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Original Research Article

Study of seizures among pediatric age group (0-12 years) in tertiary health care center of a district of Maharashtra, India

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ABSTRACT

Background: Seizures represent the most distinctive signal of neurological disease in the newborn period and these convulsive phenomena are the most frequent of the overt manifestation of neonatal neurological disorders. Recognition and classification of seizures remain problematic; particularly when pediatricians rely only on clinical criteria. The objective of this study was to study the incidence of pediatrics (0-12 years) seizures. To study the etiology and pattern of seizures.
Methods: 326 Subjects who had seizures were included in the study. Relevant history was ascertained from a patient's parents or a reliable relative or attendant, medical records and the referring physicians note, specifically from mother in case of neonatal seizures i.e. age at onset of seizures, seizure activity with special emphasis on occurrence of 1st seizures, duration of seizures, number and type of seizures, associated autonomic changes, medications required to control seizures, response time to medications, and possible causes for determination of etiology. A detailed antenatal, natal and postnatal history was taken.
Results: Out of 326 study subjects 117 (35.89%) were in neonatal age group, of which 75 (64.10%) and 42 (35.90%) were male and female respectively and 209 (64.11%) were beyond neonatal age, out of which 125 (59.8%) were male and 84 (40.2%) female. out of 117 neonatal seizures, 75 (64.10%) neonates were male and 42 (35.90%) were female. Male: Female ratio was 1.79:1. The seizures were common in male neonates. Subtle seizures were the commonest type of seizures observed both in term and preterm neonates.
Conclusions: The various types of seizure were compared with the preterm and term neonates and it was found statistically significant ($X2 = 5.06$ d.f. = 4, $p<0.05$). The various causes of seizure were compared with the preterm and term neonates and it was found statistically significant ($X2= 17.42$ d.f. = 6 $p<0.05$).

Keywords: Convulsions, Neonatal seizures, Seizures

INTRODUCTION

Convulsion in a child is a frightening experience to their parents. A convulsion is a period of involuntary muscular contraction, often followed by a period of profound lethargy and confusion and sometimes profound sleep.

Seizures represent the most distinctive signal of neurological disease in the newborn period and these convulsive phenomena are the most frequent of the overt manifestation of neonatal neurological disorders. Neonatal seizures are the most common cause of mortality and morbidity encountered in neonatal intensive

care unit.[1] Recognition and classification of neonatal seizures remain problematic; particularly when pediatricians rely only on clinical criteria. Seizures in a newborn are one of the few neonatal neurological emergencies where prompt diagnostic and therapeutic plans are necessary; a delay in therapy results in poor neurological outcome.[2] Seizures during the neonatal period are relatively common, occurring in approximately 1.8 to 3.5 per 1000 live births with greater frequency in premature or low birth weight babies as compared to term babies.[3] In the newborn, seizures are always due to an underlying cerebral or biochemical abnormality. In the neonatal intensive care unit, the incidence goes as high as 10 to 25%, out of which about 15% will die and 35 to 40% will have major neurological sequel.[4]

Most convulsions under the age of 5 years will be due to fever. The most common convulsive disorder of early childhood is febrile seizures. Febrile seizures still remain a controversial topic so far as their cause, significance and treatment are concerned. It is precipitated by fever arising from infection outside the nervous system. Febrile seizure is a common disorder affecting 2-4% of children before 5 years of age. Febrile seizures are slightly more common in boys.[5,6] Complex febrile seizure which may be focal or generalized and the seizure lasts greater than 15 minutes or there are multiple seizures within same febrile illness.[7]

Epilepsy tops the list of chronic neurological disorders in all geographical regions of the world. Its prevalence is higher in developing countries like India due to intracranial infections, perinatal birth asphyxia, birth injuries, head trauma, etc. Less than one third of seizures in children are caused by epilepsy, a condition in which seizures are triggered recurrently from within the brain. The cumulative lifetime incidence of epilepsy is 3%; more than half of cases begin in childhood. The incidence of epilepsy in developing countries is near 18/1000 population as compared to 2.7-8/1000 population in developed countries.[8] The objective of this study was to study the incidence of pediatrics (0-12 years) seizures and to study the etiology and pattern of seizures.

