antiepileptics, occurrence of an average of one seizure per month for 18 months with no more than a 3 month seizure free period during these 18 months.

CONTROLS DEFINITION:

Epileptic children who had good control of seizures for the past 1½ Yrs

STUDY DETAILS:

All children attending Institute Of Social Pediatrics with seizures were studied. 63 children met the criteria of intractable epilepsy and were included in the case group. Controls were selected by random sampling of children who had good control of seizures for the past 1½ years. Our study had a total of 126 children, 63 cases and 63 controls. The children were enrolled into the study after getting consent from the parents. The study was conducted after Institutional Ethical Committee approval was obtained

A detailed history was obtained from the parents. History regarding seizure semiology, no of AED, frequency of seizures was obtained. Details regarding age, sex, age of onset of seizures, family h/o seizures, H/o febrile seizures, H/o of status epilepticus, birth asphyxia, developmental delay, H/o neonatal seizures, were sought from a detailed medical history. Clinical examination was performed for all the cases. Parents were asked to maintain a diary to record the details of daily intake of

drugs and to record details regarding occurrence of seizures. Compliance to AED's was assessed by a detailed history and a review of past medical records. The patients were asked to maintain a diary after enrollment into the study and mark the daily intake of drugs and the no of times the drug was taken.

The diaries were reviewed every 2 weeks when the patients came to collect medications. Only those children with good compliance were enrolled in our study. Seizures were classified according to the ILAE classification of epileptic seizures.

Urine for metabolic screening, LFT, RFT and EEG was done for all children. CT scan brain was done for all children. MRI brain was done only for selected cases.

Patients underwent Ophthalmological and ENT evaluation. Pediatric neurologist opinion was sought for all the children.

Data was collected and a computerised analysis of data was performed using SPSS software packages. Data were analysed separately for univariate comparison. Analysis was done using Chi square test. A P value of <0.05 was taken to be significant. The Odds ratio was used to indicate the magnitude of association between each parameter and intractable epilepsy.

RESULTS &

OBSERVATION

RESULTS AND OBSERVATIONS

A total of 598 children with seizure disorder attended our hospital during the study period of one and half years among whom 63 children met the criteria of intractability. In our study the prevalence of intractable seizures was 10.53%. A total of 63 children in the intractable seizure group and 63 children in the well controlled group were studied.

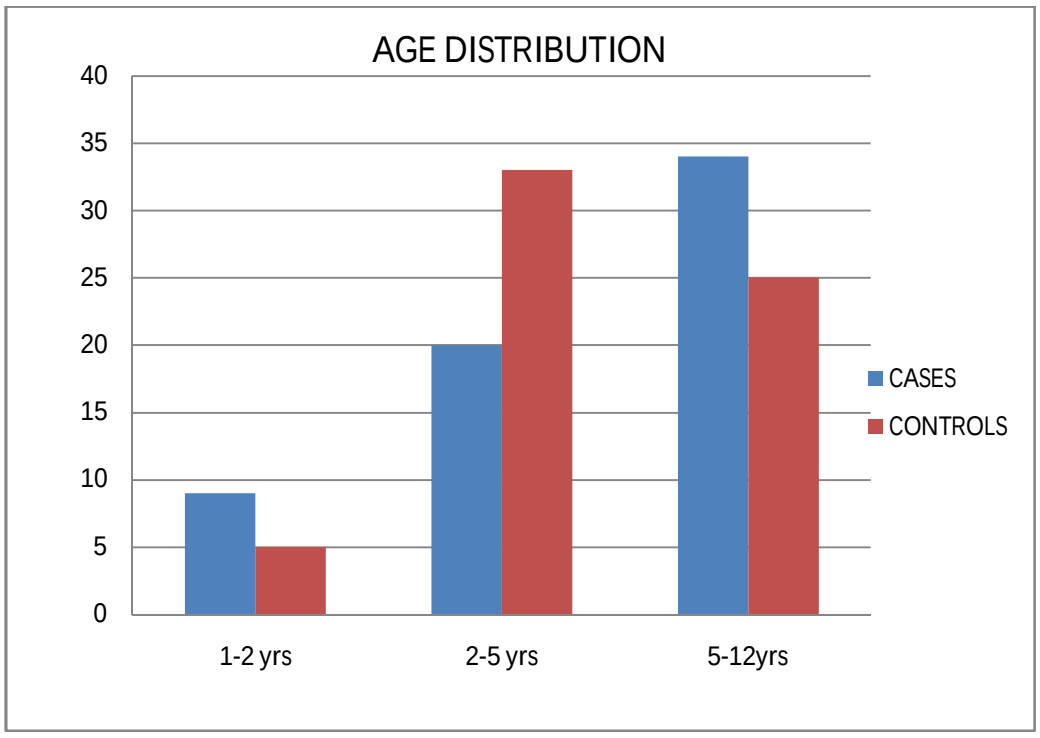
AGE DISTRIBUTION OF THE STUDY POPULATION

TABLE -1

AGE IN YEARS	CASES (63) No. %	CONTROLS (63) No. %	TOTAL (126) No. %
1-2	9 (14.3)	5 (7.9)	14 (11.1)
2-5	20 (31.7)	33 (52.4)	53 (42.1)
5-12	34 (54)	25 (39.7)	59 (46.8)

Among the 126 children studied, maximum number of children 59 (46.8%) belonged to the 5-12 years group with, 34 (54%) in the intractable group and 25(39.7%) in the well controlled group.14 (11.1%) children belonged to the age group 1-2 years with 9 (14.3%) children in the intractable group and 5 (7.9%) children in the well controlled group. 53 (42.1%) children were in the 2-5 years group with 20 (31.7%) in the intractable group and 33(52.4) children in the control group.

CHART – 1


AGE DISTRIBUTION
40
35
30
25
20
15
10
5
0
1-2 yrs
2-5 yrs
5-12yrs
CASES
CONTROLS

SEX DISTRIBUTION OF THE STUDY POPULATION

TABLE - 2

SEX	CASES		CONTROLS	
	No.	%	No.	%
MALES	45	(71.4)	40	(63.5)
FEMALES	18	(28.6)	23	(36.5)
TOTAL	63	(100)	63	(100)

The total no. of males in the study were 85 with 45 (71.4%) in the case group and 40 (63.5%) in the control group. There was predominant male preponderance in our study. There were 18 (28.6%) females among the cases and 23 (36.5%) females among the controls.

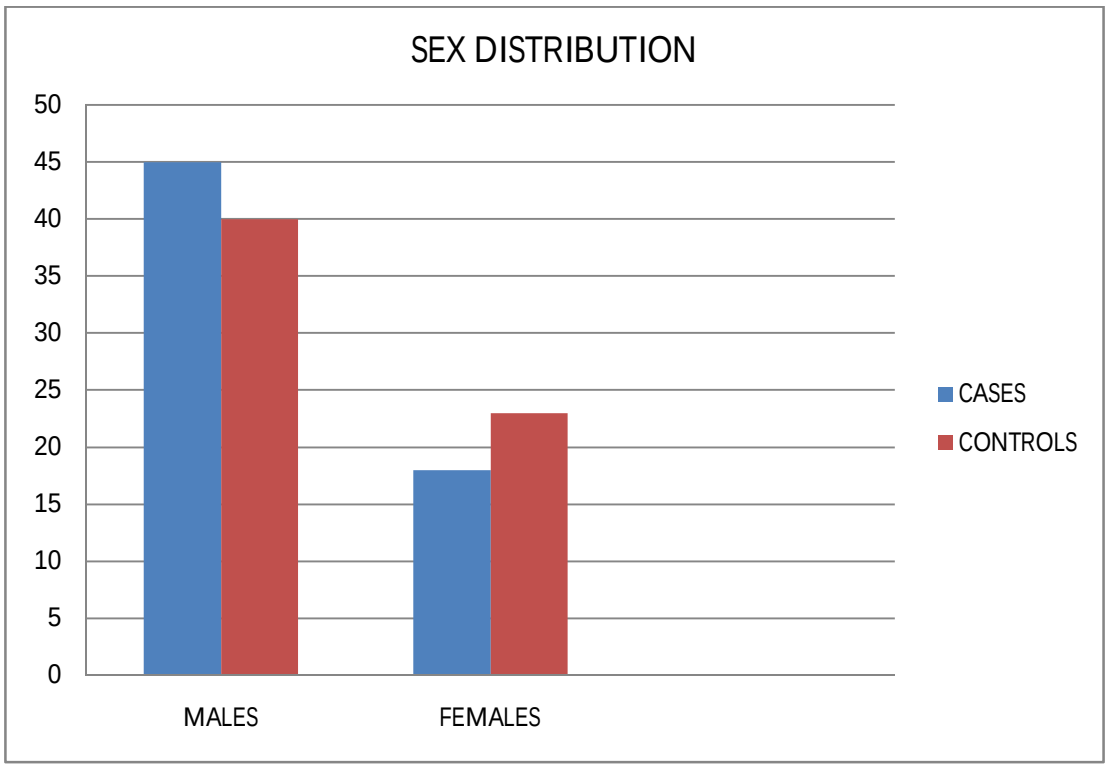
MALE SEX

TABLE - 3

SEX	CASES		CONTROLS		ODDS RATIO	CONFIDENCE INTERVAL	P VALUE
	No.	%	No.	%			
MALES	45	(71.4)	40	(63.5)	1.438	0.679 – 3.042	0.342
TOTAL	63	(100)	63	(100)			

Male sex was not significantly associated with intractable seizures in our study with a P value of 0.342. The Odds ratio for male sex was not significant 1.438 with 95% confidence interval of 0.679 - 3.042.

CHART – 2


SEX DISTRIBUTION
50
45
40
35
30
25
20
15
10
5
0
MALES
FEMALES
CASES
CONTROLS

SEIZURE FREQUENCY OF THE STUDY GROUP

TABLE - 4

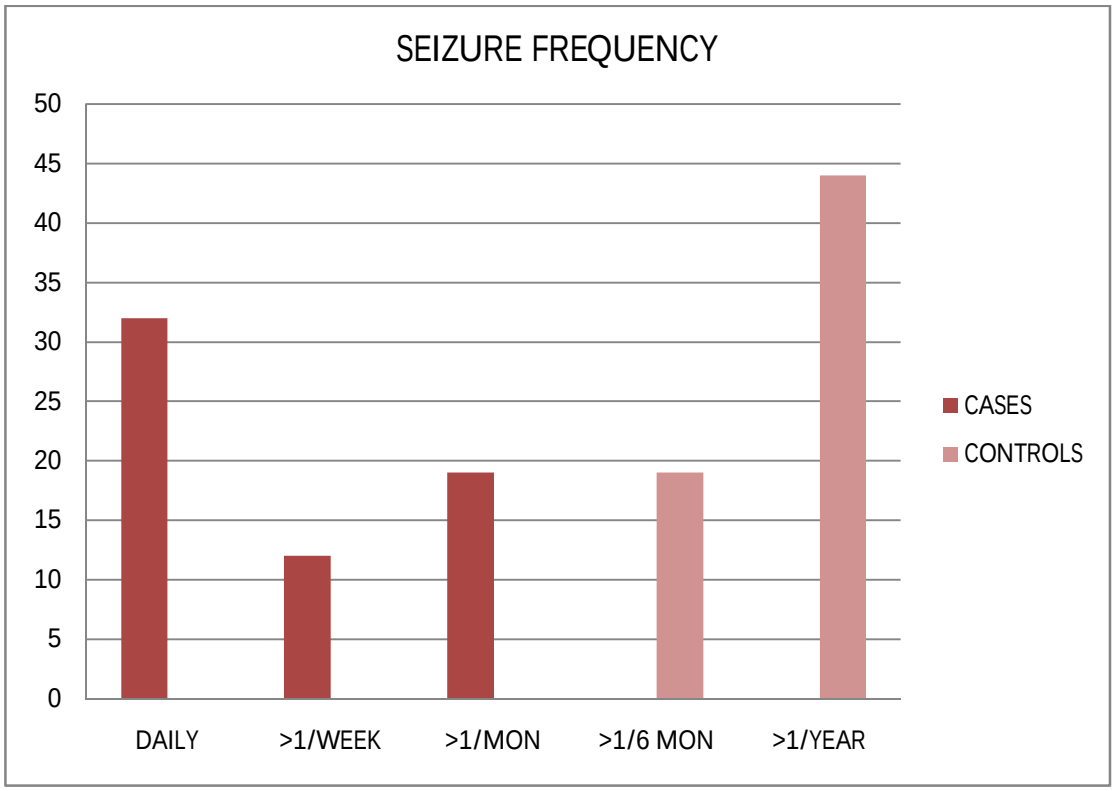
Initial seizure frequency	CASES(63) No. %	CONTROLS(63) No. %
Daily	32 (50.8)	-
>1/week	12 (19)	-
>1/month	19 (30.2)	-
>1/6 months	-	19 (30.20)
>1/year	-	44 (69.8)

Children in the intractable seizure group had a higher seizure frequency when compared to the control group.

32 (50.8%) children had daily seizures, 12 (19%) had more than 1 seizure/week and 19 (30.2%) children had more than 1seizure/month in the intractable group.

19 (30.20%) children had more than 1 seizure/6 months and 44 (69.8%) children had more than 1 seizure/ year in the well controlled group.

