

A Comparative Study on Biochemical values in Newborns with and without seizure- A Case Control Study

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Abstract

Background: Seizures occur most frequently in infants and the elderly. Age specific incidence of epilepsy is high in the first year of life. The frequency of seizures manifesting in the first month of life is greater than that in any other time of childhood. **Objectives:** To estimate blood glucose, serum calcium and serum magnesium levels in newborns with seizures and to compare the above biochemical values in newborns with seizure with those of newborns without seizure as control. **Methods:** A case control study was done conducted in the Neonatal Intensive Care Unit of department of Pediatrics, Institute of Maternal and Child Health, Medical College, Calicut. Newborn babies admitted to the neonatal unit Institute of maternal and child health with seizure with selected for the study. 30 numbers of newborn babies with clinically confirm Seizure was selected for the study group. And equal number of newborn babies admitted to the neonatal unit for other conditions without any history of seizure were included as control for the study. SPSS (22.0) was used for analysis. **Results:** Among 30 newborns with seizures 76.67% is having hypoglycemia, 23.33% is having hypocalcemia and 10% is having hypomagnesemia. Among these newborns with seizures due to hypoglycemia 95.65% with hypoglycemia and 4.35% is with hypoglycemia and hypomagnesemia. Age, birth weight, blood glucose, serum calcium and Serum magnesium were found to be significant ($p < 0.05$) when both newborn with seizures and without were compared. **Conclusion:** Routine monitoring of the blood samples with respect to metabolic parameters considered in this study will help in preventing the occurrence of Seizures and its deleterious consequences.

Keywords: Seizures, hypoglycemia, hypocalcemia, hypomagnesemia, epilepsy.

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Introduction

Seizures represent the most distinctive and frequent signal of neurological dysfunction in the newborn period. The presentation of a newborn with seizures constitute a true medical emergency, often with a statistically poor prognosis both for survival and long-term neurological competence[1,2]. Neonates are at particular risk for the development of seizures, because metabolic, toxic, structural, and infectious disease are more likely to be manifested during this time than at any other period of life. In practice over 90 per cent of seizures are due to birth complications, hypoglycemia, hypocalcemia, hypomagnesemia, or meningitis. Problems with the recognition of neonatal seizures result from both overestimation and underestimation of the incidence of this disorder. Previous studies have reported a range in the incidence of clinical neonatal seizures from 0.5 percent of term birth to 20.2 percent of preterm infants[3]. Many studies have observed neonatal hypoglycemia, as one of the important causes among the metabolic abnormalities, others being hypocalcemia and hypomagnesemia[4] It is also observed that hypocalcemia occurs almost invariably with severe hypomagnesemia when the cause is metabolic abnormalities. Even though seizures in neonates indicate a serious, life-threatening disease it is a potentially reversible condition. Therefore, it is imperative that timely and organized approach to the investigation of neonatal seizures be carried out. Hypoglycemia and hypocalcemia are common metabolic causes and should be excluded in all neonates with seizure. Furthermore, hypocalcemia occurs frequently during neonatal period.

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So, it is important to evaluate these alternations in the light of the normal dynamic changes that take place during the extra uterine transition[5]. As hypoglycemia, hypocalcemia and hypomagnesemia are the important metabolic causes of neonatal seizures, a high index of suspicion is necessary in early detection of them for prompt treatment of neonatal seizures. Therefore, the present study is taken up to determine the association and comparison of the three specific metabolic parameters in cases and controls.

Material and Methods

The present study was conducted in the Neonatal Intensive Care Unit of department of Pediatrics, Institute of Maternal and Child Health, Medical College, Calicut. It was a case control study conducted over a period of six months from July to December 2005. Newborn babies admitted to the neonatal unit Institute of maternal and child health with seizure with selected for the study.

Inclusion criteria

30 numbers of newborn babies with clinically confirm Seizure was selected for the study group. And equal number of newborn babies admitted to the neonatal unit for other conditions without any history of seizure were included as control for the study.

Exclusion criteria

Newborn babies having seizures with known etiology like hypoxic-ischemic encephalopathy, intracerebral hemorrhage and developmental malformation included from the study. Details of the selected subjects were collected according to the proforma given as appendix I.

Blood Sample Collection

1 ml of blood was collected from all subjects in cleaned right bottles by venipuncture method by using sterile, disposable syringes with 23-gauge needles. 0.5 ml blood from the above sample is transferred to clean dry bottles containing anticoagulant oxalate fluoride for estimation of blood glucose. The sample newborn babies with

seizures were collected immediately after the season along with samples taken of investigations in the neonatal unit. Blood samples from the control subjects were collected along with the samples taken at the time of admission. Biochemical investigations were carried out by using the existing facilities of Biochemistry department of Medical College Calicut. The biochemical parameters measured included the following.

- a. Blood glucose
- b. Serum total calcium
- c. Serum magnesium.

