DOI: 10.21276/sjams.2016.4.12.31

Scholars Journal of Applied Medical Sciences (SJAMS) **ISSN 2320-6691 (Online)**
Sch. J. App. Med. Sci., 2016; 4(12C):4335-4343 **ISSN 2347-954X (Print)**

(An International Publisher for Academic and Scientific Resources)
www.saspublisher.com

Original Research Article

Analytical Study of Seizure Disorders in Children

Dr. P. Sharath Chander Rao[1], Dr. Vamshi Krishna Kondle[2], Dr. Kranti Kondle[3]

[1]Assistant Professor, Department of paediatrics, Mallareddy Women's Medical College, Hyderabad, Telangana.
[2]Associate Professor, Department of paediatrics, Kamineni institute of medical sciences, Narketpally, Nalgonda, Telangana
[3]Junior resident, department of Obg, RVM institute of medical sciences and research center, Mulugu, Telangana

***Corresponding author**
Dr. P. Sharath Chander Rao
Email: sharathpolsani@gmail.com

Abstract: Seizure disorder is one of the common childhood neurological illnesses occurring in 4 – 6 per 1000 children in the general population. The degree and type of central nervous system damage existing at the onset of the seizure is decisive for the final outcome, but the cessation of the seizures also improves the child's developmental possibilities. To know the etiology and different types of seizures the present Prospective study conducted in Kamineni Institute of Medical Sciences hospital, Narketpally, over 115 children of 0-5 years during the period of July 2005 –October 2007. Majority of children with seizures were in the age group of 0 – 2 years. Most common type of convulsion during neonatal period was Subtle (38.64%), followed by focal clonic (31.83%). Among the Subtle seizures, Hypoxic ischemic encephalopathy was the most common etiology (58.82%).Most common etiology of generalized tonic seizure was Neonatal sepsis with Meningitis (42.85%).Most common etiology of multifocal clonic seizure was Hypocalcemia (50.00%).
Keywords: seizures, neonatal period, post neonatal period.

INTRODUCTION

Seizures are defined as paroxysmal alterations of neurological function due to sudden paroxysmal depolarization of a group of neurons resulting in motor, sensory or autonomic disturbances with or without change in the level of consciousness. Epileptic seizures have been recognized for millennia. One of the earliest descriptions of a secondarily generalized tonic - clonic seizure was recorded over 3000 years ago in Mesopotamia. The seizure was attributed to the God of the Moon. Epileptic seizures were described in ancient cultures, including those of China, Egypt, and India. An ancient Egyptian papyrus described a seizure in a man who had previous head trauma [1]. Hippocrates wrote the first book about epilepsy almost 2500 years ago [1]. He rejected ideas regarding the divine etiology of epilepsy and concluded that the cause was excessive phlegm that caused abnormal brain consistency. Hippocratic teachings were forgotten, and divine etiologies again dominated beliefs about epileptic seizures during medieval times. Even at the turn of the last century, excessive masturbation was considered a cause of epilepsy [1]. This hypothesis is credited as leading to the use of the first effective anticonvulsants, i.e., bromides. Modern investigation of the etiology of epilepsy began with the work of Fritsch, Hitzig, Ferrier, and Caton in the 1870s [1]. They recorded and evoked epileptic seizures in the cerebral cortex of animals. In 1929, Berger discovered that electrical brain signals could be recorded from the human head by using scalp electrodes [1]. This discovery led to the use of electroencephalography (EEG) to study and classify epileptic seizures. Gibbs, Lennox, Penfield, and Jasper further advanced the understanding of epilepsy and developed the system of the 2 major classes of epileptic seizures currently used [1].

Seizure disorder is one of the most common neurological conditions in childhood which affects approximately 3 to 4 per 1000 children in developed countries and 6 to 8 per 1000 children in developing countries [2-4]. Within the pediatric age range, very young age at onset is sometimes found to be associated with a poor prognosis [5-7]. The distribution of specific syndromes and etiologies is very different by age. Specifically, the cryptogenic and symptomatic generalized syndromes occur largely during the first year of life, and there is very little idiopathic epilepsy in

this age group. There also is more remote symptomatic epilepsy in the very young onset group.