CHART –3


SEIZURE FREQUENCY
50
45
40
35
30
25
20
15
10
5
0
DAILY
>1/WEEK
>1/MON
>1/6 MON
>1/YEAR
CASES
CONTROLS

TYPE OF SEIZURES

TABLE - 5

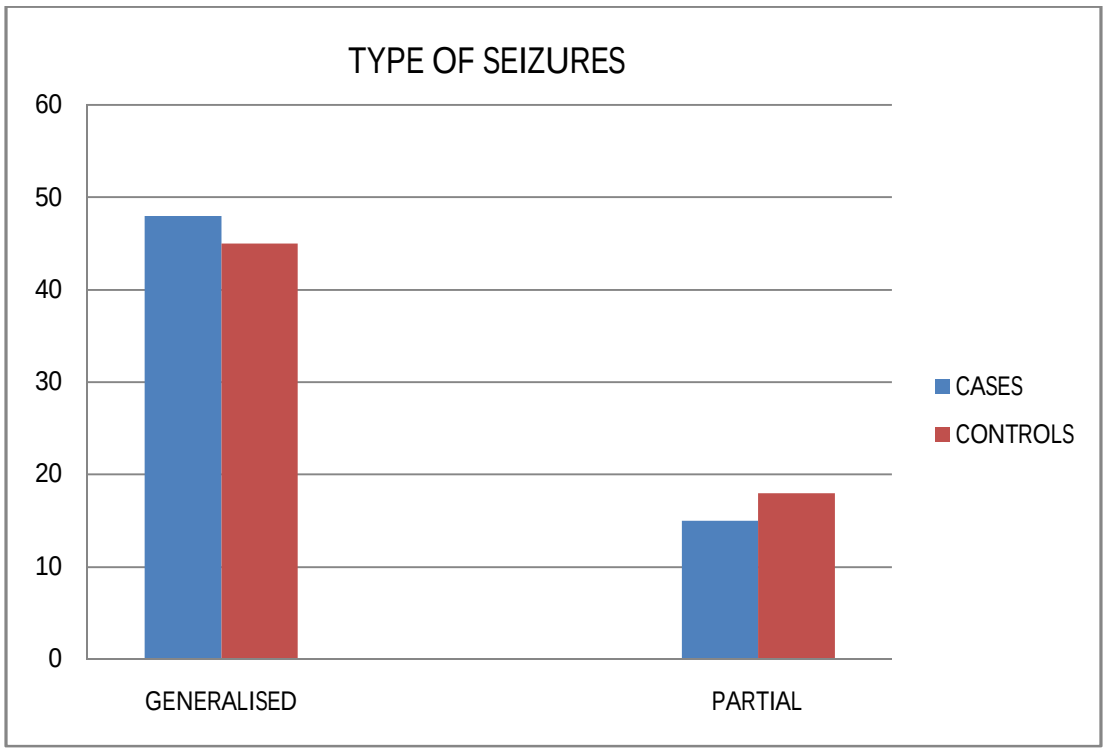
TYPE OF SEIZURE	CASES No. %	CONTROLS No. %	ODDS RATIO	CONFIDENCE INTERVAL	P VALUE
GENERALISED	48 (76.2)	45 (71.4)	1.280	0.577 – 2.840	0.543
PARTIAL	15 (23.8)	18 (28.6)	0.781	0.352- 1.733	0.543
TOTAL	63 (100)	63 (100)			

The commonest seizure in our study was generalized seizures with 48 (76.2%) children in the intractable group and 45 children (71.4%) in the control group. Generalised seizure was not significant in the cases with a P value of 0.543 and an Odds ratio of 1.280 with a 95% confidence interval of 0.577 – 2.840.

Partial seizures were seen in 15 (23.8%) children in the intractable group and 18 (28.6%) children in the well controlled group. Partial seizures were not significantly associated with intractable seizures with a P value of 0.543 and odds ratio of 0.781 with a 95% confidence interval of0.352-1.733.

2 children among the cases had more than one type of seizure with mental retardation and slow wave activity on EEG and had features of Lennox-Gastaut syndrome.

CHART –4


TYPE OF SEIZURES
60
50
40
30
20
10
0
GENERALISED
PARTIAL
CASES
CONTROLS

TYPE OF SEIZURES

TABLE - 6

	TYPE OF SEIZURES	CASES No.	%	CONTROLS No.	%
	GENERALISED SEIZURES	**48**	**(76.2)**	**45**	**(71.4)**
1	GTCS	18	(28.5)	30	(47.6)
2	Tonic	7	(11.1)	10	(15.8)
3	Clonic	3	(4.7)	3	(4.7)
4	Myoclonic	20	(31.7)	2	(3.17)
	PARTIAL SEIZURES	**15**	**(23.8)**	**18**	**(28.6)**
1	Simple partial	3	(4.7)	10	(15.8)
2	Complex partial	9	(14.3)	5	(7.9)
3	Partial seiz. with sec. generalization	3	(4.7)	3	(4.7)
	TOTAL	63	(100)	63	(100)

Among children who had generalized seizures the commonest seizure type was myoclonic seizures in the intractable group.20 children had myoclonic seizures in the intractable group and 2 children in the control group. GTCS was the commonest seizure observed in the control group with 30 children in the control

CHART- 5

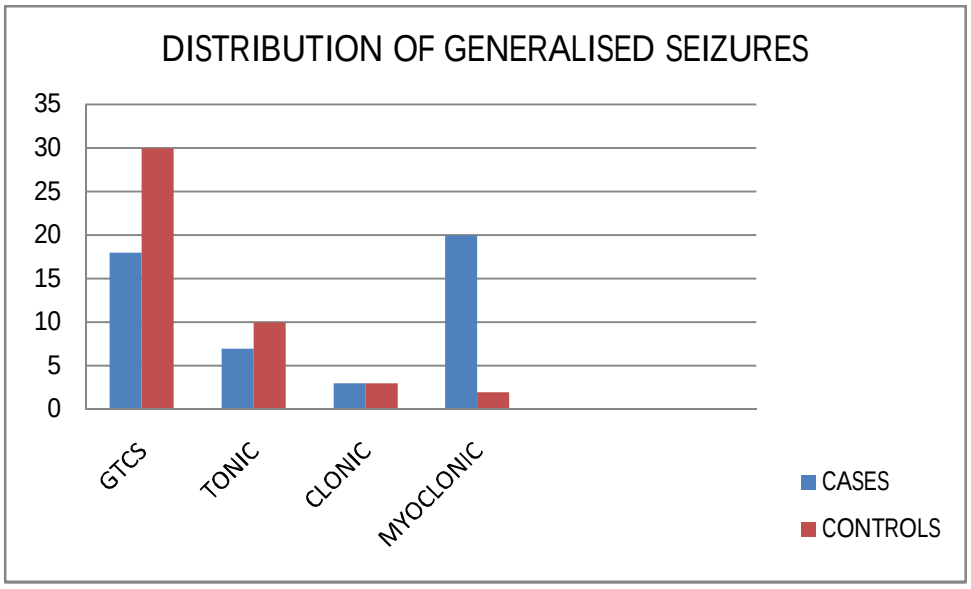
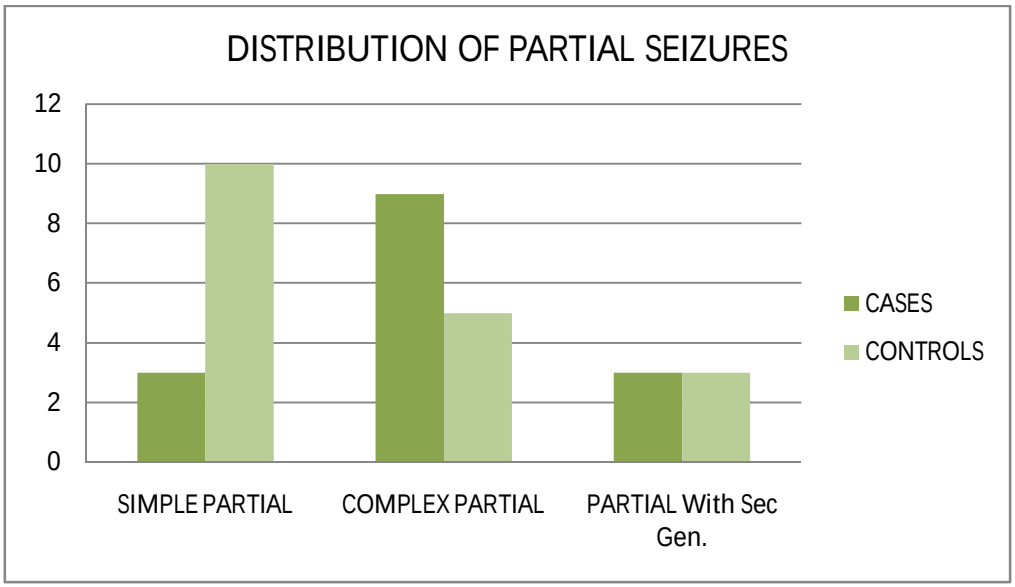


CHART – 6



group and 18 children in the intractable group. The commonest type of partial seizures was complex partial seizures with 9 children in the intractable and 5 children in the control group.

MYOCLONIC SEIZURES

TABLE - 7

TYPE OF SEIZURES	CASES(63) No. %	CONTROLS No. %	ODDS RATIO	CONFIDENCE INTERVAL	P VALUE
Myoclonic	20 (31.7)	2 (3.17)	14.18	3.149 - 63.89	< 0.001
TOTAL	63 (100)	63 (100)			

Myoclonic seizures was significantly associated with intractable seizures in the cases with a p value of <0.001 and odds ratio of 14.186 with a confidence interval of 3.149 - 63.899.

No. OF AED TAKEN BY THE STUDY GROUP

TABLE – 8

No. of AED	CASES No. %	CONTROLS No. %
5	4 (6.3)	-
4	7 (11.1)	-
3	52 (82.5)	3 (4.8)
2	-	20 (31.7)
1	-	40 (63.5)

CHART – 7

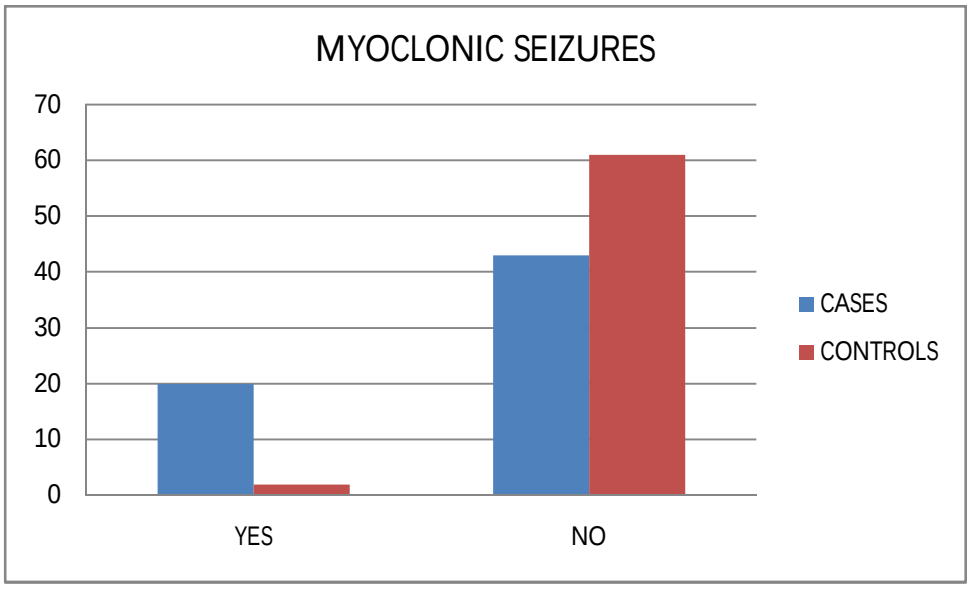
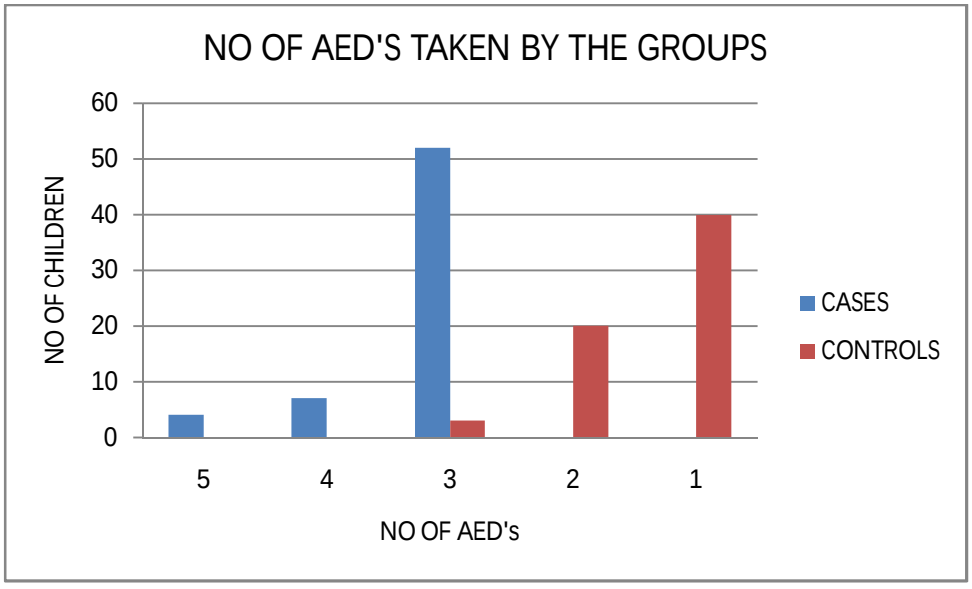


CHART – 8



Maximum number of children in the cases were on 3 AED whereas maximum number of children in the controls were on 1 AED. All the children in the case group were treated with 3 or more AED. None of the children in the control group were on more than 3 AED.

