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Research Article

**ASSOCIATION OF TERM NEONATAL FITS WITH SERUM  
CALCIUM LEVELS**<sup>1</sup>Dr. Seema Kanwal, <sup>2</sup>Dr. Mehak Adil, <sup>3</sup>Dr. Rimsha Irfan<sup>1</sup>Rawalpindi Medical University Rawalpindi, <sup>2</sup>House officer Dhq/UTH Gujranwala, <sup>3</sup>Lahore General Hospital, Lahore**Abstract :**

**Background:** The most prominent feature of neurological dysfunction in neonatal period is the occurrence of seizures. Determining its underlying etiology is critical. The objective of our study was to determine association between low calcium levels and neonatal seizures in cases presenting in Pediatrics Department Holy Family Hospital, Rawalpindi.

**Methods:** This case control study was conducted in Department Of Pediatrics Holy family Hospital Rawalpindi from February 2015 to December 2015 and included 48 neonates including 24 cases of fits and 24 controls with exclusion criteria of prematurity and those born via cesarian section. Data was collected through structured questionnaire. All the data was entered and analyzed by SPSS version 17.

**Results:** Our study comprised of 48 neonates with mean age of  $7.7 \pm 8.1$  days. Out of total 29 (60.4%) were male neonates while 19 (39.6%) were females. Among cases 46.2% had hypocalcemia while 53.8% had normocalcemia. Among controls 53.9% had hypocalcemia while 46.1% had normocalcemia. The Odd's ratio was computed to be 0.714 with confidence interval of 0.228 to 2.233 which shows association is insignificant.

**Conclusion:** Neonatal fits at term were not found to be associated with reduced calcium levels thereby other metabolic abnormalities like hypoglycemia, hyponatremia should be ruled out prior to assessment of serum calcium levels in term neonatal fits.

**Keywords:** Neonatal fits, hypocalcemia, Serum Calcium Levels.

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## INTRODUCTION:

Neonatal fits hold distinction in terms of manifestation from children and adult seizures for generalised tonic clonic convulsions seem to be absent from their presenting profile. The phenomenon of axonic and dendritic arborisation is still in the way to final development and the myelination also lags behind its ultimate core thickness. Thereby the action potential for firing the seizure cannot roam about in all the neuronal synapses within the brain substance to produce a generalised tonic clonic seizure.

Survivals of a neonate always remain a matter of great concern in any society. Pakistan's neonatal mortality rate is very high (49/1000 live births) accounting for 7% of global neonatal deaths [2]. In Pakistan, incidence of neonatal seizures has been reported as 4.8% in hospitalized neonates [3]. Seizures during the neonatal period are relatively common, occurring in approximately 1.1 to 8.5 per 1000 live births, with greater frequency in premature or low birth weight babies as compared to term babies<sup>4</sup>. The notorious metabolic disturbance include hypocalcemia (serum Ca<8 mg/dL among full term and Ca<7 mg/dL in preterm neonates) [5]. The precise estimate of hypocalcemia as contributory factor in causing seizures in asphyxiated babies is ambiguous and in a study conducted by Ajay et al about 18 and 11 cases out of 108 asphyxiated instances were attributed to hypoglycemia and hypocalcemia respectively. Hypocalcemia emerged as leading cause of generalized tonic seizure and multifocal clonic fits (approximately 31%) [6]. Hypoglycemia was a direct sequelae of poor feeding and prematurity especially in mothers who had undergone C-section while hypocalcemia was more widespread in prematurely delivered babies [7]. Hypoglycaemia, hypocalcemia and hypophosphataemia constitute the major part of the instances of neonatal seizures secondary to primary metabolic imbalances. These imbalances envisage about a quarter of total seizures [8]. Seizures can arise either from excessive excitatory neurotransmission or inhibitory neurotransmitters deficit. Moreover hypocalcemia and hypomagnesemia fire substantial depolarization by promoting sodium influx across neuronal cell membrane [9]. The symptomatic dimension of hypocalcemia is diverse but seizures emergence is highly significant. In about 90% of clinical presentations, most frequent seizure type was tonic clonic [10]. Studies reveal that neonatal seizures are more frequent in male babies than in females with the ratio of 1.3:1 [11]. Taking into consideration transient metabolic factors hypoglycemia turned out to be the most prevalent cause for seizures seconded

by hypocalcemia [12].

In our study we intend to determine relationship of serum calcium levels with term neonatal seizures so that we can find risk factors for fits to prevent them. In this way, we will also be able to improve our clinical practice and approach towards managing neonatal fits. Instead of rushing towards unnecessary investigations more focused and precise approach would benefit the patient more. This information will be valuable to our pediatricians regarding neonatal fits management.