Family history influences the development of epilepsy. Its association with outcome is less clear. The idiopathic epilepsies have a presumed genetic basis. Interestingly, exploratory analyses suggested that the effect of family history was strongest in the generalized idiopathic syndromes [4, 8]. The significance of such findings will be better addressed by the ongoing and future efforts in molecular genetics under way by several groups worldwide.

Despite advances in the diagnosis and treatment of epilepsy many children with epilepsy function poorly with an excessive incidence of psychosocial difficulties and behavioral problems as compared to healthy children or children with other chronic illnesses [4, 6]. Epilepsy has also been found to impede the development of independence and impair social function, peer relationships, and self-esteem.

AIMS

1. To study the incidence of convulsions in different periods of early childhood (before 5 years) in each sex.
2. To differentiate types of convulsions in neonatal & beyond neonatal period.
3. To know the etiology in each case of seizure disorder & to identify the causative factor / agent.
4. To suggest preventive measures if any.

MATERIAL AND METHODS

Prospective study of seizures in 0 – 5 years old Children admitted in Kamineni Institute of Medical Sciences hospital, Narketpally, during the period (July 2005 –October 2007)

Inclusion Criteria

Children brought to Kamineni Institute of Medical Sciences Hospital and admitted with history of convulsions for the first time and or with active convulsions.

Neonates: Born at Kamineni Institute of Medical Sciences Hospital and or delivered at home or any other hospital and brought with active convulsions being the presenting complaint.
Age criteria: Birth to 5 years of life.

Exclusion criteria

- Children who had convulsions and treated outside or on Anti-epileptic drugs
- Children who came with other ailments and were found to be epileptic
- Children with irregular follow up

METHODS

All children who met the study criteria were enrolled. An informed consent was taken from the parents/child prior to enrollment. A complete history including details of demographic data, seizure related variable, family background was obtained. A detailed physical and neurological examination was done with special emphasis on seizure details, birth and development, CNS infections, head trauma, Neonatal seizures and febrile seizures, family history of seizure disorder, mental retardation and neurological deficits. Seizures were classified using the International League against Epilepsy (ILAE) [9] classification of epileptic seizures and epilepsy syndromes.

OBSERVATIONS AND RESULTS

One Hundred and Fifteen children with seizures since birth to Five years of age who were attending Pediatric OPD in Kamineni Institute of Medical Sciences, Narketpally were included in the study. Data collection was done between the periods, July 2005 to October 2007. As our study design was a cross sectional prospective study there were no missing cases.

Since Etiology and Clinical presentation differ in Neonatal and beyond neonatal period, the study was broadly divided into

a) Neonatal period
b) Beyond neonatal period

Table 1: Seizure group by age and sex (n=115)

Age Group	Males	Females	Total	Percentage
Neonatal	17	15	32	27.8
Beyond Neonatal	45	38	83	72.2
Total cases	62	53	115	100

Maximum number of cases (72.2%) was in the age group of beyond neonatal period. In the neonatal group (32 cases) 17(53.12%) were males and 15 (46.88%) were females. In the beyond neonatal group (83 cases) 45 (54.21%) were males and 38(45.79%) were females.

Table 2: Types of Convulsions In Neonatal Period (N=44)

Type Of Convulsion	No. Of Cases (%)
Generalized Tonic	7 (15.90)
Focal Clonic	14 (31.83)
Multifocal Clonic	6 (13.63)
Subtle	17 (38.64)
Myoclonic	(0)

Most common type of convulsion during neonatal period was Subtle (38.64%), followed by focal clonic (31.83%). Myoclonic seizures were observed in none. In few neonates there were multiple types of convulsions documented. 7 cases of focal clonic seizures also had subtle seizures; 3 cases of multifocal seizures also had subtle seizures and 2 cases of generalized tonic seizures also had subtle seizures.

ETIOLOGY OF CONVULSIONS IN NEONATAL PERIOD (N=44)

Hypoxic ischemic Encephalopathy was the most common etiology (38.64%) of the neonatal seizures, followed by Sepsis with Meningitis (29.55%). Kernicterus was seen in only 2.27% cases.

