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Clinicopathological study of neonatal seizure with special reference to neuroimaging: A tertiary care hospital based study

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Abstract
Background: Seizures are most common and distinct clinical manifestation of neurologic dysfunction in the newborn. Its frequency is around 1.5-14/1000 neonates. The occurrence of seizure is positively correlated with structural brain damage and its consequent sequelae is later stages of life. So we need to initiate an early diagnostic workup to determine the causes. This study was conducted to determine the etiology of neonatal seizure as well as to find out how neuroimaging is useful in early diagnosis.
Aims and Objectives: The study was carried out with the objectives to find out the etiology of neonatal seizure, especially by using the neuroimaging facilities and to look at the spectrum of brain lesion.
Materials and Methods: Hospital based observational study conducted over a period of 2 years (December 2015 to November 2017) at neonatal wing of SCB Medical College, Cuttack, India. All newborns with history of seizure and those who developed seizure during hospital stay were included in the study. Detailed antenatal history, examination of the newborn and clinical detail of each seizure episode were recorded. Various data obtained were displayed in tables, charts, statistical analysis of the observations were done using percentages, averages etc.
Results: Out of 365 cases which had seizure, 233 (63.8%) were males. Term babies (60.76%) and babies weighing more than 2500 gms (57.44%) showed seizures in this study. Most (60.42%) of the cases were born by vaginal delivery who had seizure afferwards. Hypoglycemia, as a cause was found in only 4% of cases. HIE was the commonest cause (51.8%) followed by metabolic abnormalities (23.2%). Most of them showed abnormality in TC-USG, CT-Brain, MRI brain.
Conclusion: Most common cause of neonatal seizure is HIE and in maximum cases it is seen in first 72 hours of life. Screening of high risk pregnancies should be strengthened and early referral should be arranged. Imparting NRP training to all health caregivers and improvement of NICU standard in tertiary care centres will reduce the morbidity and mortality.

Keywords: Seizure, neuroimaging, tertiary care centre

Introduction
Seizures are most common and distinct clinical manifestation of neurologic dysfunction in the newborn infant [1]. It is common with frequency being 1.5-14/1000 neonates [2]. It is positively correlated with structural brain damage and its consequent sequelae at later stages of life.
Though the incidence of seizure is highest in the newborn period its clinical recognition is difficult. Thus, the true incidence, investigations, finding out the etiology and starting of therapy are always challenges.
Neonates with seizure are at risk of death, whereas survivors are at risk of neurological sequelae, developmental delay, later epilepsy and cognitive impairment. So, we need an early diagnostic work-up to determine the causes. Neuroimaging like TC-USG, CT-brain and MRI-brain have significant role in this.
This study throws light on the etiology and how neuroimaging is useful in the diagnosis of neonatal seizure and its outcome.

Aims and Objectives
The present study was carried out with the objectives to find out the etiology of neonatal seizure, to find out early intervention measures with the help of various neuroimaging facilities and to look at the spectrum of brain lesion.

Materials and Methods
The study was a hospital based observational study conducted over a period of 2 years (Aug 2015 to July 2017) at neonatal wing of SCB Medical College, Cuttack, India. Institutional ethics committee of the college approved the study. Neonates with history of seizure prior to admission and those who had seizure during hospital study were included in the study. Cares who expired during treatment were excluded from the study. Detailed antenatal history, examination of the newborn, clinical detail of each seizure episode, necessary laboratory investigation and neuroimaging wherever necessary were done. Various data obtained were displayed in tables and charts, statistical analysis of the observations were done using percentages, averages etc.

Results
Present study, clinic-pathological study of neonatal seizure with special reference to neuro-imaging is a prospective hospital based study conducted in SCBMCH & SVPPGIP Cuttack. By applying proper inclusion and exclusion

criteria, 365 case are selected.