The blood samples for glucose estimation were centrifuged immediately at 3000 rpm for 15 minutes and plasma separated done by Colorimetric method. Blood samples for calcium estimation could clot and serum separated by centrifuging at 3000 rpm for 15 minutes done by Colorimetric method. The blood samples for magnesium

estimation could clot and centrifuged at 3000 rpm for 15 minutes and serum separated.

Statistical Analysis

The results of taking were analyzed by finding out the biochemical means values and standard deviation of biochemical parameters and type of delivery, gestational age, birth weight, sex of the body, onset of seizure and type of seizure. The percentage distribution of different classes of babies of each parameter was found out. The appropriate statistical test of determining the significance of the difference in mean values of the parameters as well as the percentage distribution was applied. The student's T-test was applied to determine the significance in difference in means and t- value was calculated. From this the p-value was determined. Similarly, for the percentage distribution Chi square test applied and P-value calculated. SPSS (22.0) was used for analysis.

Results

Table 1: Frequency of The Specific Metabolic Parameters in The Study Population

Total Number of Neonates With Seizures = 30					
	NO	PERCENTAGE	NO	PERCENTAGE	TOTAL
HYPOGLYCEMIA	23	76.67	23		30
Hypoglycemia only			22	95.65	
Hypocalcemia			0	0.00	
Hypomagnesemia			1	4.35	
Both Hypomagnesemia&Hypocal			0	0.00	
NORMAL GLUCOSE	7	23.33	7		30
Hypocalcemia			5	71.43	
Hypomagnesemia			0	0.00	
Hypocalcemia&Hypomagnesemia			2	28.57	
TOTAL				100.00	
HYPOGLYCEMIA	7	23.33			30
Hypoglycemia only			5	71.43	
Hypoglycemia			0	0.00	
Hypomagnesemia			2	28.57	
Hypomagnesemia&Hypoglycemia			0	0.00	
				100.00	
NORMAL CALCIUM	23	76.67			30
Hypoglycemia only			22	95.65	
Hypomagnesemia&Hypoglycemia			1	4.35	
Hypo. Ply &Hypomag			0	0.00	
TOTAL	30	100.00		100.00	
HYPOMEGNISEMIA	3	10	10		30
Hypomagnesemia only			0		
Hypoglycemia			1	33.33	
Hypocalcemia			2	66.67	
Hypocalcemia&Hypoglycemia			0	0.00	
			3	100.00	
NORMAL CALCIUM	27	90.00	90.00		

As per table 1, among these 30 newborns with seizures 76.67% is having hypoglycemia, 23.33% is having hypocalcemia and 10% is having hypomagnesemia. Among these newborns with seizures due to hypoglycemia 95.65% with hypoglycemia and 4.35% is with hypoglycemia and hypomagnesemia. Among newborns with seizures due to hypocalcemia 71.43% is with only hypocalcemia and 28.57% is having hypocalcemia with hypomagnesemia. Among newborns with seizures due to hypomagnesemia, 0% is with only hypomagnesemia, 33.33% is having hypomagnesemia with hypoglycemia and 66.67% is having hypomagnesemia with hypocalcemia.

Table 2: Distribution of new borns with seizures according to the onset of seizures

Type of seizure	N = 30	Hypoglycemia		Hypocalcemia		Hypomagnesemia	
		NO	%	NO	%	NO	%
SEIZURE							
FOCAL		15	65.22	0	0	1	33.33
SUBTLE		6	26.09	7	42.86	2	66.67
GENERAL		2	8.7	0	0	0	0
TOTAL		23	100	7	100	3	100

As per table 2 newborns are distributed according to onset of seizures based on biochemical parameters, it was seen focal seizures were higher in newborns who were hypoglycemic. Subtle seizures are seen in hypocalcemia. Most of the newborn seizures were seen in child with hypoglycemia.

Table 3: Comparison of mean values of various parameters in the two study groups

Parameter		Cases	Controls		t- VALUE	p - VALUE
AGE	MEAN SD	3.00 4.16	6.70	6.33	2.66	< 0.01
BIRTH WEIGHT	MEAN SD	2.33 0.88	2.68	0.40	1.97	< 0.05
MOTHERS AGE	MEAN SD	25.70 4.97	25.10	4.35	0.49	NOT SIGNIFICANT
BLOOD GLUCOSE	MEAN SD	38.05 14.6	77.49	10.82	11.78	< 0.001
SERUM CALCIUM	MEAN SD	7.99 1.44	9.47	0.86	4.8	< 0.01
SERUM MEGNESIUM	MEAN SD	1.73 0.33	1.92	0.37	2.14	< 0.05

Table 3 depicts age, birth weight, blood glucose, serum calcium and Serum magnesium were found to be significant (p<0.05) when both newborn with seizures and without were compared. Mother age has no significance related to changes in biochemical parameters.