Table 3: Etiology of various types of neonatal seizures (n=44)

ETIOLOGY	GENERALISED TONIC	FOCAL CLONIC	MULTI FOCAL CLONIC	SUBTLE	MYOCLONIC	TOTAL	%
Hypoxic Ischemic Encephalopathy	2	4	1	10	--	17	38.64
Hypoglycemia	2	4	--	3	--	9	20.45
Neonatal Sepsis & Meningitis	3	4	2	4	--	13	29.55
Kernicterus	-	1	-	-	--	1	2.27
Hypocalcemia	-	1	3	-	--	4	9.09
Total (based on type of seizure)	7	14	6	17	--	--	--
Percentage (based on type of seizure)	15.91	31.82	13.63	38.64	--	--	--

Subtle seizure was the most common seizure type (38.64%) followed by Focal Clonic (31.82%). Among the Subtle seizures, Hypoxic ischemic encephalopathy was the most common etiology (58.82%).Most common etiology of generalized tonic seizure was Neonatal sepsis with Meningitis (42.85%).Most common etiology of multifocal clonic seizure was Hypocalcemia (50.00%). A lone case of Kernicterus is reported which presented as focal clonic seizure. Myoclonic seizures were none among neonates.

Table 4: Etiology of seizures beyond neonatal period (n=83)

Etiology of seizure	No. Of Cases n (%)
Febrile Convulsions	34 (40.96%)
Cerebral Palsy	11 (13.25%)
Neuro cysticercosis	11 (13.25%)
Neurotuberculosis	9 (10.85%)
Idiopathic	7 (8.44%)
Pyogenic meningitis	6 (7.22%)
Post traumatic	5 (6.03%)
Total	83 (100%)

Febrile seizures were the most common (40.96%) seizure disorder in children followed by Neuro cysticercosis and cerebral palsy accounted for 13.25% each. Post traumatic seizures were least common (6.03%).

Table 5: Types of convulsions beyond neonatal period (n=83)

Type of Convulsion	No. of Cases (%)
Generalized Tonic Clonic	40 (48.19)
Tonic	0 (0%)
Clonic	0 (0%)
Myoclonic	0 (0%)
Absence	0 (0%)
Simple Partial Seizures (SPS)	14 (16.86%)
SPS with Sec. Generalization	12 (14.47%)
Complex Partial	17 (20.48%)

Generalized tonic clonic seizures were noted in 48.19% of the cases, followed by Complex partial seizures in 20.48% of cases. Tonic, Clonic, Myoclonic, Absence seizures were observed in none in this study.

Table 6: Etiology of various types of convulsions beyond neonatal period (n=83)

ETIOLOGY	GTCS N (%)	TONIC N (%)	CLONIC N (%)	MYOCLONIC N (%)	ABSENCE N (%)	SPS N (%)	SPS SEC GENERALIZATION N (%)	COMPLEX PARTIAL N (%)
Febrile	27 (32.53)	--	--	--	--	3(3.61%)	--	4(4.82)
C.P	5 (6.02)	--	--	--	--	1(1.20%)	2(2.41%)	3(3.61)
Neuro cysticercosis	1(1.20)	--	--	--	--	5(6.02%)	3(3.61%)	2(2.41)
Neurotuberculosis	1 (1.20)	--	--	--	--	4(4.82%)	3(3.61%)	1(1.20)
Idiopathic	4 (4.82)	--	--	--	--	--	2(2.41%)	1(1.20)
Pyogenic	1 (1.20)	--	--	--	--	--	2(2.41%)	3 (3.61)
Post Traumatic	1 (1.20)	--	--	--	--	1 (1.20%)	--	3 (3.61)
Total	40(48.19)	--	--	--	--	14(16.80)	12(14.47)	17(20.48)

Generalized Tonic Clonic Seizures was the most common type of seizure (48.19%) followed by complex partial seizures (20.48%).Among the Generalized Tonic Clonic Seizures, Febrile seizures (27 out of 40) was the most common etiology (67.50%).Among the febrile seizures, Typical febrile seizures accounted for 79.41% and Atypical febrile seizures were 20.59%.Simple partial seizures accounted for 16.86% of the cases, out of which the predominant etiology was Neuro cysticercosis (45.45%).