METHODS

The present study was design a prospective observational study conducted in a tertiary care centre, Dr. Shankarrao Chavan Government Medical College, Nanded. It caters to a large number of populations from Marathwada, Telangana state and Karnataka state. This hospital admits around four thousand children aged less than twelve years annually and is one of the major hospital in the area which admits very sick children. However, not every child with a seizure from this region is admitted to this hospital. Subjects were enrolled during the period from 1st July 2015 to 30th June 2016. 326 Subjects who had seizures were included in the study.

Inclusion criteria

Pediatric patients, aged between 0 to 12 years and of either sex who presented with history of seizures with any etiology and those who are willing to participate in the study.

Exclusion criteria

- Seizure cases who went discharge against medical advice
- Neonates with doubtful seizures
- Seizure cases who expired immediately after hospitalization (before diagnosis)
- Not willing to give consent.

Ethical clearance was obtained from Institutional Ethics Committee. An informed written consent was taken from the relatives of the subjects who were enrolled in the study and all the information obtained was strictly kept confidential. Study subjects (aged between 0 to 12 years) were recruited both from NICU and pediatric ward, consecutively hospitalization of pediatric patients, and of either sex who presented with history of seizures.

Relevant history was ascertained from a patient's parents or a reliable relative or attendant, medical records and the referring physicians note, specifically from mother in case of neonatal seizures i.e. age at onset of seizures, seizure activity with special emphasis on occurrence of 1st seizures, duration of seizures, number and type of seizures, associated autonomic changes, medications required to control seizures, response time to medications, and possible causes for determination of etiology. A detailed antenatal, natal and postnatal history was taken. In cases beyond the neonatal age, the data also included demographic details, history of fever, duration and type of seizure, repetition of seizure within 24 hours. History of epilepsy and anti-epileptic drug use, seizure type, duration of seizures level of consciousness, as well as relevant past history and family history. Investigation data, treatment and outcome were also collected. All the investigations were carried out as per standard guidelines.

RESULTS

The present study was conducted in the department of pediatrics at our medical college from 1st July 2015 to 30th June 2016. All seizure cases admitted during above time period were studied to know the incidence, type and etiology. A total 4157 pediatric patients were admitted during the study period at our institute, of which a total 387 were seizures cases. Out of 387 seizure cases 61 cases were excluded due to various reasons like parents not given consent, discharged against medical advice, died without diagnosis etc.

Table 1: Age and sex wise distribution of study subjects.

Age	Sex		Total
	Male	Female	
0-28 days	75 (64.10%)	42 (35.90%)	117 (35.89%)
>28 days - 6 months	10 (52.63%)	09 (47.37%)	19 (5.82%)
>6 months - 3 years	50 (56.18%)	39 (43.82%)	89 (27.30%)
>3 years - 5 years	19 (70.37%)	08 (29.63%)	27 (8.28%)
>5 years - 12 years	46 (62.16%)	28 (37.84%)	74 (22.70%)
Total	**200 (61.35%)**	**126 (38.65%)**	**326 (100%)**

Table 2: Incidence of seizure cases among neonatal and beyond neonatal age group.

Age	Total no. of admissions	Total no. of study cases	incidence
0 - 28 days	924	117	12.66%
>28 days -12 years	3233	209	6.46%
Total	**4157**	**326**	**7.84%**

Table 3: Sex wise distribution of neonatal seizures.

Sex	No. of cases (n = 117)	Percentage
Male	75	64.10
Female	42	35.90
Total	**117**	**100**

Out of 326 study subjects 117 (35.89%) were in neonatal age group, of which 75 (64.10%) and 42 (35.90%) were male and female respectively and 209 (64.11%) were beyond neonatal age, out of which 125 (59.8%) were male and 84 (40.2%) female. The above table shows total out of 4157 admissions, 924 were neonates and 3233 were above 29 days up to 12 years. As per the inclusion criteria 326 cases were selected for the study and amongst them 117 cases were neonates and 209 cases were above 29 days up to 12 years. The incidence of neonatal seizures was 12.66%, while the incidence beyond neonatal age group up to 12 years was 6.46%.

Table 4: Comparison of preterm neonates and term neonates with types of seizures.