AGE OF ONSET OF SEIZURES <1YR

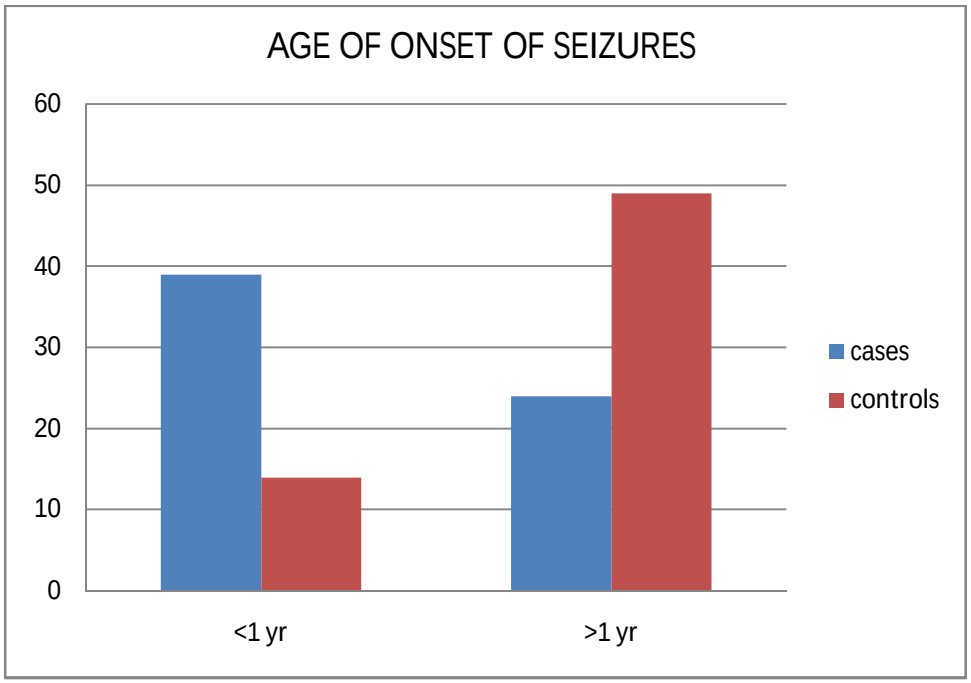
TABLE- 9

AGE OF ONSET	CASES No. %	CONTROLS No. %	ODDS RATIO	CONFIDENCE INTERVAL	P VALUE
<1 yr	39 (61.9)	14 (22.2)	5.688	2.602 - 12.431	<0.001
TOTAL	63 (100)	63 (100)			

39 (61.9%) children in the cases and 14 (22.2%) children among the controls had age of onset <1 yr. 24 (38.1%) children among the cases and 49 (77.8%) children among the control had age of onset of seizures >1 year.

The age of onset < 1yr in the cases was significant with P value of <0.001 and Odds ratio of 5.688 with a 95% Confidence interval of 2.602 -12.431.

CHART -9


AGE OF ONSET OF SEIZURES
60
50
40
30
20
10
0
<1 yr
>1 yr
cases
controls

FAMILY H/O SEIZURES, H/O FEBRILE SEIZURES AND CNS INFECTIONS

TABLE - 10

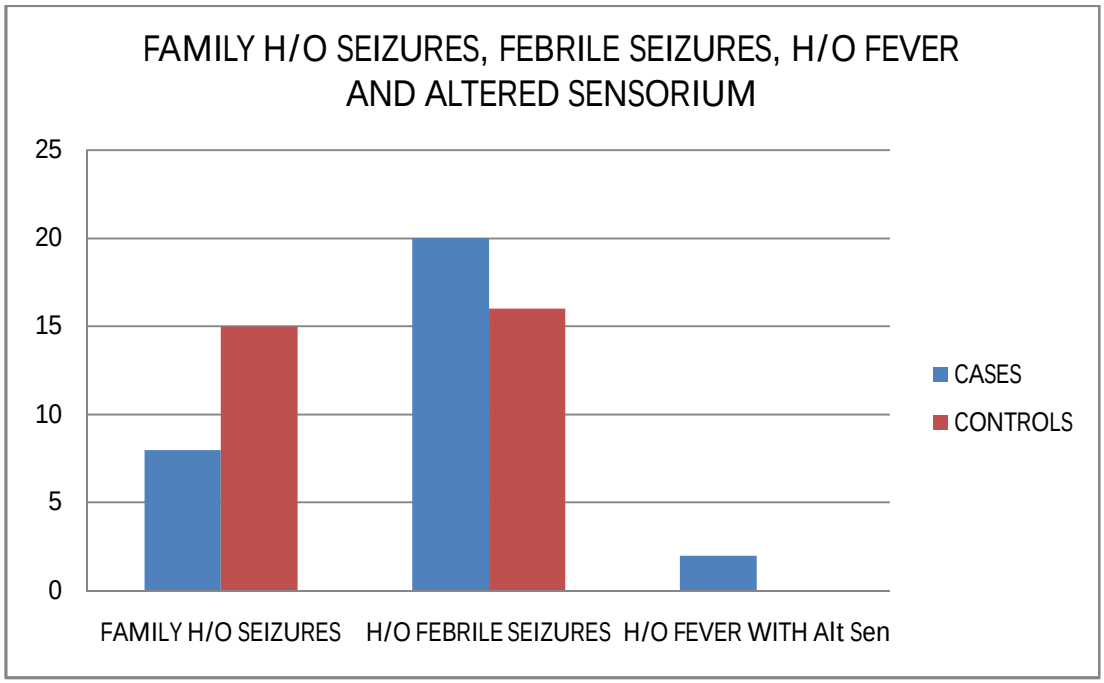
Parameter	CASES(63) No. %	CONTROLS (63) No. %	ODDS RATIO	CONFIDENCE INTERVAL	P VALUE
Family H/O Seizures	8 (12.7)	15 (23.8)	0.465	0.182 – 1.193	0.106
H/O Febrile Seizures	20 (31.7)	16 (25.4)	1.366	0.628 – 2.971	0.430
CNS Infections	2 (3.2)	-	-	-	0.154

Family H/o seizures was not significant among the cases with a P value of 0.106 and odds ratio of 0.465 with a 95% confidence interval of 0.182 – 1.193.

20 children among the cases had H/o febrile seizure with an insignificant p value-0.430 and odds ratio of 1.366 with a 95% confidence interval of 0.628 – 2.971.

2 children in the cases had H/o fever with altered sensorium and cerebrospinal fluid analysis suggestive of Central nervous system infection with an insignificant p value 0.154.

CHART – 10


FAMILY H/O SEIZURES, FEBRILE SEIZURES, H/O FEVER AND ALTERED SENSORIUM
25
20
15
10
5
0
FAMILY H/O SEIZURES
H/O FEBRILE SEIZURES
H/O FEVER WITH Alt Sen
CASES
CONTROLS

STATUS EPILEPTICUS AND NEONATAL SEIZURES

TABLE – 11

Parameter	CASES (63) No. %	CONTROLS (63) No. %	ODDS RATIO	CONFIDENCE INTERVAL	P VALUE
H/o status epilepticus	32 (50.8)	12 (19)	4.387	1.972 – 9.760	< 0.001
H/o neonatal seizures	13 (20.6)	5 (7.9)	3.016	1.005 – 9.048	0.042

32 (50.8%) children among the cases and 12 (19%) children among the controls had a history status epilepticus. 31 (49.2%) children among the cases and 51 (81%) children among the controls did not have history of status epilepticus. Children with intractable seizures had a higher incidence of status epilepticus with a significant P value of <0.001 and an Odds ratio of 4.387 with a 95% confidence interval of 1.972 – 9.760.

13 (20.6%) children among the cases and 5 (7.9%) children among the controls had H/o neonatal seizures in the past. 50 (79.4%) children among the cases and 58 (92.1%) children among the controls did not have a history of neonatal seizures. H/o neonatal seizure was a risk factor for intractable seizures with a significant P value- 0.042 and an Odds ratio of 3.016 with a 95% confidence interval of 1.005 - 9.048.

CHART- 11

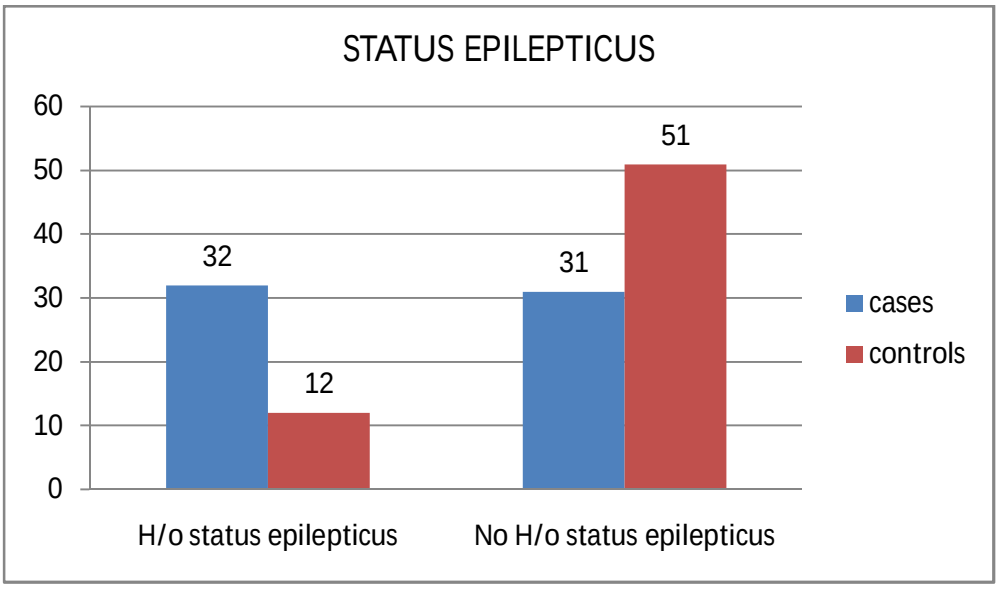
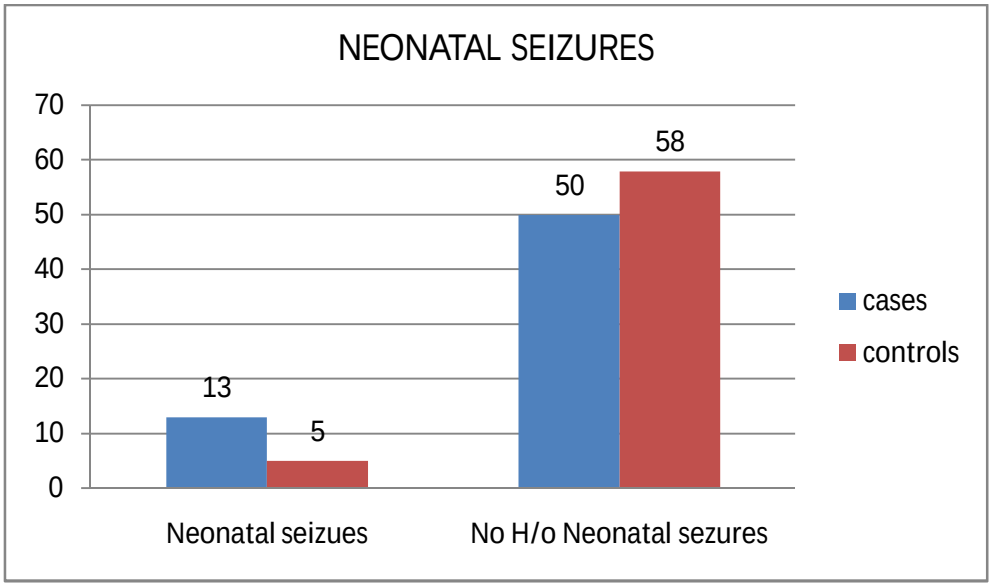


CHART – 12



BIRTH ASPHYXIA AND DEVELOPMENTAL DELAY

TABLE - 12

PARAMETER	CASES(63) No. %	CONTROLS(63) No. %	ODDS RATIO	CONFIDENCE INTERVAL	P VALUE
H/o birth asphyxia	29 (46)	9 (14.3)	5.118	2.161 -12.121	< 0.001
H/o developmental delay	34 (54)	6 (9.5)	11.138	4.196 – 29.566	<0.001

29 (46%) children among the cases and 9 (14.3%) children among the controls had a history suggestive of birth asphyxia. 34 (54%) children among the cases and 54 (85.7%) children among the controls did not have a history of birth asphyxia. H/o birth asphyxia in the cases was significant with a P value of <0.001 and an Odds ratio of 5.118 with a 95% confidence interval of 2.161 - 12.121.

34 (54%) children among the cases and 6 (9.5%) children among the controls had a history of developmental delay. 29 (46%) children among the cases and 57 (90.5%) children among the controls were developmentally normal. H/o developmental delay is significant in the cases with a P value of <0.001 and an Odds ratio of 11.138 with a 95% Confidence interval of 4.196 – 29.566.