DISCUSSION

Childhood Seizure is one of the most significant and prevalent neurological conditions in the developing years. Seizure disorder is one of the most common childhood neurological illnesses occurring in 4 – 6 per 1000 children in the general population [10]. Few epidemiological studies have assessed the incidence and etiology of acute symptomatic seizure disorders in young children, who represent one of the most vulnerable age group for seizures. Incidence, prevalence and mortality studies provide crucial measures of the frequency and therefore the burden of the disease and allow the planning of health services and preventive measures. The applications of epidemiological techniques in the field of epilepsy have extended beyond the usual concept of prevalence and incidence. The objectives of epidemiological studies include (1) identification of risk factors for epilepsy; (2) to determine overall prognosis for seizure control and the identification of factors which may modify this prognosis; (3) to assess the risk for other conditions in both the patient as well as in relatives and (4) to evaluate interventions, including drug trials. Incidence and prevalence rates may vary if age specific rates are not calculated, since the occurrence of epilepsy differs

in different age groups. Apart from these methodological factors, it is possible that there may be real differences in incidence or prevalence due to the occurrence of unusual types of epilepsy such as 'hot water epilepsy [11] or due to preponderance of central nervous system infections such as cysticercosis, tuberculosis, malaria, HIV, viral encephalitis, etc in different geographical regions with different population structure.

In our study, we have analyzed the incidence of seizures in 115 children between 0 – 5 years age group. Children with prior diagnosis of seizures and children on anti-epileptic therapy were eliminated. Overall incidence of seizures in 0 – 5 years was estimated to be 5.2% in this study. Review of literature shows the incidence of seizures in children to be in 4 – 6 per 1000 children in the general population [10].

SEIZURES IN THE NEONATAL PERIOD:

In our study the occurrence of neonatal seizures is 38.26%. The results of our study confirmed the previous findings in the literature indicating high incidence of seizures in the neonatal period. Lanska *et al.;* reported the overall risk of neonatal seizures as 2.84 per 1000 live births in a national hospital survey (1980-1991) [12]. In a large population based study from Newfoundland, Ronen *et al.;* found the incidence of clinical neonatal seizures to be 2 per 1000 live term births to 11.1 per 1000 live preterm births [13]. Kumar Ajay *et al.;* showed the overall incidence of neonatal seizures was 11.7/1000 live births, majority being preterm very low birth weight babies before 5 days of life.

TYPE OF SEIZURES IN NEONATAL PERIOD:

In most of the clinical settings including neonatal intensive care units, seizures in the newborn are identified by clinical observation. In this present study among Neonates, subtle seizure proved to be the most common, 17 cases (38.6%), followed by focal clonic, generalized tonic, multifocal clonic, 14 cases (31%). J. Volpe [14], Mizrahi and Kellaway [15], and Scher *et al.;* [16] have reported subtle seizures as the most common type of neonatal seizures in their studies. According to Kumar Ajay *et al.;* distribution of the predominant clinical seizure type was as follows: clonic [54(61%)], tonic [17(19%)], subtle [12(13%)] and myoclonic [6(7%)] [17]. Seizure types in newborn infants vary considerably from those observed in older infants, and the types in premature infants differ from those in term infants. Unlike older infants, neonates rarely have well organized generalized tonic clonic seizures. Premature infants have even less well organized spells than full term babies [17].

Seizures occur in 6%–13% of very low birth weight infants, and in 1–2 per 1,000 of infants born at term [18-23]. Older series did not usually discriminate between term and preterm infants and reported higher incidence figures because many of the cases were due to late-onset hypocalcaemia [23]. In the present study the incidence of early onset seizures was calculated to be 65.9% of all cases of neonatal seizures. The incidence of early (< 48h) seizures in term infants also varies, being 0.87 per 1,000 in Dublin between 1980–1984 [18], 1.3 per 1000 in Cardiff during 1970–1979 and 2.8 per 1,000 in Fayette County, Kentucky in 1985–1989 [19]. Subtle seizures are the most common type, particularly in pre-mature infants, being present in 75% of the cases described by Sher *et al.;* [16].