Type of seizure	No. of neonates		Total
	Preterm neonates	Term neonates	
Subtle	13	28	41
Focal clonic	08	21	29
Multifocal clonic	03	18	21
Tonic	10	14	24
Myoclonic	00	02	02
Total	**34**	**83**	**117**

X2 = 5.06; d.f.= 4; p <0.05

Table 5: Comparison of preterm neonates and term neonates with etiology of seizures.

Etiology	Preterm	Term	Total
Birth asphyxia	11	40	51
Septicemia	07	15	22
Meningitis	01	09	10
IVH	07	01	8
Hypocalcaemia	03	10	13
Hypoglycemia	04	07	11
Others	01	01	2
Total	**34**	**83**	**117**

X2= 17.42; d.f. = 6; p<0.05.

The above table shows out of 117 neonatal seizures, 75 (64.10%) neonates were male and 42 (35.90%) were female. Male: Female ratio was 1.79:1. The seizures were common in male neonates.

Subtle seizures were the commonest type of seizures observed both in term and preterm neonates. The various types of seizure were compared with the preterm and term neonates and it was found statistically significant (X2 = 5.06 d.f.= 4, p<0.05).

There was a significant difference in the incidence of intra-ventricular hemorrhage (IVH) in preterm and term neonates, being higher in preterm group. Among

metabolic abnormalities, hypocalcaemia was seen within 1st to 7th day of life in 10 out of 13 i.e. 77% neonates while as 10 out of 11 i.e. 99.9% hypoglycemia cases were within 1st to 7th day of life. So most of the metabolic abnormalities were seen after 24 hours of life. The various causes of seizure were compared with the preterm and term neonates and it was found statistically significant (X2= 17.42 d.f.= 6 p<0.05). The above table shows out of 83 cases of febrile seizures 52 (62.65%) were male and 31 (37.35%) were female, i.e. male to female ratio is 1.68: 1.

Table 6: Age and sex wise distribution of febrile seizures.

Age	Male	Female	Total
< 6 months	02 (02.40%)	01 (01.20%)	03 (03.60%)
>6 months-1 year	09 (10.84%)	09 (10.84%)	18 (21.68%)
>1-3 years	23(27.71%)	14 (16.87%)	37 (44.58%)
>3-5 years	10 (12.05%)	05 (06.02%)	15 (18.09%)
>5-12 years	08 (09.64%)	02 (02. 40%)	10 (12.05%)
Total	**52 (62.65%)**	**31 (37.35%)**	**83 (100%)**

X2 for linear trend up to 3 years = 0.231; p<0.05 odds ratio = 1.

The incidence of febrile seizures was maximum in the age group of 1 year to 3 years with 37 cases out of total 83 cases i.e. 44.58%. When chi square for linear trend test was applied for up to the age of 3 years it was found statistically significant.

DISCUSSION

The overall incidence of neonatal seizures in present study was found to be 12.66%. The incidence of neonatal seizures reported by deferent authors are as follows, Sandhu R et al.[9] studied 80 neonates and his incidence was 14.2%. Grover N studied 59 neonates and his incidence was 1.5%-14%.[10] Kumar et al studied 25 neonates and found incidence as 12.4/1000 live birth.[11]

Taksande AM et al studied 110 neonates and found 16.69% 0f incidence.[12] Noreen Faiz et al studied 101 neonates and his incidence was 18.6%.[13]

In the present study, out of 117 cases, 75 (64.10%) were male and 42 (35.90%) were female neonates. The male to female ratio was 1.79:1 suggesting that the incidence of neonatal seizures was higher in male neonates than female neonates. The exact cause of this is not known.

Similar results were also observed in study conducted by Holden et al and Powell et al.[14,15] Holden et al studied 227 neonates of which 157 (56.77%) neonates were male and 120 (43.32%) neonates were female. Powell et al studied total of 24 cases of which 17 (70.83%) were male neonates and 7 (29.16%) were females neonates.

Scher MS et al in his study of 92 neonates also observed a 50 (54.35%) of male neonates suffering from seizures in comparison to 42 (45.65%) of female neonates.[16] Taksande AM et al in his study of 110 neonates of which 73 (66.4%) neonates were male and 37 (33.6%) neonates were female.[12]

In this study, full term neonates were 83 (71%) and 34 (29%) neonates were preterm. The term neonates showed predominance for seizure activity. The possible higher incidence in term neonates can be explained by the fact that most of the neonates in this group were intrauterine growth retardation (IUGR). The incidence of birth asphyxia is higher in IUGR neonates; this might be a contributing factor for the high incidence of seizures in this group.