CHART - 13

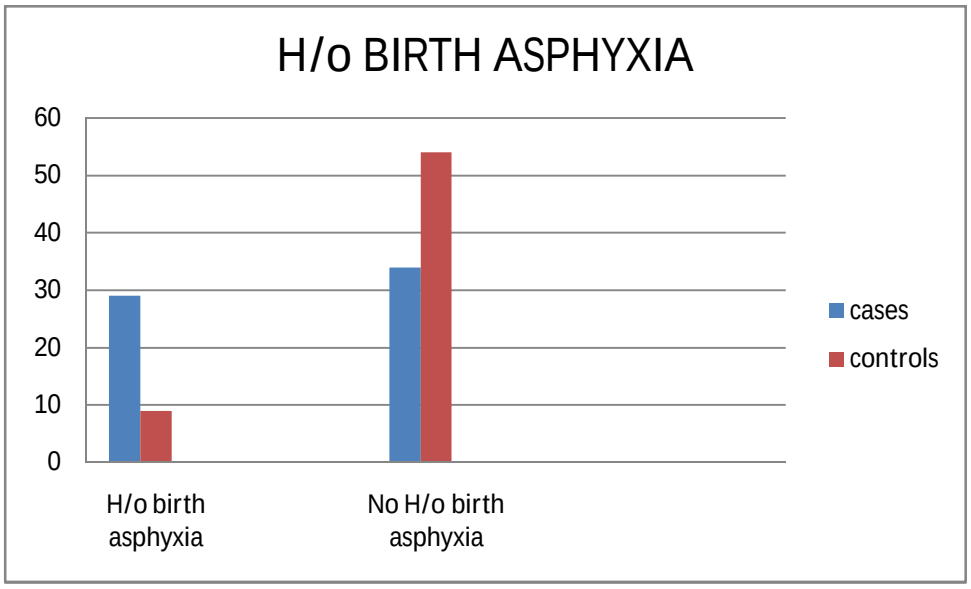
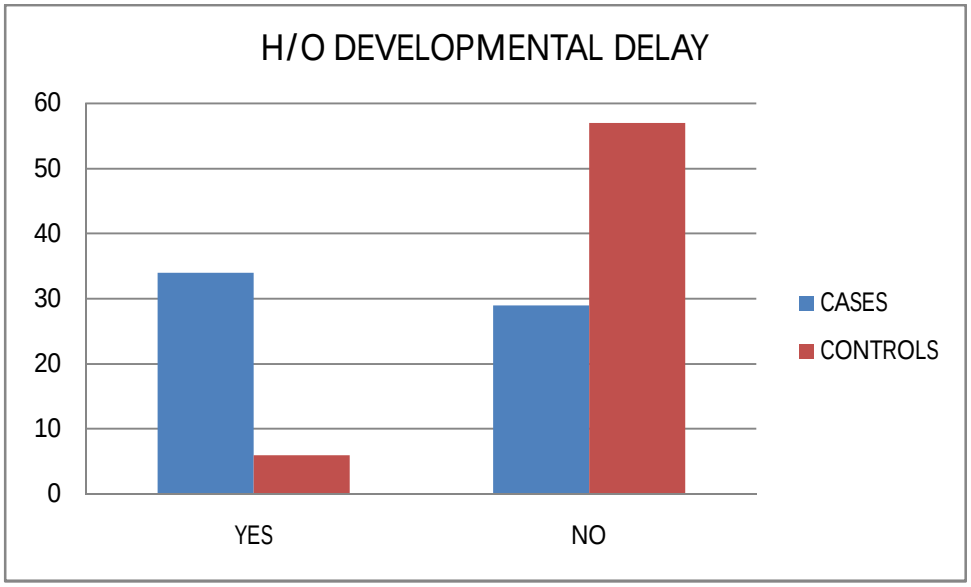


CHART – 14



ABNORMAL NEUROLOGICAL EXAMINATION

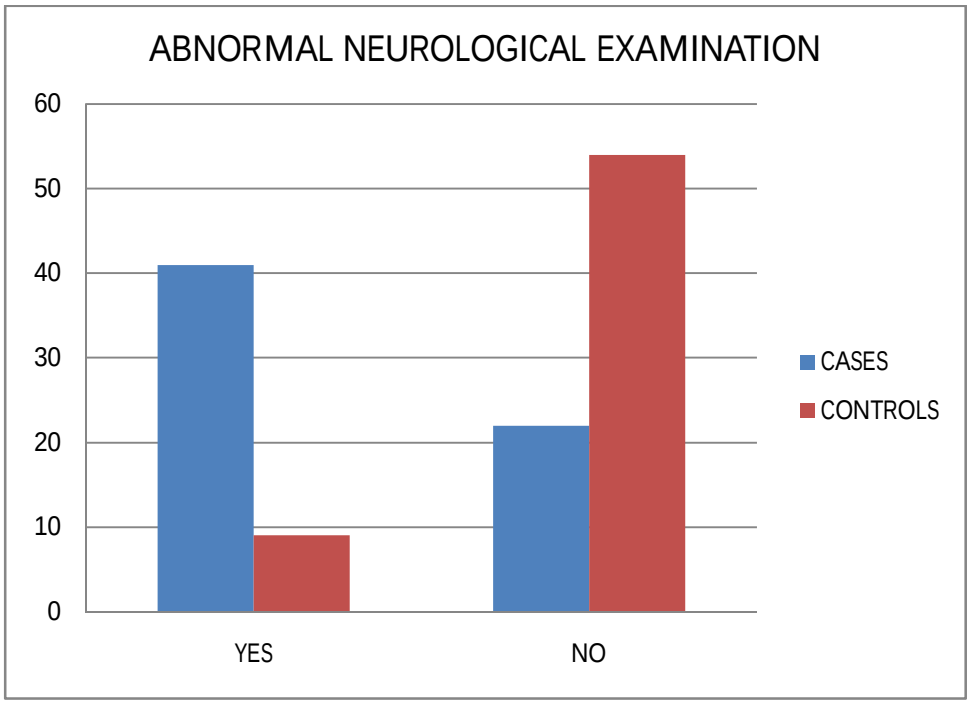
TABLE - 13

PARAMETER	CASES No. %	CONTROLS No. %	ODDS RATIO	CONFIDENCE INTERVAL	P VALUE
Abnormal neurological examination	41 (65.1)	9 (14.3)	11.182	4.660 – 26.834	<0.001
TOTAL	63 (100)	63 (100)			

Among the cases 41 (65.1%) children had an abnormal neurological examination when compared to only 9 (14.3%) children in the control group. 22(34.9%) children among the cases and 54 (85.7%) among the controls were neurologically normal.

Abnormal neurological examination seen in the cases was statistically significant with a P value of <0.001 and an Odds ratio of 11.182 with a 95% confidence interval of 4.660 – 26.834.

CHART – 15


ABNORMAL NEUROLOGICAL EXAMINATION
60
50
40
30
20
10
0
YES
NO
CASES
CONTROLS

FINDINGS ON NEUROLOGICAL EXAMINATION

TABLE – 14

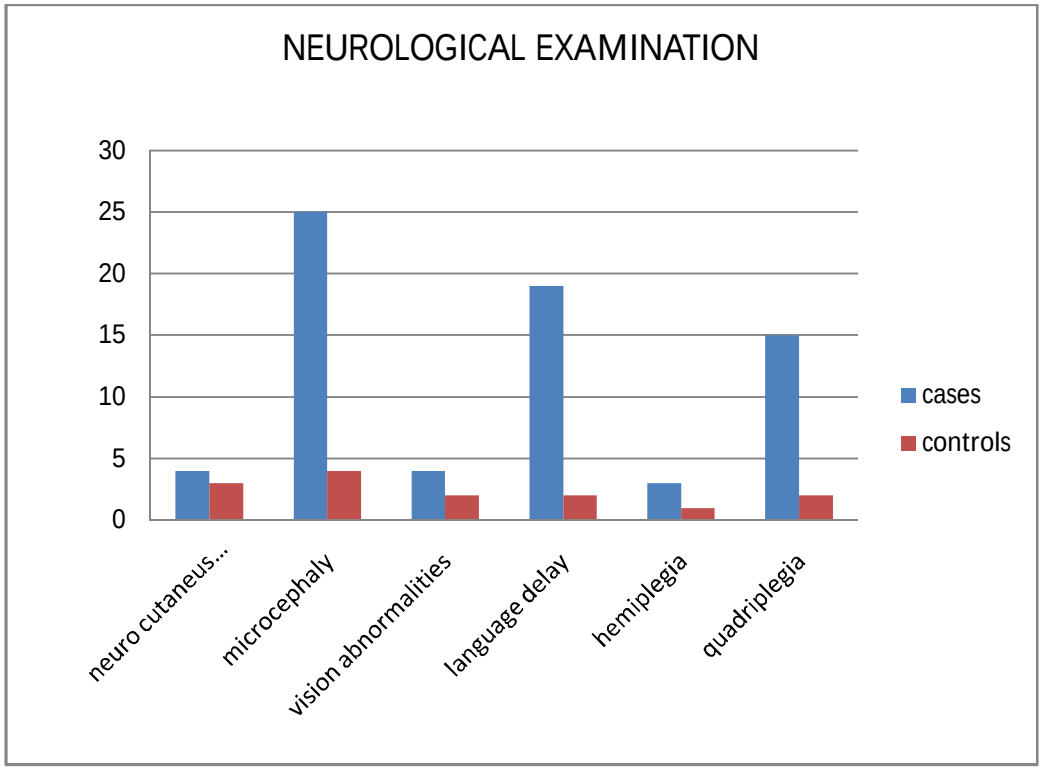
Neurological Examination	CASES(63) No	%	CONTROLS(63) No	%	ODDS RATIO	CONFIDENCE INTERVAL	P VALUE
Neurocutaneous markers	4	(6.3)	3	(4.8)	1.356	0.291 - 6.322	0.697
Microcephaly	25	(39.7)	4	(6.3)	9.704	3.130 - 30.084	< 0.001
Vision Abnormalities	4	(6.34)	2	(3.17)	1.356	0.748 - 2.457	0.403
Language Delay	19	(30.15)	2	(3.17)	2.159	1.657 - 2.813	< 0.001
Hemiplegia	3	(4.7)	1	(1.58)	1.525	0.842 – 2.762	0.310
Quadriplegia	15	(23.8)	2	(3.17)	2.004	1.524 – 2.634	< 0.001

25 (39.7%) children had microcephaly among the cases which was significant with a P value of <0.001 and Odds ratio of 9.704 with a confidence interval of 3.130- 30.084.

19 (30.1%) children had language delay among the cases which was significant with a P value of <0.001and odds ratio of 2.159 with confidence interval of 1.657-2.813

15 (23.8%) children had quadriplegia among the cases with significant P value of <0.001 and Odds ratio of 2.004 with 95% confidence interval of 1.524-2.634.

CHART -16


NEUROLOGICAL EXAMINATION
30
25
20
15
10
5
0
neuro cutaneus...
microcephaly
vision abnormalities
language delay
hemiplegia
quadriplegia
cases
controls

4 children in the cases had neurocutaneus markers suggestive of Tuberous sclerosis. Other findings were vision abnormalities 4 (6.32%) and hemiplegia 3 (4.7%) among the cases.

2 children among the controls had features suggestive of neurofibromatosis and one child had tuberous sclerosis.

ABNORMAL EEG

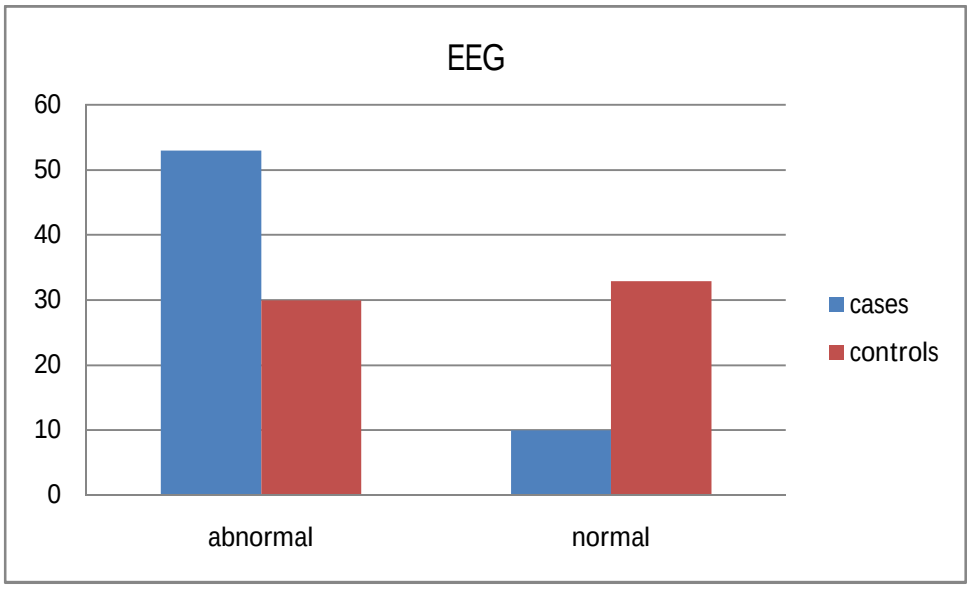
TABLE- 15

PARAMETER	CASES No. %	CONTROLS No. %	ODDS RATIO	CONFIDENCE INTERVAL	P VALUE
Abnormal EEG	53 (84.1)	30 (47.6)	5.830	2.524 – 13.468	<0.001
TOTAL	63 (100)	63 (100)			

EEG was abnormal in 53 (84.1%) cases when compared to 30 (47.6%) children in the controls. 10 (15.9%) children among the cases and 33 (52.4%) children among the controls had a normal EEG. The abnormality noted in most of the children was bilateral sharp wave discharges and multifocal sharp waves.

Abnormal EEG in the intractable group was significant in the cases with a P value of <0.001 and Odds ratio of 5.830 with a 95% Confidence interval of 2.524 -13.468.