Table 7: **comparative study of etiology of neonatal seizures**

Etiology	**Levene & Trounce [40] n (%)**	**Goldberg *et al.;* [59] n (%)**	**Andre *et al.;* [48] n(%)**	**Bergman *et al.;* [58] n (%)**	**Present Study N (%)**
HIE	53.00	16.00	49.00	30.00	38.64
Sepsis with Meningitis	8.00	3.00	2.00	7.00	29.55
Hypoglycemia	3.00	2.00	0.10	5.00	20.45
Hypocalcemia	--	--	--	22.00	9.09
Kernicterus	--	--	--	--	2.27
Other causes	36.00	79.00	51.1	64.00	--

ETIOLOGY OF VARIOUS TYPES OF NEONATAL SEIZURES:

Present study, Hypoxic Ischemic Encephalopathy (HIE) as the commonest cause of neonatal seizure is comparable with Levene & Trounce and Andre *et al.;* study, lower it is in contrast to Goldberg study. Most studies reveal perinatal asphyxia to be the most frequent cause of neonatal seizures. In various studies reported incidence is 15-53% [24, 9]. In the study conducted Wael Hayel Khreisat *et al.;* [19] perinatal asphyxia was the most frequent cause of neonatal seizures accounting for 55%. In the study done by Hassan Tekgul, Kimberlee Gauvreau *et al.;* intrapartum asphyxia was less frequently implicated [16, 14, 13, 25-27]. Possibly, because of improved obstetric management and the relatively more stringent diagnostic criteria for intrapartum asphyxia [28],

perinatal asphyxia is the important determinant of infant neurological outcome [12].

In this study the most common factor associated with subtle seizures in neonates was hypoxic ischemic encephalopathy. Hypoglycemia is most frequent in low birth weight babies, most of them being small for gestational age and in infants of diabetic mothers. Incidence of hypoglycemia as reported in literature varies from 2% to 26.6% [9, 29]. The incidence of seizures due to hypoglycemia in the present study was 11.11%. Seizures due to hypoglycemia typically occur on 2nd postnatal day [30].

Table 8: Type of seizures beyond neonatal period relative frequency of seizure types beyond neonatal period:

SEIZURE TYPE	**PRESENT STUDY n (%)**	**H.T.RWIZA *et al.;* n (%)**
All partial	51.81	31.9
Simple partial	16.86	0.5
Complex partial	20.48	9.2
SPS with sec. generalization	14.47	22.2
All Generalized	48.19	58
Absence	0	1.0
Tonic-clonic	48.19	54.1
Myoclonic	--	1.0
Tonic	--	1.4
Atonic	--	0.5
Others	--	10.1

In present study, the partial seizures were 51.81% whereas in a community based study in Ulanga, a rural Tanzanian District by H.T. Rwiza *et al.;* the partial seizures were 31.9%.Of the partial seizures, present study, complex partial seizures (20.48%) were relatively more common whereas SPS with secondary generalized seizures (22.2%) were the most common according to Rwiza *et al.;* Of the generalized seizures, generalized tonic-clonic seizures were the commonest in both studies. In another study at Dhaka Shishu Hospital by Selina H Banu *et al.;* generalized epilepsy accounted for 63.6% of cases and partial epilepsy for 25.2%.

Table 9: **Etiology of Various Types of Seizures beyond Neonatal Period:**

Etiology of seizure	**Present study n (%)**	**Wael Hayel Khreisat *et al.;* n (%)**
Febrile	40.96	32.50
Cerebral Palsy	13.25	36.50
Idiopathic	8.44	8.00
Pyogenic meningitis	7.22	15.00
Post traumatic	6.03	8.00
Neuro cysticercosis	13.25	--
Neurotuberculosis	10.85	--

Febrile seizures (40.96%) were the most common etiology followed by cerebral palsy and Neuro cysticercosis (13.25% each) in present study likely cause being high incidence of fevers. Whereas according to Wael Hayel Khreisat *et al.;* Cerebral palsy was the most frequently observed because accounting for 55% followed by febrile seizure (32.50%).

INCIDENCE OF FEBRILE SEIZURES BELOW THE AGE OF 5 YEARS

Febrile seizures was the most common etiology of seizures in beyond neonatal period 40.96% (n=34) of 115 cases in this study, out of which 79.41% (n=27) are typical febrile seizures and 20.59% (n=7) are atypical seizures. They are one of the most frequent problems for the pediatric neurologist but also for the general pediatrician. Their incidence before the age of 5 years is estimated to be between 2 and 5% in North America and Europe, and as much as 6-9% in Japan and 14% in the Mariana Islands [31, 32, 11, 33]. The incidence of febrile seizures in the study done by Berg AT *et al.;* was 2-5% of children. The study by Bharucha *et al.;* [34] in the Parsi community reported a frequency of 1.77%.