- Percentage of male neonate developing neonatal seizure was 63.8%, with male: female ratio 1.8:1.
- Incidence of neonatal seizure maximum among neonate having birth weight more than 2500gm is 57.44% (210).
- Term neonate constituted 60.76% of all cases, suffering from neonatal seizure.
- Neonatal seizure are maximum (62.73%), among primi mother.
- Newborn of mother from rural area (84.66%), faced neonatal seizure more often than their urban (15.66%) counterpart.
- Poor socioeconomic condition was a significant determinant of neonatal seizure. Among the neonatal seizure, 64.12% belong to mother of lower socioeconomic group.
- Incidence of neonatal seizure among the normal delivered babies was very high compared to babies of LSCS delivery (15.12).
- The incidence of neonatal seizure was very high during first 72 hour of life. Among all neonatal seizure cases, 64.45% are early onset and 35.55% are late onset.
- Hypoglycemia was seen in 4% cases of all neonatal seizure.
- Most common diagnosis in neonatal seizure was HIE (51.8%) followed by metabolic abnormalities (23.2%).
- Among the metabolic abnormalities, hypocalcemia & hypoglycemia constitute 15.3% & 4.1% respectively.
- Abnormal neurosonogram was found in 44% of all neonatal seizure case undergoing USG.
- Abnormal CT brain was found in 65% of neonatal seizure cases undergoing CT Brain study.
- Abnormal MRI Brain study was found in 90% of neonatal seizure cases undergoing MRI brain study.
- Most common Transcranial USG finding in neonatal seizure was Cerebral Edema (20.3%), followed by Periventricular Leukomalacia (14.2%).

Observations

Table 1: Sex wise distribution of neonatal seizure

Sl No.	Sex of newborn	No. of newborn suffer from seizure	Percentage
1	Male	233	63.8%
2	Female	132	36.2%
	total	365	100%

Table 2: Birth weight distribution in neonatal seizure

Sl No.	Birth weight of newborn	No. of newborn	Percentage
1	<1000gms	14	3.77%
2	1000 – 1500gms	35	9.68%
3	1500 – 2499gms	106	29.11%
4	>2500gms	210	57.44%
	Total	365	100%

Table 3: Gestational age at admission in relation to neonatal seizure

Sl No.	Gestational age	No. of newborn	Percentage
1	Pre-term	135	37.11%
2	Term	222	60.76%
3	Post-term	8	2.23%
4	Total	365	100%

Table 4: Maternal parity in relation to neonatal seizure

Sl No.	Parity	No. of newborn	Percentage
1	Nulliparous	229	62.73%
2	Parous	136	37.27%
	Total	365	100%

Table 5: Residence in relation to neonatal seizure

Sl No.	Residence	No. of newborn	Percentage
1	Rural	309	84.66%
2	Urban	56	15.34%
	Total	365	100%

Table 6: Socio-economic status in relation to neonatal seizure

Sl No.	Socio-economic status	No. of newborn	Percentage
1	Upper & upper middle (High)	34	9.42%
2	Lower middle & upper lower (Average)	97	26.46%
3	Lower	234	64.12%
	Total	365	100%

Table 7: Mode of delivery in relation to neonatal seizure

Sl No.	Mode of delivery	No. of newborn	Percentage
1	Nvd	221	60.42%
2	Assisted-NVD	89	24.46%
3	LSCS	55	15.12%
	Total	365	100%

Table 8: The time of onset of neonatal seizure

Sl No.	Mode of delivery	No. of newborn	Percentage
1	Early onset (< 24 Hrs.)	<24Hrs. (D_1)	38.17%
2	Early onset (24-72 Hrs.)	24 – 72 Hrs. (D_2-D_3)	26.28%
3	Late onset	>72Hrs. (D_4)	35.55%
	Total	365	100%

Table 9: Blood glucose in relation to neonatal seizure

Sl No.	Blood glucose	No. of newborn	Percentage
1	Normal blood glucose	350	96%
2	Hypoglycemia (<40mg/dl)	15	4%
	Total	365	100%

Table 10: Etiology of neonatal seizure

Sl No.	Etiology	No. of newborn	Percentage
1	HIE	189	51.8%
2	Metabolic abnormalities	85	23.2%
3	CNS infection	35	9.7%
4	ICH	26	7.2%
5	Kernicterus	16	4.3%
6	Brain malformation	10	2.7%
7	Unknown	4	1.1%
	Total	365	100%

Table 11: Metabolic etiological disorder in relation to neonatal seizure

Sl No.	Metabolic disorder	No. of newborn	Percentage
1	Hypocalcemia	56	15.3%
2	Hypoglycemia	15	4.1%
3	Hyponatremia	5	1.4%
4	Hypomagnesaemia	3	0.8%
5	Pyridoxine Deficiency	4	1.1%
6	IEM	2	0.5%
	Total	85	100%