CHART – 17



ABNORMAL CT SCAN BRAIN

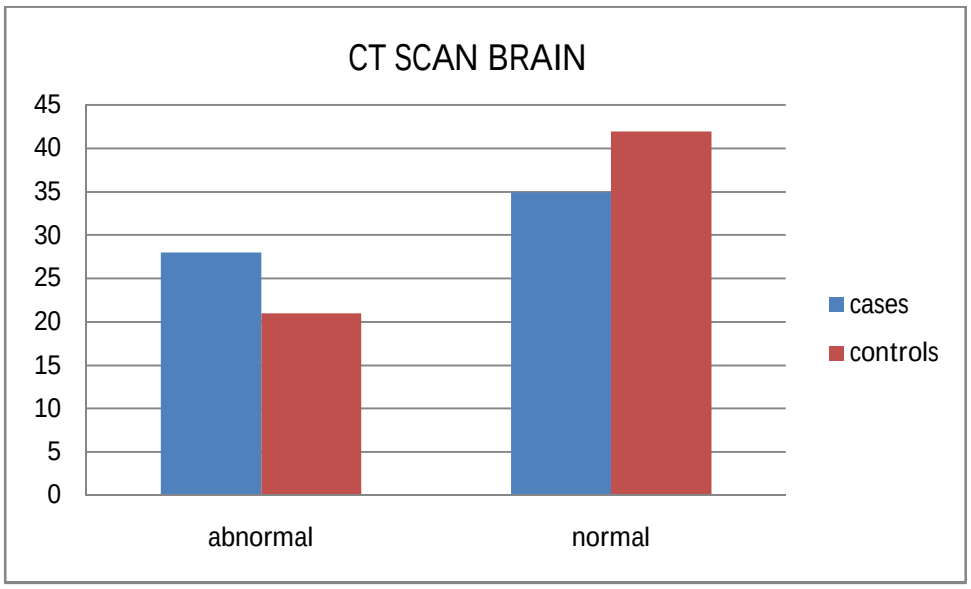
TABLE- 16

CT Scan	CASES No. %	CONTROLS No. %	ODDS RATIO	CONFIDENCE INTERVAL	P VALUE
ABNORMAL	28 (44.4)	21 (33.3)	1.600	0.777 – 3.294	0.201
TOTAL	63 (100)	63 (100)			

CT scan was done in all the children enrolled in the study. CT scan was abnormal in 28 (44.4%) cases and 21 (33.3%) controls. 35 (55.6%) children among the cases and 42(66.7%) children among the controls had a normal CT scan.

Abnormal CT scan in the cases was not significant with a p value of 0.201 and Odds ratio 1.600 with 95% Confidence interval of 0.777 – 3.294.

CHART – 18


CT SCAN BRAIN
45
40
35
30
25
20
15
10
5
0
abnormal
normal
cases
controls

FINDINGS ON CT SCAN BRAIN

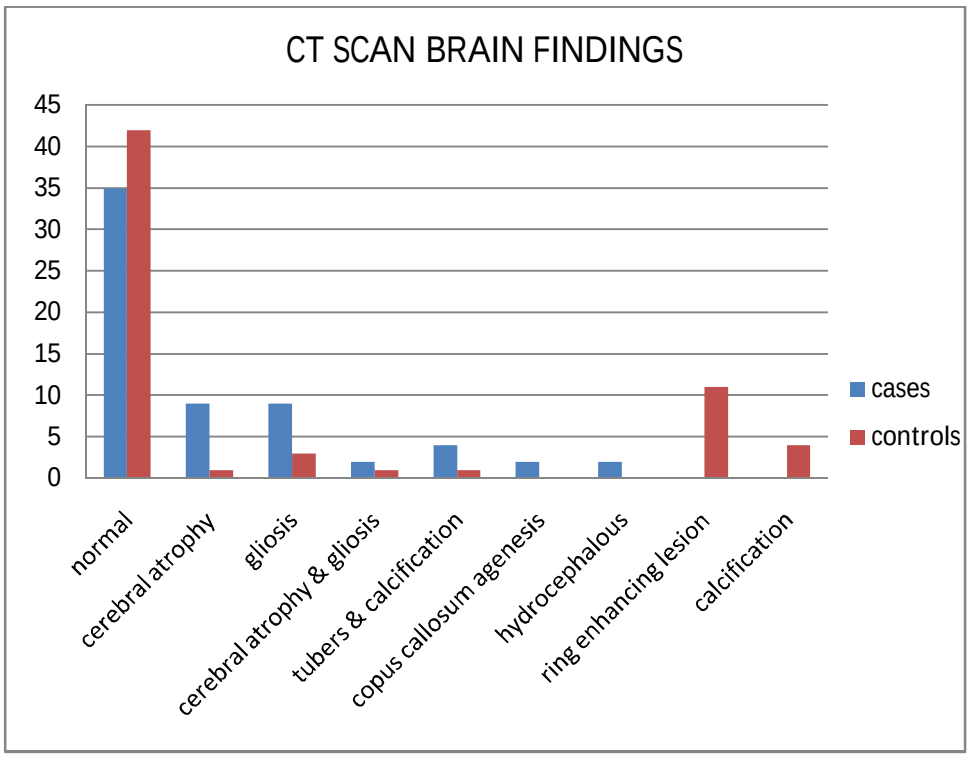
TABLE – 17

FINDINGS ON CT SCAN	CASES(63)		CONTROLS(63)	
	No.	%	No.	%
Normal	35	(55.6)	42	(66.7)
Cerebral atrophy	9	(14.3)	1	(1.58)
Gliosis	9	(14.3)	3	(4.76)
Cerebral atrophy + gliosis	2	(3.17)	1	(1.58)
Tubers and calcification	4	(6.34)	1	(1.58)
Corpus callosum agenesis	2	(3.17)	-	
Hydrocephalous	2	(3.17)	-	
Ring enhancing lesion	-		11	(17.4)
Calcifications	-		4	(6.34)

35 (55.6%) children among the cases and 42 (66.7%) children among the controls had a normal CT scan. 28 (44.4%) children among the cases and 21 (33.3%) had abnormal findings on CT scan.

Among the cases the commonest neurological finding was cerebral atrophy and gliosis. 9 (14.3%) children had cerebral atrophy and 9 (14.3%) children had gliosis among the cases. 2 (3.17%) had cerebral atrophy along with gliosis in the intractable group. 4(6.34%) cases had tubers and calcification on CT scan. 2(3.17%) children had agenesis of corpus callosum, 2 (3.17%) children had features of hydrocephalous. The commonest finding in the control group was ring enhancing lesion (17.4%).

CHART- 19


CT SCAN BRAIN FINDINGS
45
40
35
30
25
20
15
10
5
0
normal
cerebral atrophy
gliosis
cerebral atrophy & gliosis
tubers & calcification
copus callosum agenesis
hydrocephalous
ring enhancing lesion
calcification
cases
controls

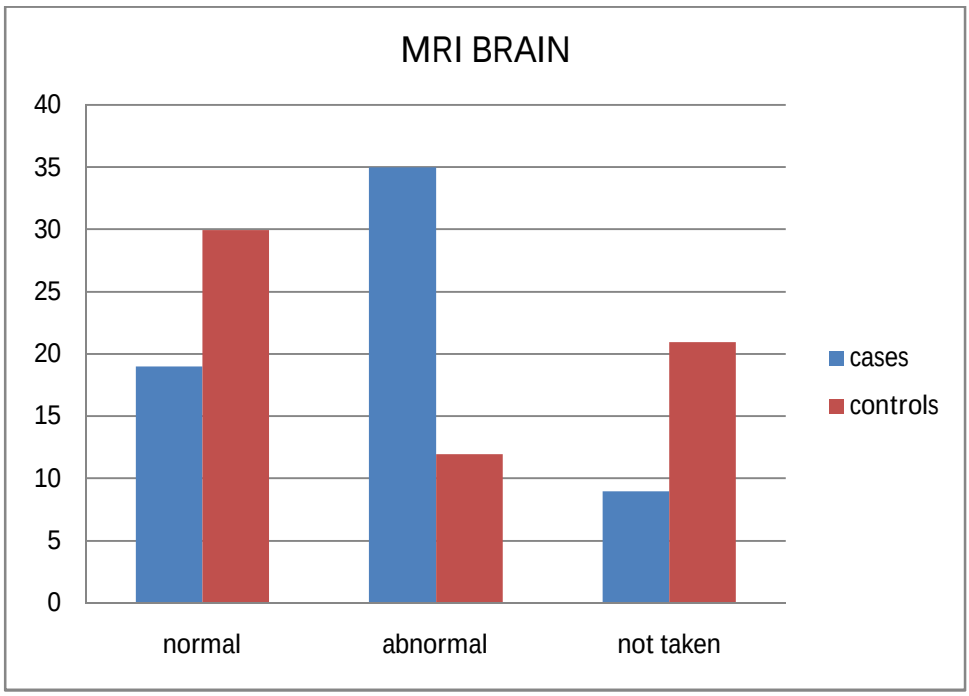
ABNORMAL MRI BRAIN SCAN

TABLE - 18

MRI	CASES No. %	CONTROLS No. %	P VALUE
ABNORMAL	35 (55.6)	12 (19.04)	0.005
NORMAL	19 (30.1)	30 (47.6)	
NOT TAKEN	9 (14.3)	21 (33.3)	
TOTAL	63 (100)	63 (100)	

MRI was not done in 9 cases and 21 controls. MRI was abnormal in 35 (55.6%) children of the cases and 12 (19.04%) children of the controls. Abnormal MRI was significant in the cases with a P value of 0.005.

CHART-20


MRI BRAIN
40
35
30
25
20
15
10
5
0
normal
abnormal
not taken
cases
controls

FINDINGS ON MRI BRAIN SCAN

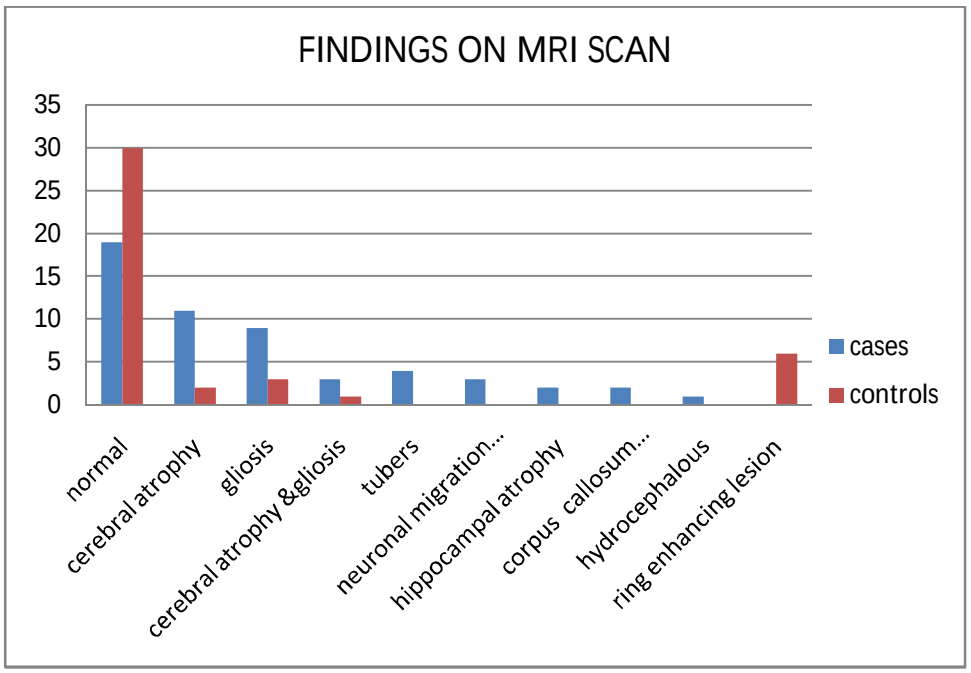
TABLE-19

FINDINGS ON MRI SCAN	CASES		CONTROLS	
	No.	%	No.	%
Normal	19	(30.1)	30	(47.6)
Cerebral atrophy	11	(20.37)	2	(4.76)
Gliosis	9	(16.7)	3	(7.14)
Cerebral atrophy + gliosis	3	(5.5)	1	(2.38)
Tubers	4	(7.40)	-	
Neuronal migration defects	3	(5.5)	-	
Hippocampal atrophy	2	(3.70)	-	
Corpus callosum agenesis	2	(3.70)	-	
Hydrocephalous	1	(1.85)	-	
Ring enhancing lesion	-		6	(14.3)

MRI Scan was not taken in 9 cases and 21controls who had a lesion on CT scan.

The commonest finding on MRI was cerebral atrophy which was seen in11 (20.37%) children. 9 (11.1%) children had features of gliosis and 3 (5.5%) children had features of cerebral atrophy and gliosis. 4 (7.40%) children in the cases had features of tuberous sclerosis. 2 (3.70%) children each in the cases had features of hippocampal atrophy and agenesis of the corpus callosum. 3 (5.5%) among the cases had features suggestive of neuronal migration disorders. There were 2 cases of Polymicrogyria and one case of Lissencephaly. 1 (1.85%) child among the cases had features of hydrocephalous.

CHART – 21


FINDINGS ON MRI SCAN
35
30
25
20
15
10
5
0
normal
cerebral atrophy
gliosis
cerebral atrophy &gliosis
tubers
neuronal migration...
hippocampal atrophy
corpus callosum...
hydrocephalous
ring enhancing lesion
cases
controls

ETIOLOGY OF INTRACTABLE EPILEPSY

TABLE- 20

ETIOLOGY	CASES No. %	CONTROLS No. %
REMOTE SYMPTOMATIC	44 (69.8)	33 (52.3)
IDIOPATHIC	19 (30.15)	30 (47.61)
TOTAL	63 (100)	63 (100)

In 19 (30.15%) children among the cases the etiology was idiopathic and 44 (69.8%) children had remote symptomatic etiology.

