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| **Original Article** |

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| **Factors Leading to Epilepsy in Children with Cerebral Palsy** |

**The Frequency of Factors Leading to Epilepsy in Children with Cerebral Palsy**

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**ABSTRACT**

**Objective:** To determine the frequency of factors leading to epilepsy in cerebral palsy children presenting in tertiary care hospital Karachi.

**Study Design:** Cross Sectional Study

**Place and Duration of Study:** This study was conducted at the Pediatrics Department, Unit III, Dow University of Health Sciences, Civil Hospital, Karachi, from June 2020 to July 2021.

**Materials and Methods:** A total of 274 cerebral palsy patients of either gender, between 2-12 years, with a history of epilepsy, were included in the study. Parents were asked about the history of seizures in their children when they were in the neonatal period and also about their family history of seizures. The patient was examined for height (cm), weight (kg), and involvement of all four limbs as quadriplegic type cerebral palsy. Data were entered and analyzed using the computer program SPSS-19. Effect modifiers were controlled by stratification. The Chi-square test was applied post-stratification and a p-value ≤0.05 was considered significant.

**Results:** There were 194 male and 80 female patients. The mean age was 7.49±2.95 (range 2–12) years. The mean weight was 21.95±6.89kg and the mean height was 96.03±35. 50cm. The factors leading to epilepsy were evaluated individually, neonatal seizure was positive in 79.9% of patients, family history of seizure was positive in 26.6% of patients, and quadriplegic type cerebral palsy was found in 62.0% of patients.

**Conclusion**: A history of neonatal seizures and the occurrence of seizures in the first year of life warrant a close evaluation and appropriate follow-up for early detection of epilepsy. History of neonatal seizure is the most common factor with 79.9%.

**Key Words:** Risk Factors, Epilepsy, Cerebral palsy

**Citation of article: Memon MH, Kashif S, Hanif S, Saeed F, Saboohi E, Mallick AHH. The Frequency of Factors Leading to Epilepsy in Children with Cerebral Palsy. Med Forum 2022;33(11):130-134.**

**INTRODUCTION**

Cerebral palsy (CP) describes a medical condition due to no n-progressive disorder in development of fetal and infantile brain. It causes a group of permanent disorder of movement and posture causing activity limitation.1

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Received: June, 2022

Accepted: August, 2022

Printed: November, 2022

The overall prevalence of cerebral palsy is 2.5/1000 live births but incidence varies from 1 to 6 per 1000. The most frequent type of CP is spastic CP, second most commonly occurring type is called extra pyramidal presenting as athetosis, ataxia and tremors.2 Epilepsy (EPI) is considered one of the most common neurologic disorders that accompany patients with cerebral palsy. EPI is found to occur in 14-94% CP patients, depending on different types of CP.3

G.GulMert study discussed the multiple risk factors for epilepsy in cerebral palsy children and results showed that the frequency of risk factors of EPI were: history of neonatal seizures (28.6%), family history of seizure (23.2%), mental retardation (25%).4 Nathaniel study found that neonatal seizure was most common risk factor for epilepsy in cerebral palsy children(81.5%), followed by low APGAR score(62.5%), quadriplegic type cerebral palsy(58.2%), term infants(42.6%). 5 The same results found in Elodie Sellier study, aiming to find out the association between EPI, neonatal characteristics, associated impairments and CP subtypes. 6

In Pakistan little has been studied regarding cerebral palsy although burden of cerebral palsy is increasing in our community. The association of EPI with cerebral palsy in Children Hospital Lahore (2011) was found to be about 58.6% in their study and it was found that generalized tonic clonic epilepsy was more common in quadriplegic and diplegic type, while partial epilepsy in hemiplegic type. 7

In order to manage EPI in children with CP general principles of treating EPI are followed. Special attention is paid to any possible side effects of antiepileptic drugs (AEDs) used for treating symptoms in these patients. 5

No literature was found about study which is available in Pakistan for frequency of factors leading to epilepsy in cerebral palsy so local data for factors leading to epilepsy in cerebral palsy is scanty. I feel that this study will provide valuable information on factors leading to epilepsy in cerebral palsy children. It is reasonable to do this study because cerebral palsy children with epilepsy are more difficult to manage.