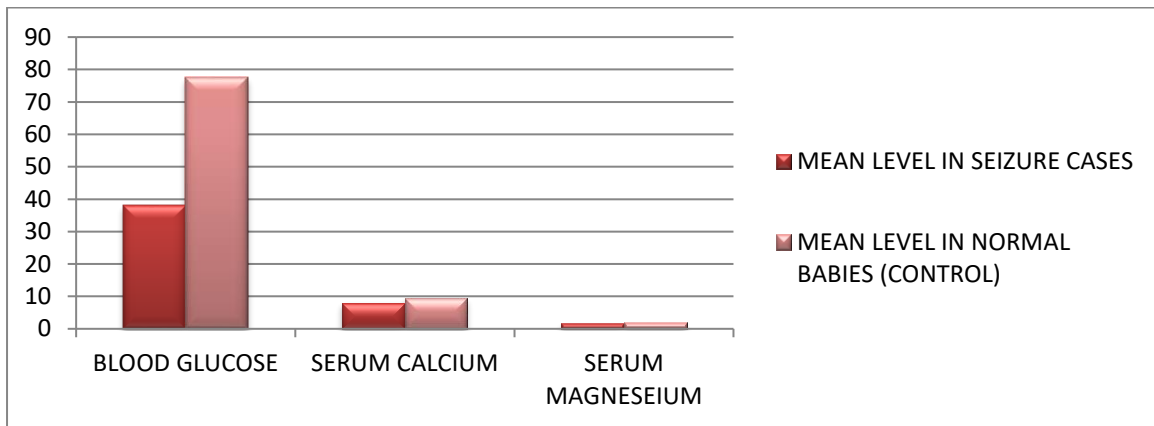


Fig 1: Suggest the mean values of biochemical parameters especially blood glucose and serum calcium were higher in Control group as compared to seizure group. While serum magnesium was found to be almost equivalent

Discussion

Identification of seizures presents a significant clinical problem in caring of newborn. Seizures during neonatal period have a board differential diagnosis, many with a specific treatment and prognosis. Early detection and appropriate treatment of neonatal diseases caused by metabolic disturbances will help in preventing the occurrence of brain damage and subsequent neurological sequelae. Biochemical consideration can contribute to resistance of the immature brain to damage from neonatal seizures. Keen (1973) reported a most useful prospective study of neonates with convulsions and showed that hypoglycemia and hypocalcemia are more common causes of convulsions[6]. In the present study, among these 30 newborns with seizures 76.67% is having hypoglycemia, 23.33% is having hypocalcemia and 10% is having hypomagnesemia. Among these newborns with seizures due to hypoglycemia 95.65% with hypoglycemia and 4.35% is with hypoglycemia and hypomagnesemia. Among newborns with seizures due to hypocalcemia 71.43% is with only hypocalcemia and 28.57% is having hypocalcemia with hypomagnesemia. Among newborns with seizures due to hypomagnesemia, 0% is with only hypomagnesemia, 33.33% is having hypomagnesemia with hypoglycemia and 66.67% is having hypomagnesemia with hypocalcemia. Updhyay A and Aggarval R (2001) in their study on seizures in newborns concluded that focal clonic seizures have a better prognosis as compared to other types of seizures[7]. In the present study it is found that focal seizures are more common in hypoglycemic newborns. Hence early detection promises a better prognosis in these cases. Kumar A, et al

(1995) in a study of biochemical abnormalities in neonatal seizures reported that focal seizures occur mainly with hypoglycemia[8]. Subtle seizures is the most common type of seizures seen in hypocalcemia. In a prospective study of Mizrahi EM, Levene M and Painter M.J similar results were reported[9,10]. The present study also reveals same observation. Hypomagnesemia causing neonatal seizures is known for the past few years. In majority of these instances, disturbance of magnesium homeostasis is secondary to an obvious cause, as observed by Richard E. Behrman and Bardley P. Fuhrman[4,11]. Causes include dietary deficiency, gastrointestinal ddisorder, and renal disorders. The type of seizures bserved in the present study with hypomagnesemia is subtle seizure. The probable explanation is that hypocalcemia is invariably present with hypomagnesemia and the type of seizures seen in hypocalcemia is sable seizure. This fact has been established in the study by and Painte M.J and Saunder M Bernes[12].

Conclusion

Even though it is a well-established fact that hypoglycemia, hypocalcemia, and hypomagnesemia are the common metabolic causes for neonatal seizures, from the present study it can be suggested that a high level of suspicion of occurrence of neonatal seizures due to metabolic abnormalities should always be kept in mind. Instead of waiting for the Seizures to occur, routine monitoring of the blood samples with respect to metabolic parameters considered in this study will help in preventing the occurrence of Seizures and its deleterious consequences.

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Conflict of Interest: Nil

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