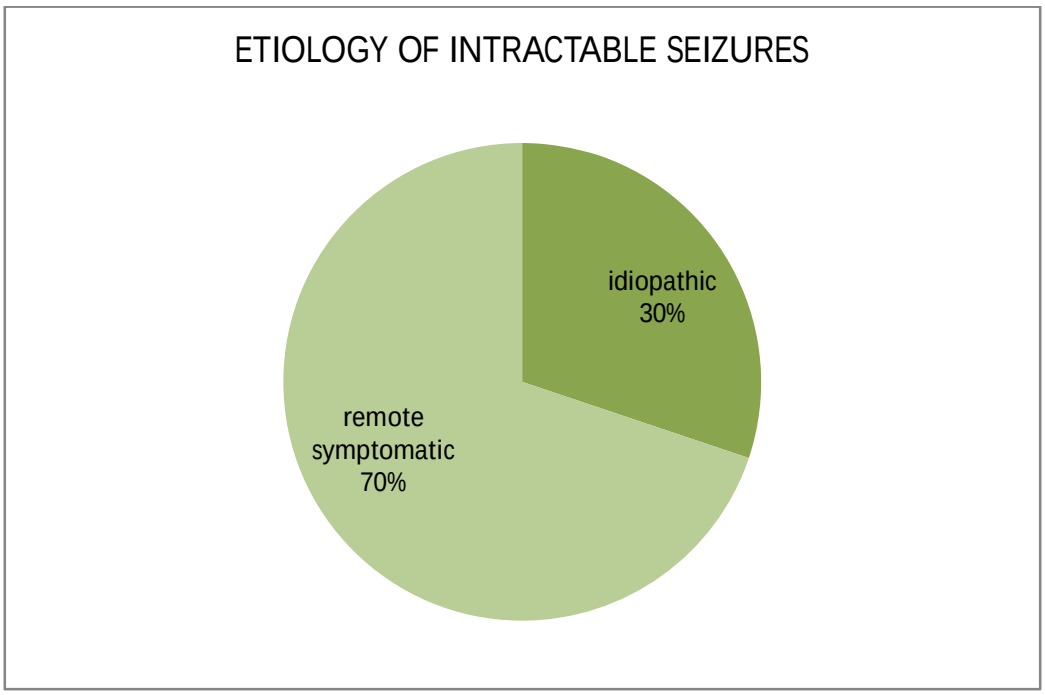
REMOTE SYMPTOMATIC ETIOLOGY

TABLE -21

ETIOLOGY	CASES No. %	CONTROLS No. %	ODDS RATIO	CONFIDENCE INTERVAL	P VALUE
REMOTE SYMPTOMATIC	44 (69.8)	33 (52.3)	2.1052	1.013 – 4.371	0.044
TOTAL	63 (100)	63 (100)			

Remote symptomatic etiology was significantly associated with intractability with a P value of 0.044 and Odds ratio of 2.1053 with a 95% confidence interval of 1.013 -4.371.

CHART- 22


ETIOLOGY OF INTRACTABLE SEIZURES
idiopathic
30%
remote
symptomatic
70%

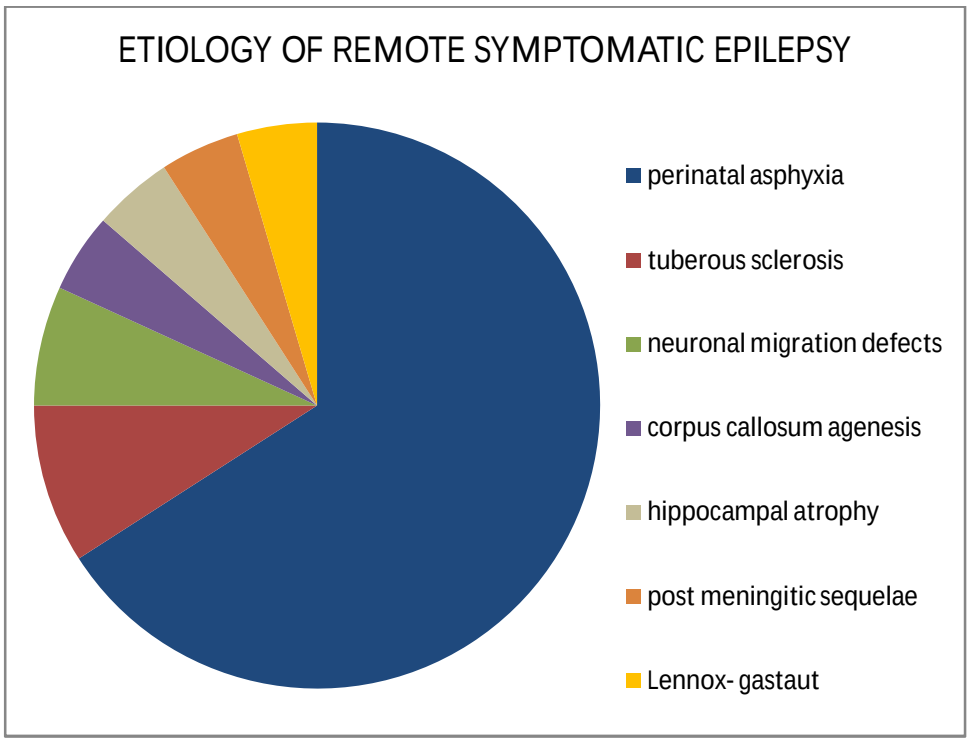
ETIOLOGY OF INTRACTABLE SEIZURES AMONG THE CASES

TABLE- 21

ETIOLOGY	CASES No. %	ODDS RATIO	CONFIDENCE INTERVAL	P VALUE
Perinatal Asphyxia	29 (46)	5.118	2.161 -12.121	<0.001
Tuberous Sclerosis	4 (6.34)	1.641	1.021 - 2.638	0.170
Neuronal migration disorders	3 (4.76)	-	-	0.080
Corpus callosum agenesis	2 (3.17)	-	-	0.154
Hippocampal atrophy	2 (3.17)	-	-	0.154
Postmeningitic sequelae	2 (3.17)	-	-	0.154
Lennox-Gastaut syndrome	2 (3.17)	-	-	0.154

The commonest cause of intractable seizures was perinatal asphyxia 29 (46%) followed by tuberous sclerosis 4 (6.34%). Other causes of intractability are neuronal migration disorders 3 (4.76%), corpus callosum agenesis 2 (3.17), hippocampal atrophy 2 (3.17%), Postmeningitic sequelae 2 (3.17%), Lennox-Gestaut syndrome 2 (3.17%) cases. Perinatal asphyxia was significantly associated with intractable seizures with a significant P value <0.001 and Odds ratio of 5.118.

CHART - 23


ETIOLOGY OF REMOTE SYMPTOMATIC EPILEPSY
perinatal asphyxia
tuberous sclerosis
neuronal migration defects
corpus callosum agenesis
hippocampal atrophy
post meningitic sequelae
Lennox- gastaut

DISCUSSION

DISCUSSION

The prevalence of intractable seizures was 10.53% in our study. Camfield et al[6] showed the prevalence of intractable seizures to be 8% in his studies. Sillanpaa in his study showed the prevalence of intractable seizures to be 22%. Medically intractable seizures is estimated to develop in 10- 20% of children with epilepsy[12].

In our study 67.5% of the children were males. There was a significant male preponderance in both the groups. Similar results were seen by Javad Abhondian et al[4] (76.5%). Mallik et al[9] also showed a male preponderance in his study. However male sex was not significantly associated with intractable seizures in our study.

In our study the incidence of daily seizures was 50.8% in the case group. A similar result was shown by Manoj et al[1] in his case group (50%). Javad et al[4] showed the incidence of daily seizures to be 66.7% in his cases. The occurrence of weekly seizures in our study was 19% and these matched well with Manoj et al[1] studies (20%). 30.2% of our cases had monthly seizures and our results matched well with Manoj et al[1] who showed the occurrence of monthly seizures to be 30%.

TYPE OF SEIZURES

TABLE-23

	COMMONEST SEIZURE TYPE
Present Study	Generalized seizures
Chawla et al[2]	Generalized seizures
Ohtsuka et al[13]	Generalized seizures
Berg et al[3]	Generalized seizures
Singhvi et al[8]	Partial seizures

The commonest seizure type in our study was generalized seizures. These results were also shown by Chawla et al[2], Ohtsuka et al[13] and Berg et al[3] in their studies.

Among the seizure types Myoclonic seizures proved to be an important predictor of intractability in our study. A similar result was shown by Chawla et al[2], Malik et al[9] and Javad et al[4] in their studies. Eriksson et al[14], Udani et al[11] and Berg et al[3] stated that myoclonic seizures/infantile spasms have the poorest seizure control.

82.5% of the cases were on 3 AED's, 11.1% on 4 AED's and 6.3% on 5 AED. 4.8% of the controls were on 3 AED's. None of the children in the control group was on more than 3 AED.

AGE OF ONSET OF SEIZURES

TABLE -24

STUDIES	AGE OF ONSET < 1 YEAR
Present Study	61.9%
Manoj et al[1]	60%
Chawla et al[2]	66%
Ohtsuka et al[13]	53%

In our study 61.9% of the children with intractable seizures had age of onset < 1 year. This compared well with studies of Manoj et al[1] (60%) and Chawla et al[2] 66%. However Ohtsuka et al[13] in his study stated age of onset of seizures <1 year to be 53%. In our study age of onset of seizures was a predictor of intractable epilepsy. The reasons for early onset of seizures are due to the etiologies like perinatal asphyxia, Tuberous sclerosis.

12.7% of our cases had a family history of seizures. Family H/o seizure was not significantly associated with intractable epilepsy in our study. These results go along with Manoj et al[1] and Javad et al[4].

Febrile seizure is a known risk factor for epilepsy the probable risk factor being hippocampal damage due to hyperthermia (Bourgeois et al[15]). H/o febrile seizure was not significantly associated with intractable seizures in our study. These

results were comparable with Manoj et al[1]. H/o fever with altered sensorium was not significantly associated with intractable seizures in our study.

50.8% children presented with status epilepticus in the cases and when compared to 19% of the children in the controls. Similar results were stated by Manoj et al[1] (55%). However Javad et al[4] showed only 11.8% of the cases to have status epilepticus. H/o status epilepticus was significantly associated with intractable epilepsy in our study. These results went well with Berg et al[3] and Manoj et al[1]. However in Javad et al[4] study there was no significant association between status epilepticus and intractable seizures. The explanation would be cause of an insult to the growing brain.

There were 46% of children with H/o perinatal asphyxia among the cases. Chawla et al[2] showed 50% of his cases with perinatal problems. Perinatal asphyxia was a predictor of intractable epilepsy. Similar results were shown by Atlunbasak et al[7] and Manoj et al[1].

H/o developmental delay was significantly associated with intractable epilepsy in our study. Similar results were shown by Aithala et al[10] in his study.

Microcephaly among the cases (39.7%) was significantly associated with intractable seizures in our study. Berg et al[3], Chawla et al[2] and Manoj et al[1] also showed similar results.

Abnormal neurological examination was a predictor of intractable epilepsy in our study. Chawla et al[2], Javad et al[4] and Atlunbasak et al[7] also showed similar

results. 40% of the children had microcephaly, 30 % children had language delay and 25% had quadriplegia.

Abnormal EEG among the cases was significantly associated with intractable seizures in our study. Atlunbasak et al[7] and Singhvi et al[8] (69%) also showed the same results in their study.

Abnormal CT scan was seen in 44.4% of our cases. Singhvi et al[8] reported 41% of abnormal CT scan among his cases. Abnormal CT scan among the cases was not significantly associated with intractable epilepsy in our study. However Javad et al[4] and Singhvi et al showed association between abnormal CT and intractable epilepsy.

Abnormal MRI scan among the cases was associated with intractable seizures in our study. Manoj et al[1] stated abnormal neuroimaging was associated with intractable seizures in his study.

The commonest cause of seizure in the cases was remote symptomatology in our study. Similar results were shown by Atlunbasak et al[7], Berg et al[3] and Manoj et al[1] in their studies.

SUMMARY OF THE

RESULTS &

CONCLUSIONS

SUMMARY OF THE RESULTS AND CONCLUSIONS

The following factors were found to be significantly associated with Intractable Epilepsy in our study

- Age of onset < 1 year
- Status epilepticus
- Neonatal seizures
- Myoclonic seizures
- Birth asphyxia
- Developmental delay
- Abnormal neurological examination
- Microcephaly
- Language delay
- Quadriplegia
- Abnormal EEG
- Abnormal MRI scan
- Remote symptomatic etiology

Children presenting with Myoclonic seizures, Age of onset <1year, Status epilepticus, Neonatal seizures, Birth asphyxia, Developmental delay, Microcephaly, Abnormal findings on EEG and MRI must be identified early and referred to a specialist for optimization of pharmacotherapy, considering early surgery in selective cases and trial of the newer modalities of treatment. Early identification is also important for parental counseling regarding the nature of the disease and importance of compliance to medications.

In our study the commonest cause of Intractable Epilepsy was perinatal asphyxia. Perinatal asphyxia can be prevented by good nutrition during pregnancy, regular antenatal checkups with detection of high risk pregnancy, promoting hospital deliveries and prompt resuscitation of newborn when required.

Status epilepticus is also a significant risk factor for Intractable Epilepsy. It must be prevented by counseling mothers regarding compliance to drugs and to seek medical facilities for early intervention when seizures occur.

RECOMMENDATIONS

RECOMMENDATIONS

It would be of great interest to study the etiology of Intractable Epilepsy using newer modalities of investigations like (PET) Positron Emission Tomography, (SPECT) Single Photon Emission Computed Tomography, (f MRI) Functional Magnetic resonance Tomography. These modalities of investigations help in accurate identification of the Epileptogenic zones which gives clue to the etiology and also aids in surgical intervention. This will help in, more effective management and better outcome of children with intractable seizures.