Table 12: Relation of neonatal seizure onset time to etiological disorder

Sl No.	Etiology	Early onset <72Hrs D_4		Late onset >72hrs D_4		Total	
		No.	%	No.	%	No.	%
1	HIE	167	88.4%	22	11.6%	189	100%
2	Metabolic disorder	40	47.1%	45	52.9%	85	100%
3	CNS infection	10	28.6%	25	71.4%	35	100%
4	ICH	10	38.5%	16	61.5%	26	100%
5	Kernicterus	0	00%	16	100%	16	100%
6	Brain malformation	8	80%	2	20%	10	100%
7	Unknown	0	00%	4	100%	4	100%
	Total	235	64.45%	130	35.55%	365	100%

Table 13: Relation of neuroimaging with neonatal seizure

Sl No.	Neuroimaging G	No. of newborn	Abnormal imaging No.	%of abnormal imaging
1	Transcranial USG	360	158	44%
2	CT Brain	50	33	65%
3	MRI brain	20	18	90%

Table 14: Different transcranial ultrasonography finding in neonatal seizure

Sl No.	Finding	Number	Percentage
1	Normal	202	56%
2	Cerebral edema	73	20.3%
3	Periventricular leucomalacia	51	14.2%
4	Intra cranial hemorrhage	12	3.3%
5	Infraction	4	1.1%
6	CNS malformation/cyst	10	2.8%
7	Corpus callosum agenesis	3	0.8%
8	Calcification	3	0.8%
9	Hydrocephalus	2	0.7%
	Total	360	100%

Discussion

Table-1: Shows sex distribution in neonatal seizure. Our study reports a male predominance with 63.8% as compared to 36.2% in case of female babies. A male to female ratio of 1.8:1 was noted.

A similar study done by Dr. Adeebah A. Alyasiri [3] in 2015 showing male predominance with male to female ratio of 1.7:1. Banerjee *et al.* [4], 1996 have shown a male to female ratio in birth asphyxia to be 1.6:1.

In Indian studies the male dominance noted may be due to the preference of health care seeking behavior for male babies still persisting in certain section of the society.

Table-2: Shows birth weight distribution in neonatal seizure. In our study 42.56% of seizure newborn had a birth weight less than 2500gm and constituted low birth weight group where as 57.44% of seizure newborn had a birth weight more than 2500gm.

This study is comparable with Sahana *et al.* [5] study. More number of neonatal seizure in neonate having birth weight more than 2500gm, may be due to birth asphyxia more common in these neonates.

Table -3: Describes the gestational age in relation to neonatal seizure. In our study pre-term babies accounted for 37.11% of all newborn, while term babies 60.76% and post term babies 2.23%.

The majority of neonates who developed seizure were full term (60.76%), which is less than finding of AI. Marzoki [6] (95.4%) and Yasar (93.1%) study. Incidence appear to be less in pre-term due to high mortality rate in pre-term and other complication.

Table -4: Shows maternal parity in relation to neonatal seizure. In our study nulliparous mother account for 62.73% case of neonatal seizure compared to parous mother 37.27%, this may be due to nulliparous mother are prone to prolong labour and obstructed labour.

Table – 5: Shows Residence in relation to neonatal seizure. In our study neonatal seizure from rural area is maximum 84.66% and minimum in urban area 15.34%.

A similar study by Zhuochun *et al.* [7] in 2000 in china reported that there was higher incidence of neonatal mortality 69 per 1000 live birth in rural area. High incidence of neonatal seizure in rural area may be due to most of the delivery is unplanned, unresistered, unattended by trained person, health system is far away from people, timely resuscitation of baby not possible.

Table – 6: Shows Scio-economic status in relation to neonatal seizure. In the present study, 64.12% neonate having neonatal seizure belong to lower socio-economic status. Study by Bhargav *et al.* [8] started that most of the women of lower socio-economic status belong to rural area and suffer from delivery related complication.

Table – 7: Shows mode of delivery in relation to neonatal seizure. In our study neonatal seizure incidence in normal vaginal delivery being 60.42% as opposed to 15.12% case LSCS and 24.46% cases required some form of instrumentation.

