

# Risk Factors Associated with Epilepsy among Children with Cerebral Palsy

URMI RAHMAN<sup>1</sup>, SEIKH AZIMUL HOQUE<sup>2</sup>, AKM MATIUR RAHMAN<sup>3</sup>, NARAYAN CHANDRA SAHA<sup>4</sup>

## Abstract

**Background:** Cerebral Palsy (CP) is a major cause of childhood disability and is more prevalent in the more socioeconomically deprived populations of the world. Epilepsy is said to occur in 15-90% of children with CP and this causes additional economic and psychological stress on affected children and their family.

**Materials and Methods:** This cross sectional case control study was conducted in paediatric neurology OPD of Dhaka Medical College Hospital & BSMMU from July 2008 to June 2009. Four hundred children with CP were included in this study & CP with epilepsy was taken as case and CP without epilepsy as control. Medical records of these patients were reviewed and analyzed.

**Results:** 150 children studied had associated epilepsy, giving a prevalence rate of 37.5%. Epilepsy most commonly affected children with spastic quadriplegia (43.5%). GTCS was more common of epilepsy in spastic quadriplegic CP and partial seizure common in spastic hemiplegic CP. After logistic regression analysis significant positive correlation was found between LBW (OR, 0.428), post-natal CNS infection (OR, 0.416) with occurrence of epilepsy in CP cases. Statistically significant positive correlation was not found between prematurity, neonatal jaundice, neonatal convulsion, neonatal sepsis as a risk factor to develop epilepsy in CP.

**Conclusion:** Among CP cases epilepsy is most common in spastic quadriplegic CP and GTCS is more common type of epilepsy in spastic quadriplegic CP. LBW and postnatal CNS infection significantly increase the risk of epilepsy in CP cases. Prematurity, neonatal jaundice, neonatal convulsion does not increase the risk of developing epilepsy in CP.

**Key Words:** Epilepsy, Cerebral Palsy (CP)

## Introduction:

Cerebral palsy (CP) describes a group of permanent disorders of development of movement and posture, causing activity limitations that are attributed to non-progressive disturbances that occur in developing fetal or infant brain. The motor disorders of cerebral palsy are often accompanied by disturbances of sensation, perception, cognition, communication and behavior, by epilepsy and by secondary musculo-skeletal problems.<sup>1</sup>

The worldwide incidence of CP is approximately 2-2.5 per 1000 live births. A community based study conducted by Tabib SMSB et al. during the period from July 2006 to June 2007 mentioned that the prevalence of CP was 6.1/1000 children.<sup>2</sup>

History, combined with a neurologic examination establishing diagnosis of the CP. Serial examinations may be necessary to assure the diagnosis of CP, especially when the history is not reliable.<sup>3</sup> Most of the CP patients also have some associated problems like epilepsy, mental retardation and problem related to speech, hearing, vision or behavior. Among them epilepsy is one of the commonest associated problem in patients of CP.<sup>4</sup> In the general childhood population, the prevalence of epilepsy is between 3-6 per 1000.<sup>5</sup> Epilepsy is more common in some form of CP than in others. It has been observed that seizures in the

1. Assistant Professor, Paediatrics, Popular Medical College, Dhaka.

2. Associate Professor, Paediatric Neurology, NINS, Dhaka.

3. Professor, Paediatrics, Popular Medical College, Dhaka.

4. Professor, Paediatric Neurology, NINS, Dhaka.

**Correspondence:** Dr. Urmi Rahman, Assistant Professor, Paediatrics, Popular Medical College, Dhaka. Mobile-01716933375, email: urmiraahman56@yahoo.com

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CP children tend to have an earlier onset, necessitating the use of more than one antiepileptic drugs.<sup>6,7</sup> The present study aims are to observe the prenatal, natal and postnatal factors on development of epilepsy in children with CP. So, that rapid identification of patient with highest risk would allow physician to consider for early diagnosis and proper management to prevent undesirable morbidity.