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BIBLIOGRAPHY

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ANNEXURES

PROFORMA

NAME **AGE** **SEX** **Dc.No:**

WEIGHT **HOSPITAL NUMBER**

ADDRESS **CONTACT NUMBER**

COMPLAINTS

PRESENT HISTORY

01. Type of seizures

A	Generalised tonic clonic	
B	Tonic	
C	Clonic	
D	Myoclonic	
E	Atonic	
F	Absence	
G	Simple partial	
H	Complex partial	
I	Partial seizures with secondary generalization	

02. Frequency

a.1/year	b. 1/month	c.>1/month	d. 1/week	e. >1/week	f. >1/day

03. NO of AED tried so far

a.	Phenytoin	
b.	Phenobarbitone	
c.	Carbemezipine	
d.	Sodium Valproate	
e.	Lamotrigine	
f.	Topiramate	
g.	Levitirecetam	

04. Duration of AED tried so far

No of drugs used	a.>18 months	b. >2 years	> 3 years
1. >2			
2. >3			

05. Maximum dose used

a. >2 drugs	b. >3 drugs	c. > 4 drugs

06. Duration of seizure

a.< 20 minutes	c. > 20 minutes

07. ETIOLOGY AND PREDICTORS OF INTRACTABLE SEIZURES

A. Age at onset of first seizures

1. <1 year	2. 1- 5 years	3. > 5 years

B. Sex

1. Male	2. Female

C. Seizure frequency

1. >1/ Day	2. >1/Week	3. >1/Month	4. >1/ 6 Months	5. > 1/ Year

D	Type of seizures		
E	Febrile seizures	Present	Absent
F	Family History of Seizures	Present	Absent
G	Birth Asphyxia	Present	Absent
H	Developmental Delay	Present	Absent
I	Neonatal seizures	Present	Absent
J	CNS Infections	Present	Absent
K	Stroke	Present	Absent
L	H/O Head trauma	Present	Absent
M	Abnormal Neurological Examination	Present	Absent
N	Abnormal EEG	Present	Absent
O	Lesion on CT	Present	Absent
P	Lesion on MRI	Present	Absent

EXAMINATION

General examination

EXAMINATION OF THE CNS

HIGHER FUNCTIONS:

CRANIAL NERVES:

MOTOR SYSTEM:

1. Bulk
2. Tone
3. Power
4. Reflexes

Superficial Reflexes

Babinski's

Deep Reflexes

Jaw jerk

Biceps

Triceps

Knee

Ankle

SENSORY SYSTEM:

CEREBELLAR SIGNS:

EXAMINATION OF SKULL AND SPINE

EXAMINATION OF OTHER SYSTEMS

CVS

RS

ABDOMEN

INVESTIGATIONS

Hb

TC

DC

PLATELET

URINE FOR METABOLIC SCREENING

LFT

RFT

EEG

CT

MRI

OPHTHAL EVALUATION

ENT EVALUATION

INSTITUTIONAL ETHICAL COMMITTEE, STANLEY MEDICAL COLLEGE, CHENNAI-3

Title of the Work : Clinical Profile of Intractable Seizures

Principal Investigator : Dr.S.Bhagyalakshmi
Designation : P.G in MD (Paed)
Department : Paediatrics

The request for an approval from the Institutional Ethical Committee (IEC) was considered on the IEC meeting held on 01.02.2011 at the Modernized Seminar Hall, Stanley Medical College, Chennai-1 at 2PM

The members of the Committee, the secretary and the Chairman are pleased to approve the proposed work mentioned above, submitted by the principal investigator.

The Principal investigator and their team are directed to adhere to the guidelines given below:

1. You should inform the IEC in case of changes in study procedure, site investigator investigation or guide or any other changes.
2. You should not deviate form the area of the work for which you applied for ethical clearance.
3. You should inform the IEC immediately, in case of any adverse events or serious adverse reaction.
4. You should abide to the rules and regulation of the institution(s).
5. You should complete the work within the specified period and if any extension of time is required, you should apply for permission again and do the work.
6. You should submit the summary of the work to the ethical committee on completion of the work.

09/05/11

MEMBER SECRETARY,
IEC, SMC, CHENNAI

தகவல் படிவம்

குழந்தைக்கு மருந்துகளால் கட்டுப்படுத்த முடியாத தீவிர வலிப்பு நோயின் காரணங்களையும், அதன் தன்மைகளையும் கண்டறிவதற்கான ஓர் ஆய்வு.

தங்களின் குழந்தைக்கு மருந்துகளால் கட்டுப்படுத்த முடியாத தீவிரமான வலிப்பு நோய் உள்ளது. நோயிற்கான காரணத்தையும், அதன் தன்மைகளையும் கண்டறிவதற்காக ஓர் ஆய்வு மேற்கொள்ளபட உள்ளது. தங்கள் குழந்தையின் நோய் குறித்த விபரங்கள் மற்றும் இரத்தம், சிறுநீர், இ.இ.ஜி. மற்றும் ஸ்கேன் பரிசோதனைகளின் முடிவுகளை தங்கள் சம்மதத்துடன் இவ்வாய்வில் பயன்படுத்த விரும்புகிறோம்.

இதன் மூலம் நோயின் காரணங்களையும் தன்மையும் அறிந்து கொண்டு மருந்துகவ சிகிச்சையை மேலும் மேம்படுத்துவதற்காக மேற்கொள்ளப்பட உள்ள ஆய்வு.

தாங்கள் விரும்பினால் மருத்துவ ஆய்விலிருந்து எப்பொழுது வேண்டுமானாலும், எந்த சட்ட சிக்கலுக்கும் உட்படாமல் தாங்கள் தன் குழந்தையை ஆய்விலிருந்து விலகிக் கொள்ளலாம்.

இந்த ஆய்வின் மூலம் கிடைக்கும் தகவல்களும், பரிசோதனை முடிவுகளும் தங்களின் ஒப்புதலின் மூலம் மட்டுமே மருத்துவ ஆய்வில் பயன்படுத்தப்படும்.

ஆய்வாளர் கையொப்பம் :

ஆய்வாளரின் பெயர் :

இடம் :

நாள் :

சுய ஒப்புதல் படிவம்

ஆய்வு செய்யப்படும் தலைப்பு

குழந்தைக்கு மருந்துகளால் கட்டுப்படுத்த முடியாத தீவிர வலிப்பு நோயின் காரணங்களையும், அதன் தன்மைகளையும் கண்டறிவதற்கான ஓர் ஆய்வு.

ஆராய்ச்சி நிலையம் : ஆரசு ஸ்டான்லி மருத்துவமனை,
சென்னை-600 001.

பங்கு பெறுபவரின் பெயர் :

பங்கு பெறுபவரின் எண் :

பங்கு பெறுபவர் இதனை (✓) குறிக்கவும்

மேலே குறிப்பிட்டுள்ள மருத்துவ ஆய்வின் விவரங்கள் எனக்கு விளக்கப்பட்டது. என்னுடைய சந்தேகங்களை கேட்கவும், அதற்கான தகுந்த விளக்கங்களை பெறவும் வாய்ப்பளிக்கப்பட்டது. ☐

எனது குழந்தையை நான் இவ்வாய்வில் தன்னிச்சையாகத்தான் பங்கேற்க வைக்கிறேன். எந்த காரணத்தினாலோ எந்த கட்டத்திலும் எந்த சட்ட சிக்கலுக்கும் உட்படாமல் நான் என் குழந்தையை இவ்வாய்வில் இருந்து விலகிக் கொள்ளலாம் என அறிந்துக் கொண்டேன். ☐

இந்த ஆய்வின் சம்மந்தமாகவோ, இதை சார்ந்த மேலும் ஆய்வு மேற்கொள்ளும் போதும். இந்த ஆய்வில் பங்கு பெறும் மருத்துவர் என்னுடைய குழந்தையின் மருத்துவ அறிக்கைகளை பார்ப்பதற்கு என் அனுமதி தேவையில்லை என அறிந்து கொள்கிறேன். நான் என் குழந்தையை ஆய்விலிருந்து விலக்கிக் கொண்டாலும் இது பொருந்தும் என அறிகிறேன். ☐

இந்த ஆய்வின் மூலம் கிடைக்கும் தகவல்களையும் பரிசோதனை முடிவுகளையும் மற்றும் சிகிச்சை தொடர்பான தகவல்களையும் மருத்துவர் மேற்கொள்ளும் ஆய்வில் பயன்படுத்திக் கொள்ளவும் அதை பிரசுரிக்கவும் என முழு மனதுடன் சம்மதிக்கிறேன். ☐

இந்த ஆய்வில் எனது குழந்தை பங்குக் கொள்ள ஒப்புக்கொள்கிறேன். எனக்கு கொடுக்கப்பட்ட அறிவுரைகளின்படி, நடந்துக் கொள்வதுடன் இந்த ஆய்வை மேற்கொள்ளும் மருத்துவ அணிக்கு உண்மையுடன் இருப்பேன் என்றும் உறுதியளிக்கிறேன். என் குழந்தையின் உடல் நலம் பாதிக்கப்பட்டாலோ அல்லது எதிர்பாராதா வழக்கத்திற்கு மாறான நோய்குறி தென்பட்டாலோ அதை உடனே மருத்துவ அணியிடம் தெரிவிப்பேன் என உறுதியளிக்கிறேன். ☐

இந்த ஆய்வில் எனது குழந்தையின் இரத்தம், சிறுநீர் எக்ஸ்ரே, இ.இ.ஜி. ஸ்கேன், பரிசோதனை செய்துக்கொள்ள நான் முழுமனதுடன் சம்மதிக்கிறேன். ☐

பங்கேற்பவரின் கையொப்பம்..... இடம்..... தேதி

கட்டைவிரல் ரேகை

பங்கேற்பவரின் பெயர் மற்றும் விலாசம்.....

ஆய்வாளரின் கையொப்பம்.....இடம்.....தேதி

ஆய்வாளரின் பெயர்.....

MASTER CHART - CASES

NAME	AGE	SEX	Sez. fre	Typ.of sz	No AED	Onst<1yr	Fa h/o sz	Feb. sz	Sta. Epi	Neo.sz	CNS infe	BA	DD	Neu. cut	Microcep	Neu. Exa	EEG	CT	MRI
Gokulakrishnan	2	1	3	1	3	1	2	2	1	2	2	1	1	2	1	1	1	1	1
Mubeena	3	2	3	1	3	2	2	2	1	2	2	1	1	2	1	1	1	1	1
Thamizhselvan	3	1	1	2	3	1	2	2	2	1	2	1	1	2	1	1	1	1	1
Gouse Basha	3	1	3	2	3	2	2	1	2	2	2	2	2	2	2	2	1	1	1
Aravind	3	1	3	2	4	2	1	1	2	2	2	2	2	2	2	2	1	2	2
Pavithra	3	2	1	1	3	1	2	2	2	2	2	2	2	1	2	2	1	1	3
Karthikeyan	3	1	3	1	3	2	1	2	1	2	2	1	1	2	1	1	1	1	3
Vijay	3	1	3	1	3	1	1	1	2	1	2	1	1	2	2	1	1	1	3
Archana	3	2	1	1	3	1	2	2	1	2	2	2	1	2	2	1	1	1	3
Mahesh	3	1	3	2	3	2	2	2	1	2	2	2	2	2	2	2	1	2	1
Desarani	3	2	3	1	3	1	2	2	1	2	2	1	1	2	1	2	1	1	1
Vetrivel	2	1	3	1	3	1	2	1	2	2	2	1	1	2	1	1	1	2	1
Samuel	2	1	3	2	3	1	2	2	2	2	2	2	2	2	2	2	1	2	2
Gopinath	2	1	1	1	3	1	2	2	2	1	2	1	1	2	1	2	1	2	2
Arunraj	2	1	3	1	3	2	2	2	2	2	2	1	2	2	1	2	2	1	3
Manimegalai	3	2	1	1	4	1	2	2	2	2	1	2	2	2	1	1	1	1	3
Srikanth	3	1	3	1	3	2	2	1	2	2	2	2	2	2	2	2	1	1	1
Seeniammal	3	2	3	2	3	2	2	1	2	2	2	2	2	2	2	2	1	2	2
Vignesh	3	1	1	1	3	1	2	2	2	1	2	2	2	1	1	2	1	1	1
Imtiyaz	3	1	2	1	4	1	2	2	2	2	2	2	1	2	2	1	1	1	1
Yuvaraj	2	1	1	1	3	1	2	2	2	2	2	2	2	2	1	1	1	1	1
Durgasree	3	2	1	1	3	1	2	2	2	2	2	2	2	1	1	2	1	1	1