In present study, occurrence of Neuro cysticercosis was 13.25% which was mostly due to under cooked food, poor sanitation. Most children (80%) present with seizures, particularly partial seizures; headache and vomiting are seen in one third of these cases. Yazmin

Del LaGarza *et al.;* [35] in their prospective study at eleven university – affiliated geographically diverse, urban emergency departments in the United States from July 1996 to September 1998 reported that 2.1% of the patients coming to emergency rooms with seizures had neuro cysticercosis [35, 36]. Sorvillo [37] and others studied reported cases of cysticercosis in Los Angeles County estimated that Neuro cysticercosis is the cause of seizures in 13.5% of Hispanic patients. These patients when interviewed reported significant risk factors for infection, including ingestion of undercooked pork, pig husbandry, immigration from and frequent travel to villages in disease-endemic areas.

INCIDENCE OF TYPES OF SEIZURE IN NEUROTUBERCULOSIS

In my study Neurotuberculosis 10.85% (n=9),44.44% of the cases presented with simple partial seizure followed by simple partial seizures with secondary generalization(33.33%); whereas in study done by A.K. Patwari *et al.;* generalized tonic clonic seizures were the commonest(58%) type of seizures followed by focal seizures (38%) [38].

INCIDENCE OF TYPES OF SEIZURE IN CEREBRAL PALSY

In our present study, the most common type of seizure with cerebral palsy was generalized tonic clonic seizures (45.45%) followed by complex partial seizures which is similar to the study done by Dr. Prathibha Singhi *et al.;* [39].

INCIDENCE OF SEIZURE WITH POST TRAUMATIC

In our study post traumatic seizures were 6.02% where as in study done by Wael Hayel Khreisat *et al.;* the incidence of seizure was 4.00%.

SUMMARY &CONCLUSIONS

- Seizures are the most common neurological manifestation and are an important cause of morbidity in children.
- Each seizure type has a potential to transform to Epilepsy.
- An Epilepsy itself can form an economic burden on family and consequently on society also. Hence it is important the incidence, etiology and various potentiating factors.
- Knowledge about each seizure type will guide in choosing the appropriate anti-epileptic drug.
- Understanding of above features will help in planning preventing measures at individual, family, and public health level.
- Our study included 115 children since birth to 5 years of age with seizure disorders, over a period of 2 years (July2005 – June 2007). It is a prospective, cross-sectional study with reference to their incidence, etiology, type and their clinical manifestations with suggestions regarding the preventive measures respectively.
- Majority of children with seizures were in the age group of 0 – 2 years.
- The incidence of seizures is relatively more in males compared to females.
- Among the neonatal seizures, subtle seizures were the most common type.
- Hypoxic Ischemic Encephalopathy was the most common etiology of the neonatal seizures.
- Febrile seizures was the most common etiology among the beyond neonatal seizures.
- Generalized tonic clonic type of seizure is the most common in beyond neonatal period.

PREVENTIVE MEASURES

Neonatal period

A. Perinatal Asphyxia can be prevented by
   1. Regular Ante-natal follows up. And anticipation of risk factors
   2. Institutional delivery by trained medical practitioner
   3. Early anticipation of fetal distress.
   4. Neonatal resuscitation by trained medical practitioner preferably Paediatrician.

B. Neonatal Sepsis:
   1. Institutional delivery by trained medical practitioner under strict aseptic precautions.
   2. Proper care of umbilical cord, skin, eyes, genitals.
   3. Minimize invasive procedures and avoid nosocomial infections by maintaining high standards of aseptic precautions.
   4. Early detection and aggressive treatment of Sepsis.
   5. Metabolic disorders like Hypoglycemia and Hypocalcemia can be prevented by educating the mother about early feeding, proper feeding techniques, and frequent monitoring in high risk babies.
   6. One of the major causes of neonatal morbidity, like Hypothermia should be prevented by wrapping the baby with proper clothing and keeping the baby in thermo neutral zone temperature.
   7. One should observe the clinical progression of neonatal jaundice, and frequent monitoring of serum bilirubin level and initiate phototherapy accordingly.
   8. Neonates should be evaluated for inborn errors like galactosemia, congenital adrenal hyperplasia.

Beyond Neonatal Period

A. In our study, the most common etiology of seizures from infancy to 5 years was Febrile Seizures which is largely preventable with

prompt control of fever with Acetaminophen and also with subsequent treatment of the underlying cause.