### Materials and Methods:

This cross sectional case control study was done in outpatient department (OPD) of Paediatric Neurology, Dhaka Medical College Hospital & Bangabandhu Sheikh Mujib Medical University from July' 2008 to June' 2009. Total 400 hundred children with CP were included in this study and 150 CP child with epilepsy was taken as case in group-A and 250 CP child without epilepsy as control in Group-B. Epilepsy in suspected cases of neurometabolic and neurodegenerative disorder, whose presentation is as like as cerebral palsy and epilepsy in progressive neurological disorder were excluded. Diagnosis of cerebral palsy was clinical, based on disorder of posture and movement of cerebral origin with improving developmental trend and findings related to centers controlling such posture and movement as documented by findings related to pyramidal, extrapyramidal and cerebellar system. Epilepsy is considered to be present when two or more unprovoked seizures occur in a time frame of longer than 24 hours. Diagnosis of epilepsy was based on history from a reliable eye witness or video documentation if available and EEG was done in selected cases. All the diagnoses were made by the paediatric neurologist(s) based on study definition. Written structured questionnaire was used for collection of data regarding socio-demographic, type of CP, type of epilepsy (where seizure present), H/o antenatal care, gestational age, birth wt., any perinatal insult in form of asphaxia/infection/jaundice /neonatal seizure etc. Then data were analyzed to find out the associated risk factors of epilepsy using SPSS. Written informed consent was taken from parents or caregiver of each child who were enrolled in this study. Ethical approval was taken from local ethical review committee.

### Results:

Among total 400 CP children of this study, 150 children of group-A had associated epilepsy and 250 children of group-B without epilepsy. Patients age

range was 6 months-9.5 years in group-A and 6 months-10 years in group-B (table-I). Maximum cases were <2 years of age group, 52% (78/150) in group-A and 54.4% (136/250) in group-B. Male cases were more, 60% (90/150) in group-A and 56.4% (141/250) in group B (table-I). In group-A home delivery was more (54%) but in group-B hospital delivery were more (52%). On the other hand, normal vaginal delivery was more than caesarean section in both group (table-II). Considering the type of CP spastic quadriplegia was found as most common type in both group, 48% (72/150) in group-A and 40.8% (102/250). Spastic Diplegia was second most common type of CP in both group (22% in group-A & 25.6% in group-B). Other than motor delay speech delay was the most common in both group 50% (75/150) in group-A and 47.6% (119/250) in group-B. Considering common risk factors causing CP, LBW was the commonest risk factor in group-A (42%) and delayed cry was the commonest in group-B (35.6%) (table-III) in CP cases. In this study among CP cases epilepsy was found in 37.5% (150/400).

**Table I**

*Age & sex distribution of patients (n=400)*

Age in Year	Group A (n=150)	Group B (n=250)
<2	78 (52%)	136 (54.4%)
2-5	63 (42%)	93 (37.2%)
>5	9 (6%)	21 (8.45)
Mean±SD	2.39±2.07	2.44±1.98
Sex		
Male	90 (60%)	141 (56.4%)
Female	60 (405)	109 (43.6%)

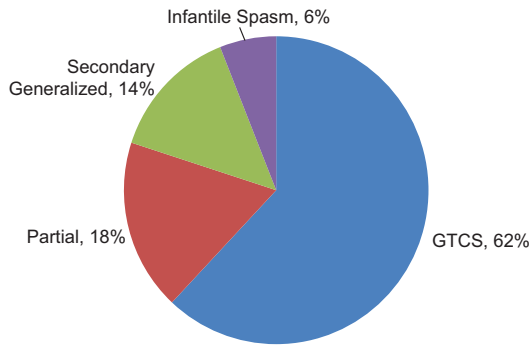
**Table II**

*Place and mode of delivery of patients (n=400)*

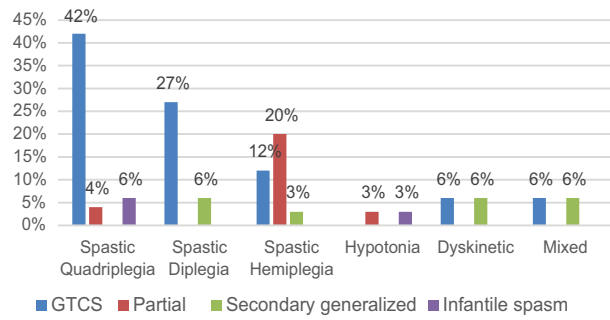
Place of delivery	Group A (n=150)		Group B (n=250)		p value
	n	%	n	%	
Home	81	54	120	48	0.245
Hospital	69	46	130	52	
Mode of delivery					
NVD	111	74	188	75.2	0.789
CS	39	26	62	24.8	

**Table III**  
*Comparison of risk factors in studied children (n=400)*

Risk factors	Group A(n=150)		Group B(n=250)		pvalue
	n	%	n	%	
ANC (absent)	54	36	87	34.8	0.808
Maternal illness	15	10	37	14.8	0.167
LBW	63	42	79	31.6	0.035
Prematurity	24	16	49	19.6	0.367
Delayed Cry	48	32	89	35.6	0.463
Neonatal Jaundice	31	20.7	34	13.6	0.064
Neonatal Sepsis	25	16.7	30	12	0.189
Neonatal Convulsion	54	36	63	25.2	0.016
Postnatal CNS infection	16	10.7	11	4.4	0.016



**Fig-1:** Type of epilepsy in children having epilepsy (n=400)



**Fig-2:** Seizure pattern in different type of CP (n=150)

In CP with epilepsy (group-A, 150 cases) 73.3% (110/150) of children manifested first seizure before one year of age and GTCS was the most common type of seizure 62% and partial seizure was found in 18% cases (Figure-1). GTCS was the commonest type of seizure in spastic quadriplegic CP and partial type in spastic hemiplegic CP (Figure-2).