## PATIENTS AND METHODS:

This case control study was conducted at Pediatric Department Holy Family Hospital Rawalpindi with sample size of 48. According to WHO sample size calculator keeping level of significance 5% and anticipated odd ratio of 6 according to our reference study<sup>13</sup> sample size came out to be 24 (24 cases and 24 controls). Our inclusion criteria included full term neonates born via SVD. Cases were neonates with observed fits. Controls were neonates without any history of fits. Exclusion criteria was premature neonates and those born through C-section because our main focus of study was to study full term neonates not premature fits etiology. Our sampling technique was non probability consecutive sampling technique. Our study duration was from February 2015 to December 2015.

After approval from Institutional Research Forum and ethical review committee of RMU, neonates fulfilling selection criteria were identified in Paediatric ward, HFH and after written approval from Medical superintendent HFH data was collected. All neonates with fits were included as cases and those without fits were controls. The information regarding Serum Calcium levels was taken from their records. All the data was recorded in structured questionnaire designed for this study. Data was entered and analyzed using the statistical package for social sciences (SPSS version 17). Frequencies and percentages were calculated for categorical variables e.g. gender, calcium levels and low birth weight. Odd ratio with confidence interval containing value of 1 was considered statistically insignificant.

## RESULTS:

Our study comprised of 48 neonates with mean age of 7.7 days with SD of +8. The highest age of neonate observed was 28 days and the lowest being less than 24 hours. Among cases 46% had hypocalcemia while 54% had normocalcemia. Among controls 53.9% had hypocalcemia while 46.1% had normocalcemia (Table 1). The Odd's ratio

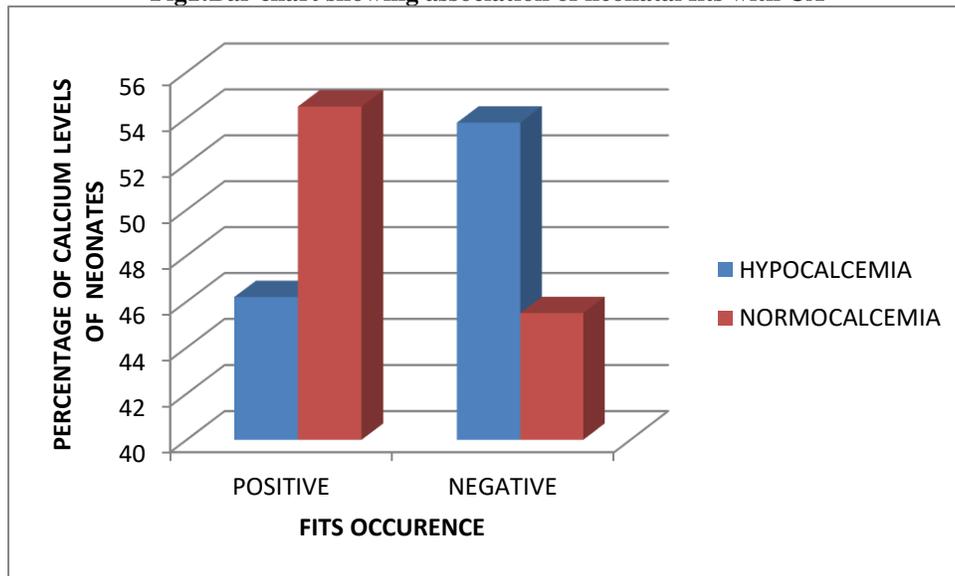
for fits positive cases was 0.714 showing negative association of neonatal fits with hypocalcemia. Term neonatal fits were not associated with lowered serum

calcium levels in our study. Graphical representation is shown in fig 1.

**Table 1: Calcium level association with neonatal fits**

	Calcium levels		Total
	Hypocalcemia	Normocalcemia	
Neonates with fits(cases)	11 46%	13 54%	24 100%
Neonates without fits(controls)	14 53.9%	10 46.1%	24 100%
<b>Total</b>			<b>48 100.0%</b>