B. Parents should be advised the importance of proper immunization to decrease the incidence of pyomeningitis especially with pneumococci and Haemophilus influenza.
C. Neuro cysticercosis can be prevented by taking good hygienic food and avoidance of pork.
D. Neurotuberculosis can be prevented by avoiding the exposure of the child to potential transmitters. By maintaining good hygiene.
E. Pyogenic meningitis should be detected early and treated accordingly.
F. Post traumatic seizures can be avoided by proper care of the child by elders. Avoiding keeping harmful objects in near vicinity of the child, by ensuring that child is comfortably seated while travelling.
G. Strong stimuli that irritate the brain—such as injury, certain drugs, sleep deprivation, infections, fever, low levels of sugar in the blood—can trigger a seizure whether a person has a seizure disorder or not. Avoiding such stimuli can help prevent seizures**.**

REFERENCES

1. Cavazos JE, Lum F, Spitz M, Diaz-Arrastia R, Talavera F, Benbadis SR. Seizures and epilepsy: overview and classification. Updated December. 2005
2. Sidenvall R, Forsgren L, Heijbel J. Prevalence and characteristics of epilepsy in children in northern Sweden. Seizure. 1996 Jun 30; 5(2):139-46.
3. Sridharan R, Murthy BN. Prevalence and pattern of epilepsy in India. Epilepsia. 1999 May 1; 40(5):631-6.
4. Nicoletti A, Reggio A, Bartoloni A, Failla G, Sofia V, Bartalesi F, Roselli M, Gamboa H, Salazar E, Osinaga R, Paradisi F. Prevalence of epilepsy in rural Bolivia A door-to-door survey. Neurology. 1999 Dec 1; 53(9):2064-.
5. AUSTIN JK. Comparison of child adaptation to epilepsy and asthma. Journal of Child and Adolescent Psychiatric Nursing. 1989 Dec 1; 2(4):139-44.
6. Knudsen FU. Febrile seizures: treatment and prognosis. Epilepsia. 2000 Jan 1; 41(1):2-9.
7. Van Stuijvenberg M, Derksen-Lubsen G, Steyerberg EW, Habbema JD, Moll HA. Randomized, controlled trial of ibuprofen syrup administered during febrile illnesses to prevent febrile seizure recurrences. Pediatrics. 1998 Nov 1; 102(5):e51-.
8. Austin JK, Riseinger. MW, Beckett LA. Correlates of behavioral problems in children with epilepsy. Epilepsia 1992; 33: 1115 -1122.
9. Singhi P, Dayal D, Khandelwal N. One week versus four weeks of albendazole therapy for neuro cysticercosis in children: a randomized, placebo-controlled double blind trial. The Pediatric infectious disease journal. 2003 Mar 1; 22(3):268-72.
10. Volpe Neurology if the Newborn, fourth edition 2001, chapter 5: W.B. Saunders company
11. Kumar A, Gupta A, Talukdar B. Clinico-etiological and EEG profile of neonatal seizures. The Indian Journal of Pediatrics. 2007 Jan 1; 74(1):33-7.
12. Mizrahi EM, Kellaway P. Characterization and classification of neonatal seizures. Neurology. 1987 Dec 1; 37(12):1837-.
13. Scher MS, Aso K, Beggarly ME, Hamid MY, Steppe DA, Painter MJ. Electrographic seizures in preterm and full-term neonates: clinical correlates, associated brain lesions, and risk for neurologic sequelae. Pediatrics. 1993 Jan 1; 91(1):128-34.
14. Levene MI, Trounce JQ. Cause of neonatal convulsions. Towards more precise diagnosis. Archives of disease in childhood. 1986 Jan 1; 61(1):78-9.
15. Goldberg HJ. Neonatal convulsions--a 10 year review. Archives of disease in childhood. 1983 Dec 1; 58(12):976-8.
16. Naveen B, Vanitha AJ, Vijai Kumar HV, Gururaj S, Satish R. Etiological Profile of Neonatal Seizures in a Referral Centre. In Abstract of scientific paper presented at 20th Annual convention of NNF. At Mumbai 2000 Nov.
17. Volpe JJ. Neonatal seizures. In: volpe JJ. Neurology of Newborn 4th Ed. W.B. Saunders, Philadelphia 2001: 178-214.
18. Cowan LD, Bodensteiner JB, Leviton A, Doherty L. Prevalence of the epilepsies in children and adolescents. Epilepsia. 1989 Feb 1; 30(1):94-106.
19. Seay AR, Bray PF. Significance of seizures in infants weighing less than 2,500 grams. Archives of neurology. 1977 Jun 1; 34(6):381-2.
20. Ronen GM, Penney S, Andrews W. The epidemiology of clinical neonatal seizures in Newfoundland: a population-based study. The Journal of pediatrics. 1999 Jan 31; 134(1):71-5.
21. Leth H, Toft PB, Herning M, Peitersen B, Lou HC. Neonatal seizures associated with cerebral lesions shown by magnetic resonance imaging. Archives of Disease in Childhood-Fetal and Neonatal Edition. 1997 Sep 1; 77(2):F105-10.