By calculating Odds ratio by logistic regression analysis (Table-IV) it was found that LBW and postnatal CNS infection significantly increase the risk of epilepsy in CP cases. It was also found that prematurity in CP cases is an important factor which reduce the risk of epilepsy significantly.

**Table IV**  
*Logistic regression analysis of epilepsy on predictor variables*

Variable	Adjusted Odds ratio (OR)	95% CI (OR)	p value
ANC (absent)	1.250	0.766-2.038	0.372
Maternal illness	1.321	0.660-2.645	0.432
LBW	0.428	0.42-0.757	0.004
Prematurity	2.296	1.097-4.806	0.027
Delayed Cry	1.149	0.708-1.864	0.575
Neonatal Jaundice	0.830	0.450-1.532	0.551
Neonatal Sepsis	0.778	0.400-1.513	0.459
Neonatal Convulsion	0.726	0.40-1.170	0.188
Postnatal CNS infection	0.416	0.171-1.014	0.05

**Discussion:**

In this study epilepsy was present among 37.5% of children with CP, which is similar to other studies of Laganju IA, Kulak W, Carlsson M, Hadjipanayis A and Zelnik N et al. where frequencies 29%-42% have been reported.<sup>8-12</sup>

In this study, home delivery was found more among CP with epilepsy and hospital delivery was more in CP without epilepsy. On the other hand, normal vaginal delivery was more than cesarean section in both groups of CP, which is similar to observations of Laganju IA.<sup>8</sup> and Kulak W.<sup>9</sup> in their study.

In this study spastic quadriplegic type of CP was more common in both group followed by spastic diplegia. Kulak W.<sup>9</sup> and Hadjipanayis A.<sup>11</sup> found similar result in their study.

In this study, the first seizure occurred during the first year of life in 73.33% of patient of group A (CP with epilepsy) which is similar with observation of Kulak W.<sup>9</sup> and Nathanel N et al.<sup>12</sup> in their study. The most common forms of seizure found in children with CP in this study were GTCS (62%), partial (18%), secondary generalized (14%) and less common forms seen was infantile spasm (6%). This finding was consistent with report from previous studies of Laganju IA.<sup>8</sup> as they found major seizure types were GTCS (53.8%), partial seizure 18.5% and infantile spasm 15.4%.

The findings of the present study showed that epilepsy was more likely to have in children with quadriplegic CP. Similar result have been reported by Kwng M.<sup>4</sup> and Carlsson A.<sup>10</sup> in their studies.

In this study LBW was found more frequently (42%) in CP with epilepsy and was significantly associated with an increased risk of epilepsy. Kulak W.<sup>9</sup> and Curatolo P.<sup>13</sup> also found association between LBW and increased risk of epilepsy in CP cases. Prematurity was present in 16% in group-A and 19.6% in group-B in this study but after logistic regression analysis no significant positive correlation was found to develop epilepsy in CP. Hirvonen M et al.<sup>14</sup> in their study among CP cases found preterm birth was associated with a significantly increased risk of epilepsy which differ from our study.

Postnatal CNS infection showed significant relation to develop epilepsy in CP in this study, which is similar to findings of Laganju IA.<sup>8</sup> and Carlsson M.<sup>10</sup> in their study. This study showed no significant relation

between neonatal convulsion and development of epilepsy in CP cases, that observation was similar to Kwong K.<sup>4</sup> and Zelnik N et al.<sup>12</sup> in their study.

There were some limitations as it was a retrospective study. It is assumed that a prospective approach would have resulted in more comprehensive data retrieval. Familial history of epilepsy previously noted to be a significant risk factor for epilepsy among children with CP and epilepsy<sup>13,15</sup> has not been included in our analysis (due to difficulties to validate its reliability). Further studies looking in to possible genetic and early prenatal factors may lead to better understanding of the cause of epilepsy.

**Conclusion:**

Among CP cases epilepsy is most common in spastic quadriplegic CP and GTCS is more common type of epilepsy in spastic quadriplegic CP. LBW and postnatal CNS infection significantly increase the risk of epilepsy in CP cases. Prematurity, neonatal jaundice, neonatal convulsion, neonatal sepsis does not increase the risk to develop epilepsy in CP.

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