Table – 8: Shows the time of onset of neonatal seizure. We found that 64.45% of the neonates had seizure of early onset (less than 72 hours) and 35.55% had late onset (more than 72 hours). This is similar to finding of Sahana *et al.* [5] study, Sabzehei *et al.* study and Fiaz *et al.* [9] study, who found that 77.9%, 50%, 59.6% of neonate, respectively, had early onset seizure. While Al-Marzoki [6] find that most neonatal seizure are late onset (after 72 hours). This difference could be explained by that, most common cause for seizure in our study was due to HIE, but the most common dominant factor contributing to neonatal seizure in Almarzoki study was metabolic abnormalities.

Table – 10: Shows etiology of neonatal seizure. The most common cause of neonatal seizure in the current study was HIE 51.8% followed by metabolic abnormalities 23.2%. this finding is comparable to studies by Sahana *et al.* [5] study and Kumar *et al.* [10] study, respectively, 57.8% and 44.4% of the neonate with HIE followed by 15.5% and 23.33% of neonate with metabolic abnormalities.

In the present study the infection were in 9.7% neonate which is similar to Sahana *et al.* [5] (14.6%) and Legido *et al.* (17.2%) of neonates. While Sabzehei *et al.* study, Takande *et al.* study and Fiaz *et al.* [9] study reported high infection rate 24.5%, 28.2% and 28.7% of neonate respectively. This may be a reflection of early use of antibiotic in our neonatal care unit.

Other important etiological factor of neonatal seizure include intracranial hemorrhage 7.2% of neonate, which is similar to Bushra *et al.* (9.5%) and Sabzehei *et al.* (6.9%).

Table – 11: Shows metabolic etiological disorder in relation to neonatal seizure. The most common metabolic disturbance were hypocalcemia and hypoglycaemia, which is consistent with the observation of Sabzehei *et al.* study and Fiaz *et al.* [9] study. In our study hypocalcemia in 15.3% neonate, hypoglycaemia was observed in 4.1% neonate. Sahana *et al.* [5] study reported hypoglycaemia in 9.17% and hypocalcemia in 6.42% neonate. Kumar *et al.* study found

the incidence of seizure due to hypoglycaemia and hypocalcemia was 11.11% and 10% respectively. The study conducted by Kumar *et al.* [10] study and A1-Marzoki [6] showed that biochemical abnormalities were seen in neonates with HIE, ICH, Infection and Metabolic abnormalities. Kumar *et al.* study reported that perinatal asphyxia was the most common cause of neonatal seizure, the exact contribution of hypoglycaemia and hypocalcemia as a cause of seizure in neonate with perinatal asphyzia is not certain. Moreover, A1-Marzoki also demonstrated that hypocalcemia and hypoglycaemia were most common metabolic abnormalities. The above results were comparable with finding of our study.

Table – 12: shows relation of neonatal seizure onset time to etiological disorder. In our study we found, out of 189 newborn having etiology HIE,88.4% have early onset convulsion and 11.6% have late onset convulsion and 11.6% have late onset convulsion. Out of 85 newborn having etiology Metabolic abnormalities, 47.1% have early onset convulsion and 52.9% have late onset convulsion. Out of 35 newborn having etiology CNS Infection, 28.6% have early onset convulsion and 71.4% have late onset convulsion. Out of 26 newborn having etiology ICH, 38.5% have early onset convulsion and 61.5% have late onset convulsion. All Kernicterus neonate have convulsion late onset. Out of 10 newborn having etiology Brain Malformation/ Cyst, 80% have early onset convulsion and 20% have late onset convulsion. The relation of onset to the etiological condition was examined and we found early onset seizure significantly associated with this set of conditions (P – value <0.001).

This study is similar to study done by Dr. Adeebah A. Alysiri [11] in which early onset HIE 82.9%, late onset HIE 17.1% and early onset metabolic disorder 41.7%, late onset 61.5%.

Table – 13: Shows relation of neuro-imaging with neonatal seizure. In our study Transcranial USG done on 360 neonate, 44% shows abnormal imaging. CT Brain done on 50 neonate, 65% shows abnormal imaging. MRI Brain done on 20 neonate, 90% shows abnormal imaging. Similar study done by Fischer *et al.* [12] 1998 shows 70% of sick newborn had Transcranial USG abnormalities.