22. Andre M, Matisse N, Vert P, Debruille CH. Neonatal seizures-recent aspects. Neuropediatrics. 1988 Nov; 19(04):201-7.
23. Calciolari G, Perlman JM, Volpe JJ. Seizures in the Neonatal Intensive Care Unit of the 1980s Types, Etiologies, Timing. Clinical pediatrics. 1988 Mar 1;27(3):119-23.
24. Volpe JJ. Hypoxic-ischemic encephalopathy: clinical aspects. Neurology of the newborn. 1995:314-69.
25. Curtis PD, Matthews TG, Clarke TA, Darling M, Crowley P, Griffin E, O'Connell P, Gorman W, O'Brien N, O'Herlihy C. Neonatal seizures: the Dublin Collaborative study. Archives of disease in childhood. 1988 Sep 1; 63(9):1065-8.
26. Lanska MJ, Lanska DJ, Baumann RJ, Kryscio RJ. A population-based study of neonatal seizures in Fayette County, Kentucky. Neurology. 1995 Apr 1; 45(4):724-32.
27. Legido A, Clancy RR, Berman PH. Neurologic outcome after electroencephalographically proven neonatal seizures. Pediatrics. 1991 Sep 1; 88(3):583-96.
28. Lee J, Croen LA, Backstrand KH, Yoshida CK, Henning LH, Lindan C, Ferriero DM, Fullerton HJ, Barkovich AJ, Wu YW. Maternal and infant characteristics associated with perinatal arterial stroke in the infant. Jama. 2005 Feb 9; 293(6):723-9.
29. Watkins A, Szymonowicz W, Jin X, Yu VV. Significance of seizures in very low-birthweight infants. Developmental Medicine & Child Neurology. 1988 Apr 1; 30(2):162-9.
30. Goldberg HJ. Neonatal convulsions--a 10 year review. Archives of disease in childhood. 1983 Dec 1; 58(12):976-8.
31. Aicardi J. Infantile spasms and related syndromes. Epilepsy in children. 1994:18-43.
32. Hauser WA, Kurland LT. The epidemiology of epilepsy in Rochester, Minnesota, 1935 through 1967. Epilepsia. 1975 Mar 1; 16(1):1-66.
33. Tsuboi T. Epidemiology of febrile and afebrile convulsions in children in Japan. Neurology. 1984 Feb 1; 34(2):175-.
34. George R, Sonnen A, Upton A, Salinsky M, Ristanovic R, Bergen D, Mirza W, Rosenfeld W, Nari-Toku D, Manon-Espaillat R, Barolat G. A randomized controlled trial of chronic vagus nerve stimulation for treatment of medically intractable seizures. Neurology. 1995; 45(2):224-30.
35. Patwari AK, Aneja S, Ravi RN, Singhal PK, Arora SK. Convulsions in tuberculous meningitis. Journal of tropical pediatrics. 1996 Apr 1; 42(2):91-7.
36. Del La Garza Y, GRAVISS EA, Daver NG, Gambarin KJ, Shandera WX, Schantz PM, White AC. Epidemiology of neurocysticercosis in Houston, Texas. The American journal of tropical medicine and hygiene. 2005 Oct 1; 73(4):766-70.
37. Ong S, Talan DA, Moran GJ, Mower W, Newdow M, Tsang VC, Pinner RW. Neurocysticercosis in radiographically imaged seizure patients in US emergency departments. Emerging infectious diseases. 2002 Jun 1;8(6):608-13.