Similar findings were also observed in the study conducted by Legido, Clancy and Berman et al and Kumar et al, Legido et al studied 40 neonates out of which 28 (70%) were term neonates and 12 (30%) were preterm neonates and Kumar et al studied 35 neonates, out of which 30 (85.71%) neonates were term neonates.[17,18]

In our study, out of 83 term neonates, 40 (48.20%) neonates had birth asphyxia, 24 (28.84%) neonates had infection, and 1 (1.20%) neonate had intra-ventricular hemorrhage followed by hypocalcaemia in 10 (12.04%) neonates, hypoglycemia in 7 (8.43%) neonates. Among 34 preterm neonates, 11 (32.35%) neonates had birth asphyxia, 8 (23.53%) neonates had infection. Intra-ventricular hemorrhage (IVH) was seen in 7 (20.58%) neonates followed by hypocalcaemia in 3 (8.82%) neonates, hypoglycemia in 4 (11.76%) neonates. The similar result was also shown by Eriksson studied 77 neonatal seizure cases out of which 48% were due to birth asphyxia.[19] Legido A, et al studied 40 neonatal seizure cases out of which 35% were due to birth asphyxia.[17] Taksande AM studied 110 neonatal seizure cases out of which 42.7% were due to birth asphyxia.[12]

Talukdar B et al studied 90 neonatal seizure cases out of which 44.44% were due to birth asphyxia.[20]

Twenty-four term neonates had infections, out of which 9 (10.84%) neonates had meningitis and 15 (18%) neonates had septicemia. In preterm group 7 (20.58%) neonates had septicemia and 1 (2.94%) neonate had meningitis. The diagnosis of septicemia was made on the basis of clinical signs and laboratory parameters.

The comparative studies are Taksande AM, et al studied 110 cases of neonatal seizures out of which 28.2% were infectious origin.[12] Talukdar B et al studied 90 cases of neonatal seizures and found only 7.78% as infectious origin. Mwaniki M et al studied 142 cases of neonatal seizures and found 60% of cases due to infection.[20,21]

In our study, 8 (6.83%) neonates had intra-ventricular hemorrhage out of which 1 (1.20%) neonate was term while 7 (20.58%) neonates were preterm. The incidence of intra-ventricular hemorrhage was higher in preterm neonates than term neonates. Peri-ventricular or intra-ventricular hemorrhage is the most common cause of intracranial bleeding and neurological damage in low birth weight and preterm neonates.The similar result were also shown by studies conducted by Taksande AM et al out of 110 neonatal seizure cases 7(6.36%) neonates develop seizures due to IVH. Talukdar B et al studied 90 cases out of which 4 (4.44%) due to IVH.[12,20]

Hypocalcaemia is one of the important metabolic causes of neonatal seizures. In the present study neonatal seizures due to hypocalcaemia was observed in 13 (11.11%) neonates, out of which 10 (76.92%) neonates were term and 3 (23.08%) neonates were preterm.

Most neonates fed with the non-human milk have lower calcium and higher phosphate concentration on sixth day of life than breast fed neonates. This can be the possible cause for late onset seizures. The similar result were also shown by studies conducted by Kumar et al out of 35 neonatal seizure cases 14.28% were due to hypocalcaemia.[18] Taksande AM et al out of 110 neonatal seizure cases 13 (11.81%) neonates develop seizures due to hypocalcaemia.[12] Talukdar B et al studied 90 cases out of which 9 (10%) due to hypocalcaemia.[20]

Hypoglycemia occurs in both term and preterm neonates and particularly in neonates of diabetic mother. In this present study, hypoglycemia as a cause of neonatal seizures was observed in 11 (9.40%) neonates, out of which 7 (63.64%) neonates were term and 4 (36.36%) neonates were preterm.The similar result were also shown by studies conducted by Legido A et al out of 40 neonatal seizure cases 9.5% were due to hypoglycemia.[17] Taksande AM et al out of 110 neonatal seizure cases 9 (8.18%) neonates develop seizures due to hypoglycemia.[12] Talukdar B et al studied 90 cases out of which 10 (11.11%) due to hypoglycemia.[20]

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