NAME	AGE	SEX	Sez. fre	Typ.of sz	No AED	Onst<1yr	Fa h/o sz	Feb. sz	Sta. Epi	Neo.sz	CNS infe	BA	DD	Neu. cut	Microcep	Neu. Exa	EEG	CT	MRI
Kamaraj	2	1	1	1	5	3	2	1	1	2	2	1	1	2	1	1	2	1	1
Mohanaraja	2	1	1	1	3	1	2	1	2	2	2	1	2	2	1	1	2	2	2
Balamurugan	1	1	1	2	3	1	2	2	1	2	2	1	1	2	2	1	1	2	1
Senthil	1	1	2	1	4	2	2	1	2	2	2	2	2	2	2	2	1	2	1
Suhasini	3	2	1	1	5	2	2	1	2	2	2	2	2	2	2	1	1	2	1
Vasantha	1	1	3	2	3	3	2	2	1	2	2	2	1	2	1	1	2	2	1
Sheela	2	2	1	2	3	2	2	2	2	2	2	2	2	2	1	1	1	2	1
SivaKumar	3	1	2	1	3	1	1	2	1	1	2	2	2	1	2	2	1	1	1
Suresh	1	1	1	1	3	1	1	2	1	1	2	2	2	2	2	1	1	2	1
Gayathri	2	2	1	1	3	2	2	1	2	2	2	1	1	2	2	1	1	2	2
Mohammad	1	1	1	1	5	2	2	1	1	2	2	1	1	2	2	1	1	2	2
Angelin	3	2	1	1	3	1	2	1	1	2	2	1	1	2	1	1	1	2	2
Prakatheeswaran	1	1	2	1	3	1	2	1	2	2	2	1	2	2	1	2	1	1	2
Kathiravan	3	1	1	2	3	1	2	2	1	1	2	1	1	2	1	1	1	1	1
Sudakar	2	1	3	1	4	1	2	2	1	2	2	1	1	2	1	1	1	2	3
Mageshwari	3	2	1	1	3	1	1	2	2	2	2	2	1	2	2	2	2	2	2
Raghunathan	3	1	1	1	3	2	2	2	1	1	2	2	1	2	2	1	1	1	1
Arunachalam	3	1	2	2	3	1	2	2	1	2	2	2	2	2	2	1	1	1	1
Sridevi	2	2	3	2	3	1	1	2	1	2	2	1	1	2	1	2	2	2	2
Janagan	3	1	1	1	4	1	2	2	1	2	2	1	1	2	1	1	1	2	1
Rajasekaran	2	1	3	1	3	1	2	1	1	1	1	2	2	2	2	1	1	2	1
Balakrishnan	3	1	2	1	3	1	1	2	2	2	2	2	1	2	2	2	2	1	3
Ganesh	2	1	1	1	5	2	2	2	1	2	2	1	2	2	1	1	1	1	2
Kamalakannan	3	1	3	1	3	1	2	2	1	2	2	2	1	2	2	1	1	2	1

NAME	AGE	SEX	Sez. fre	Typ.of sz	No AED	Onst<1yr	Fa h/o sz	Feb. sz	Sta. Epi	Neo.sz	CNS infe	BA	DD	Neu. cut	Microcep	Neu. Exa	EEG	CT	MRI
Uma Devi	1	2	2	1	3	2	2	2	2	2	2	1	2	2	2	1	2	2	2
Rajesh	1	1	1	1	3	1	2	2	1	2	2	2	2	2	2	1	2	2	1
Sakthivel	3	1	1	2	4	1	2	1	1	1	2	2	1	2	2	1	1	2	1
Gomathi	2	2	1	1	3	2	2	2	2	2	2	1	1	2	1	1	1	1	2
Raghavan	3	1	1	1	3	1	2	2	2	2	2	2	2	2	2	1	2	2	2
Manohar	2	1	2	1	3	3	2	1	1	2	2	1	1	2	2	2	1	2	1
Lakshmi	2	2	1	2	3	1	2	1	1	2	2	2	1	2	2	1	1	2	1
Basakaran	3	1	3	1	3	1	2	2	2	1	2	2	1	2	2	1	1	1	3
Palanivel	1	1	2	1	3	2	2	2	1	2	2	1	1	2	1	2	1	2	2
Ezhumalai	3	1	1	1	3	2	2	1	1	2	2	2	2	2	2	1	1	2	1
Chandrasekar	2	1	2	1	3	1	2	2	1	2	2	2	2	2	2	1	1	2	1
Ashwini	2	2	1	1	3	1	2	2	2	2	2	1	2	2	2	2	1	1	2
Sadagopan	3	1	1	1	3	2	2	2	2	1	2	2	1	2	2	1	1	2	1
Santhanam	2	1	2	2	3	1	2	1	1	2	2	1	1	2	2	1	1	2	2
Geetha	3	2	1	1	3	1	2	2	1	2	2	2	1	2	2	2	1	1	1
Gnanavel	3	1	2	1	3	3	2	2	2	1	2	1	1	2	2	1	1	2	1
Subramanian	3	1	1	1	3	1	2	2	1	2	2	1	2	2	2	1	1	2	2

MASTER SHEET - CONTROLS

NAME	AGE	SEX	Sez. fre	Typ.of sz	No. AED	Onst. <1yr	Fa. h/o sz	Feb. sz	Sta. Epi	Neo. sz	CNS infe	BA	DD	Neu. cut	Microcep	Neu. Exa	Abn EEG	Abn CT	Abn MRI
Mathiazhagan	1	1	5	1	1	1	1	1	1	2	2	1	1	2	2	1	1	1	3
Thenmozhi	3	2	4	1	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2
Vajiravelu	2	1	5	1	1	2	1	2	2	2	2	2	2	2	2	1	2	2	2
Suramanjiri	2	2	5	2	1	2	2	2	1	2	2	2	2	2	2	2	2	2	3
Perumal	2	1	5	2	2	1	2	1	2	2	2	2	2	1	2	2	1	1	3
Kirubakaran	3	1	5	1	2	2	2	2	2	1	2	1	1	2	1	1	2	1	3
Porkodi	3	2	5	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Vinayagam	2	1	4	1	1	1	2	2	1	2	2	2	2	2	2	2	2	2	2
Boopalan	1	1	4	2	1	3	1	1	2	2	2	2	2	2	2	2	2	2	2
Malarvizhi	2	2	5	1	3	2	2	2	2	2	2	2	2	2	2	2	1	1	3
Krishmoorthy	2	1	5	1	1	2	2	2	2	2	2	2	2	2	2	2	1	2	2
Gopal	2	1	5	2	2	1	2	1	1	2	2	1	2	1	1	1	1	1	3
Ilavarasi	3	2	5	1	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2
Vishwanathan	2	1	4	1	2	3	2	2	2	2	2	2	2	2	2	1	2	2	1
Rajkumar	1	1	5	1	1	2	2	2	2	2	2	2	2	2	2	2	1	1	3
Kalaiselvi	2	2	5	2	1	1	2	1	1	2	2	2	2	2	2	2	2	2	1
Soundarajan	3	1	4	1	3	2	1	2	2	2	2	2	2	2	2	2	2	2	2

NAME	AGE	SEX	Sez. fre	Typ.of sz	No. AED	Onst. <1yr	Fa. h/o sz	Feb. sz	Sta. Epi	Neo. sz	CNS infe	BA	DD	Neu. cut	Microcep	Neu. Exa	Abn EEG	Abn CT	Abn MRI
Thandapani	2	1	5	2	1	2	2	2	2	2	2	2	2	2	2	1	1	1	3
Naveen Kumar	2	1	4	1	1	2	2	2	2	1	2	1	1	2	2	1	1	1	2
Junaitha Banu	2	2	5	1	2	3	2	1	2	2	2	2	2	2	2	2	1	2	2
Thiyagaraj	3	1	4	1	1	2	1	2	2	1	2	2	2	2	2	2	2	2	2
Rathinavel	3	1	5	1	1	1	2	2	2	2	2	2	2	1	2	2	2	1	3
Iyngaran	3	1	5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Vijayalaksmi	3	2	5	1	1	2	2	2	1	2	2	2	2	2	2	2	1	2	2
Humayoon	2	1	4	1	1	3	1	1	2	2	2	2	2	2	2	2	2	1	3
Marunraj	2	1	4	1	1	3	2	2	2	2	2	2	2	2	2	2	1	2	2
Dhanavanthini	3	2	5	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	1
Venkatesh	3	1	5	2	1	3	2	2	2	2	2	2	2	2	2	*2*	1	1	3
Madhumitha	2	2	4	1	1	3	2	2	1	2	2	1	1	2	2	1	1	1	3
Ravichandran	3	1	5	1	1	2	2	1	2	2	2	2	2	2	2	2	2	2	1
Jayaganapathy	3	1	5	1	2	1	1	2	2	2	2	2	2	2	2	2	1	2	2
Manjunath	3	1	5	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	1
Arun Kumar	3	1	5	1	1	2	2	2	1	1	2	1	2	2	2	2	1	1	2
Parvathy	2	2	5	1	3	2	2	2	2	2	2	2	2	2	2	2	2	2	1
Assif Baig	3	1	4	2	1	2	2	2	2	2	2	2	2	2	2	2	1	2	2
Suryaprakash	2	1	5	1	1	1	1	1	2	2	2	2	2	2	2	2	2	1	3

NAME	AGE	SEX	Sez. fre	Typ.of sz	No. AED	Onst. <1yr	Fa. h/o sz	Feb. sz	Sta. Epi	Neo. sz	CNS infe	BA	DD	Neu. cut	Microcep	Neu. Exa	Abn EEG	Abn CT	Abn MRI
Jayakumar	2	1	5	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1
Archana	3	2	5	1	2	2	2	2	2	2	2	1	1	2	1	1	1	2	3
Ramesh	2	1	5	1	1	3	2	2	1	2	2	2	2	2	2	2	2	2	2
Narayanamoorthy	1	1	5	2	1	2	2	1	2	2	2	2	2	2	2	2	1	2	1
Poornima	2	2	4	1	1	2	2	2	2	2	2	2	2	2	2	2	2	1	3
Lokeshwaran	2	1	5	1	2	1	2	2	2	2	2	2	2	2	2	2	1	2	2
Selvaraj	3	1	5	1	1	3	1	2	2	2	2	2	2	2	2	2	2	2	2
Prabhu Shankar	2	1	4	2	1	2	2	1	1	2	2	2	2	2	2	2	2	2	1
Kalaimathi	3	2	4	1	1	3	2	2	2	2	2	2	2	2	2	2	2	1	3
Sunil Joshua	2	1	5	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2
Sabarinathan	2	1	5	1	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2
Anand	3	1	4	2	1	3	2	2	2	2	2	2	2	2	2	2	1	2	2
Meenakshi	2	2	4	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	1
Akshatha	2	2	5	2	1	3	2	2	2	2	2	2	2	2	2	2	2	1	3
Dillibabu	3	1	5	1	2	2	1	2	1	2	2	2	2	2	2	2	1	2	2
Dharani	3	2	4	2	1	3	2	2	2	2	2	2	2	2	2	2	2	2	2
Narmatha	2	2	5	1	2	2	2	2	2	1	2	1	1	2	1	2	1	1	3
Rajarajeshwari	1	2	5	1	2	1	2	2	2	2	2	2	2	2	2	2	1	2	1
Sasikumar	2	1	5	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2

NAME	AGE	SEX	Sez. fre	Typ.of sz	No. AED	Onst. <1yr	Fa. h/o sz	Feb. sz	Sta. Epi	Neo. sz	CNS infe	BA	DD	Neu. cut	Microcep	Neu. Exa	Abn EEG	Abn CT	Abn MRI
Dheena	2	1	4	1	2	3	2	1	2	2	2	2	2	2	2	2	2	2	2
Suganya	2	2	5	2	1	2	1	2	2	2	2	2	2	2	2	2	1	2	2
Varadarajan	3	1	5	1	2	3	2	2	2	2	2	2	2	2	2	2	2	2	1
Deepika	3	2	4	1	1	3	2	2	1	2	2	2	2	2	2	2	2	2	2
Nandagopal	3	1	5	2	2	1	2	1	2	2	2	1	2	2	2	2	1	1	3
Sangeetha	2	2	5	1	1	2	2	2	2	2	2	2	2	2	2	2	1	2	2
Pandiyan	2	1	5	1	1	2	1	2	2	2	2	2	2	2	2	2	1	1	3
Janani	2	2	5	1	1	2	2	1	2	2	2	2	2	2	2	2	1	1	3

KEY TO MASTER CHART

Age

1 - 1-2 years

2 - 2-5 years

3 - 5-12 years

Sex

1 -Male

2 - Female

Seiz.fre. – SEIZURE FREQUENCY

1 - Daily seizures

2 - > 1/week

3 - > 1 /month

4 - > 1/ 6 months

5 - > 1/year

Typ. of sz – TYPE OF SEIZURES

1 – Generalised

2 - Partial

No. AED – NUMBER OF AED

1 - One AED

2 - Two AED

3 - Three AED

4 - Four AED

5 - Five AED

Onst. < 1 yr – ONSET < 1 YEAR

1 - < 1 year

2 - > 1 year

Fa h/o sz – FAMILY HISTORY OF SEIZURES

1 - Present

2 - Absent

Feb. sz – FEBRILE SEIZURES

1 - Present

2 - Absent

Sta. Epi – STATUS EPILEPTICUS

1 - Present

2 - Absent

Neo. sz – NEONATAL SEIZURES

1 - Present

2 - Absent

CNS infec – CNS INFECTION

1 - Present

2 - Absent

BA – BIRTH ASPHYXIA

1 - Present

2 - Absent

DD – DEVELOPMENTAL DELAY

1 - Present

2 - Absent

Neu.cut – NEUROCUTANEUS MARKERS

1 - Present

2 - Absent

Microcep. – MICROCEPHALY

1 -Present

2 - Absent

Neu. Exa – NEUROLOGICAL EXAMINATION

1 - Abnormal

2 - Normal

EEG – ELECTRO ENCEPHALOGRAPHY

1 - Abnormal

2 - Normal

CT – COMPUTED TOMOGRAPHY OF BRAIN

1 - Abnormal

2 - Normal

MRI – MAGNETIC RESONANCE IMAGING OF BRAIN

1 - Abnormal

2 - Normal

3 - Not taken

ABBREVIATIONS USED IN THE BOOK

AED	**-**	**Anti Epileptic Drugs**
EEG	**-**	**Electro Encephalography**
MRI	**-**	**Magnetic Resonance Imaging**
CT	**-**	**Computed Tomography**
No	**-**	**Number**