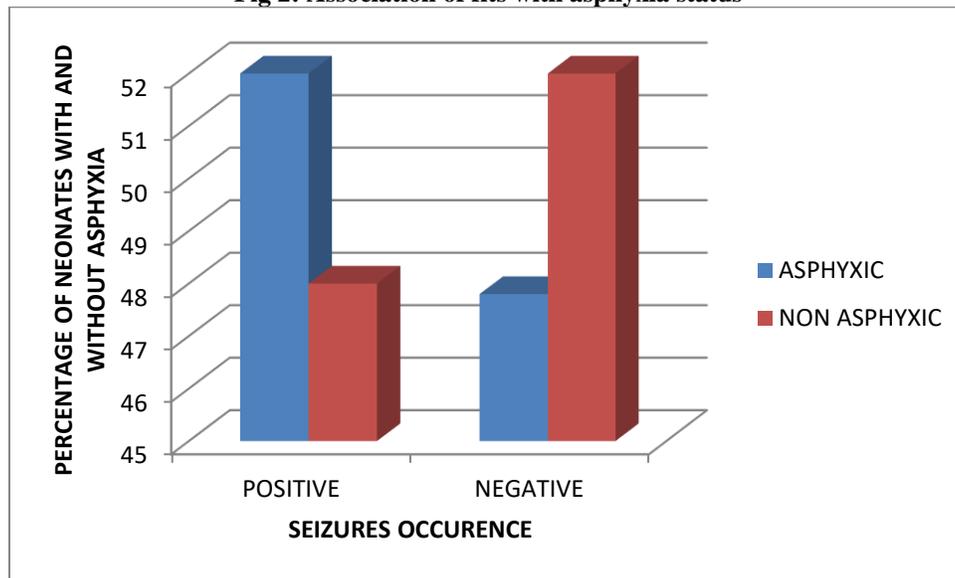
**Fig1:Bar chart showing association of neonatal fits with CA**



In our study the confounding variables were asphyxia, pyrexia and low birth weight. Their percentages and Odd's ratio was also computed. Among cases 52.2% had asphyxia while 47.8% don't have asphyxia while among controls 47.8% had

asphyxia and 52.2% without asphyxia. Odds ratio for cases came out to be 1.18 which is statistically significant showing that asphyxia is a main factor for neonatal fits (Fig 2).

Fig 2: Association of fits with asphyxia status



About 56.5% of positive cases were febrile with 43.5% afebrile having an Odd's ratio of 1.655 with Confidence interval of 0.582-1.582, giving a Of the positive cases 33% had lower birth weight while 57 % were of normal birth weight giving an odd's ratio of 0.368 with Confidence interval 0.103 to 1.532 .

So the conclusion was that hypocalcemia has no significant association with term neonatal fits born via SVD while asphyxia which was our confounding variable came out to be major culprit of neonatal fits.

### DISCUSSION:

Neonatal seizures are epileptic seizures occurring from birth to the end of the neonatal period .These are abnormal electrical discharges in the CNS of neonates and usually manifest as stereotyped muscular activity or autonomic changes .The incidence of seizures is higher in the neonatal period (i.e. the first four weeks after birth ) than any other time of life .Types of seizures include generalized tonic clonic ,myoclonic ,absence and clonic.

In a research study carried out at neonatal ward , Dhaka Bangladesh in 2003 and 2004, 60% of cases had hypocalcemia against 46.2% of our study statistics while only 20% of the controls had hypocalcemia against 53.85% [13].The Odd ratio was 6 times more in cases in Bangladeshi study whereas in our study the odd ratio was not statistically significant. This difference was probably because our exclusion criteria was prematurity and infants born via C-section which was their inclusion criteria so we can conclude that hypocalcemia is a

major culprit in case of premature and C-section born infants but not in term infants born via SVD. Another international study showed that out of 51 cases only 8(15.7%) had hypocalcemia as cause of neonatal fits[14].

A study conducted by Faridullah et al. to study the etiology of seizures conducted at neonatal unit of Hayatabad Medical Complex , Peshawar depicted that when all etiological factors were taken along for causation of neonatal seizures, hypocalcemia contributes to only 12.5% of the seizure [7]. In a similar study conducted by Najeem et al. at Ayub teaching hospital Abbottabad asphyxia was found to be main etiology (46%) in causation of neonatal fits [6]. Another study conducted at Children hospital Multan showed that asphyxia is commonest cause of seizures present in 53.7% of neonates [15]. All these studies are consistent with our study in which asphyxia came out to be leading cause (52.2%).In light of our study results we want to recommend our paediatricians that any term neonate presenting with fits product of spontaneous vaginal delivery should be thoroughly investigated .Serum calcium levels should be done but not as a first priority .Asphyxia, meningitis, birth weight and other metabolic abnormalities must be ruled out first. Our results may be subject to selection bias as we did not do random sampling and used hospital cases and controls.

### CONCLUSION:

Neonatal fits at term are not associated with reduced calcium levels there by other metabolic abnormalities like hypoglycemia, hyponatremia should be ruled

out prior to assessment of serum calcium levels. Other possibilities like asphyxia, pyrexia, low birth weight should be given more protocol to investigative approach in term neonates born via normal vaginal delivery presenting with fits.

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