Table – 14: Shows Transcranial USG finding in neonatal seizure. In our study a normal USG was noted in 56% neonate. Commonest abnormalities noted was cerebral edema in 20.3% case. Other finding were Periventricular Leucomalacia in 14.2% case, ICH were in 3.3% case, Cyst were in 2.8% case, Infraction were in 1.1% case, Corpus Callosum Agenesis were in 2.8% case, Calcification in 0.8% case and Hydrocephalous in 0.7% case

Anand N. K *et al.* [13] 1994 in a study in New Delhi show cerebral edema in 86% and a normal neurosonogram in 14% and ventricular echogenicity in 6.6% case.

Conclusion

- Most common cause of neonatal seizure was HIE.
- Maximum neonatal seizure is seen in first 72 hour of life.
- Hypocalcemia & Hypoglycemia are the most common transient metabolic abnormalities seen in neonatal seizure, the best outcome was observed with them.
- The two most common diagnosis associated with neonatal seizure, that carry high mortality and neurological sequelae were neonatal HIE & Infection, which are preventable.
- Cerebral Edema was the most common sonographic finding.
- An abnormal neurosonogram can be a good predictor of poor neurological status at discharge, so every neonate having neonatal seizure must undergo neurosonogram as it is highly valuable in predicting the hospital course and outcome of the baby at discharge.
- Screening of high risk pregnancies should be strengthened and arrangement made for early referral by JSSK (Jananishishu Suraksha Karyakram).
- There should be community participation at village level for development of emergency system for transport of mother & baby whenever necessary to higher centre
- Neonatal resuscitation training should be imparted to all health workers.
- Improvement of neonatal Intensive Care Unit (ICU).
- Improvement of the Laboratory investigation to diagnose IEM (Inborn Error of Metabolism).
- We recommend Prospective study on the long-term neurological & developmental outcome following neonatal seizure.

References

1. Volpe JJ. Neonatal seizures. Neurology of the new-born. Philadelphia, PA: WB Saunders, 2001, 178-214.
2. Airede KI, Neonatal seizures and a two year neurological outcome. J Trop Pediatr. 1991; 37:313-17.
3. Dr. Adeebah Alyasiri A. Etiology and Short outcome of Neonatal Seizure, University of Babylon, college of medicine Deptt. of paediatrics, Babylon, Iraq; ISSN NO. 2394-3971.
4. Banerjee MA, Parthasarthy D. hypoxic ischemic encephalopathy, early MRI findings and their evolution, Neuropediatrics. 1996; 26:183-91.
5. Sahana G, Anjaiah B. Clinical profile of neonatal seizures, international journal of medical and applied sciences. 2014; 3:1.
6. Jasim MA1. Marzoki. Clinico-Biochemical Profile of Neonatal Seizures, QMJ. 2010; 6(10):163-154.
7. Zhuochun LV, Viisainen K, Wang Y, Hemminki E. Perinatal mortality in rural India: retrospective cohort study. British Medical journal. 2003; 327(7427):1319.
8. Bhargava SK, Singh KK, Saxena BNICMR Task Force; national Collaborative Study on Identification of high risk families, mothers and outcome of their off-springs with peculiar reference to the problem of maternal nutrition, low birth weight, perinatal, infant morbidity, mortality in rural and urban slums communities. Summary, Conclusion & Recommendation. Indian Pediatrics, 1991, 1473-1480.

9. Faiz N, Malik M, Azam M, Afzal U. Etiology and type of neonatal seizures, Ann Pak Inst Med Sci. 2009; 5(2):77-86.
10. Ajay Kumar, Ashish Gupta, Bibek Talukdar. Clinico-Etiological and EEG profile of Neonatal seizures, Indian J Pediatrics. 2007; 74(1):33-37.
11. Adeebah Alyasiri A. Etiology and Short outcome of Neonatal Seizure, University of Babylon, College of Medicine Deptt. of paediatrics, Babylon, Iraq; ISSN NO. 2394-3971.
12. Fischer CG, Allen AC, Vineer MJ, *et al*. Effect of timing of cerebral ultrasonography on the prediction of later neurodevelopmental outcome in high risk preterm infants. J Pediatric. 1998; 112:970-975.
13. Anand NK, Gupta AK, Lamba IM, neurosonographic abnormalities in neonates with hypoxic encephalopathy. India Pediatrics. 1994; 31(7):767-774.