**MATERIALS AND METHODS**

We studied 274 cerebral palsy patients of either gender, age up to 12 years with history of epilepsy. This study was initiated after authorization of hospital ethical review board. All the patients who had cerebral palsy visiting the department of Pediatrics, Dow Hospital, Karachi and fulfilled the inclusion criteria were made a part of this study. The study population sample size was calculated by using the prevalence of seizures in cerebral palsy children using P=23.2%,8 d=5% the calculated sample size was 274 patients with the help of WHO software for sample size calculation taken 95% confidence level. Non-probability consecutive sampling technique was used in our study. Patients having history of neurometabolic or neurodegenerative originated progressive encephalopathy, fits secondary to neurodegenerative disease or metabolic fits were omitted from this research.

Informed written consent was obtained from parents. Patient’s complete clinical examinations were done by principal investigator. Parents were asked regarding history of neonatal seizures, family history of seizure and labeled as per operational definition. Child was examined and involvement of all four limbs was taken as quadriplegic type cerebral palsy. Child’s weight was measured in kg by weighing scale, and height was measured by standiometer in cm, length of children was measured by infantometer in cm who were unable to stand.

SPSS version 19 was used for data analysis. Mean+ SD were calculated age, weight and height. Frequency and percentage were computed for qualitative variables i.e. gender, family history of seizure, history of neonatal seizure and quadriplegic type of cerebral palsy. Data was stratified according to age, gender and height using chi square test. P value of ≤0.05 was considered as significant.

The symptoms are not episodic or progressive and are the result of brain malfunction. Early childhood is a time when tone and postural issues may become more obvious, but qualitative changes are rare.

**RESULTS**

A total 274 cerebral palsy patients of either gender, with history of epilepsy were included in the study. There were 194 (70.8%) male and 80 (29.2%) female patients. The mean age of study subjects was 7.49±2.95 years, with range of 10(2–12) years.

**Table No.1: The descriptive statistic of age, weight and height groups**

|  |  |  |
| --- | --- | --- |
| Groups | Mean ±SD | 95%CI |
| Age |   |
| ≤ 8 years(n=155) | 5.39±2.13 | 5.05 – 5.73 |
| > 8 years (n=119) | 10.22±0.94 | 10.05 –10.39 |
| Weight  |   |
| ≤ 20 Kg (n=103) | 14.67±2.95 | 14.10 –15.25 |
| > 20 Kg(n=171) | 26.33±4.45 | 25.66 –27.00 |
| Height  |   |
| ≤ 95 cm(n=92) | 49.76±16.42 | 46.36 –53.16 |
| > 95 cm(n=182) | 119.42±11.29 | 117.77 –21.07 |

**Table No.2: Frequency and association of history of neonatal seizure according to gender, age, weight and height.**

|  |  |  |
| --- | --- | --- |
|  | History of Neonatal Seizure |  |
| Gender | YES | NO | TOTAL | P-Value |
| Male | 156 | 38 | 194 | 0.755\*\* |
| Female | 63 | 17 | 80 |
| Age |  |
| ≤ 8 years | 128 | 27 | 155 | 0.211\*\* |
| > 8 years | 91 | 28 | 119 |
| Weight |  |
| ≤ 20 Kg | 86 | 17 | 103 | 0.252\*\* |
| > 20 Kg | 133 | 38 | 171 |
| Height |  |  |  |  |
| ≤ 95 cm | 77 | 15 | 92 | 0.268\*\* |
| > 95 cm | 142 | 40 | 182 |

**Table No.3: Frequency and association of family history of seizure according to gender, age, weight and height.**

|  |  |  |
| --- | --- | --- |
|   | Family History of Seizure |   |
| Gender | YES  | NO  | TOTAL  | P-Value |
| Male  | 57 | 137 | 194 | 0.110\*\* |
| Female  | 16 | 64 | 80 |
| Age |   |   |   |   |
| ≤ 8 years  | 44 | 111 | 155 | 0.456\*\* |
| > 8 years  | 29 | 90 | 119 |
| Weight |   |   |   |   |
| ≤ 20 Kg  | 27 | 76 | 103 | 0.901\*\* |
| > 20 Kg  | 46 | 125 | 171 |
| Height |   |   |   |   |
| ≤ 95 cm  | 29 | 63 | 92 | 0.194\*\* |
| > 95 cm | 44 | 138 | 182 |

**Table No.4: Frequency and association of quadriplegic type cerebral palsy according to gender, age, weight and height.**

|  |  |  |
| --- | --- | --- |
|   | Quadriplegic Type Cerebral Palsy |   |
| Gender | YES  | NO  | TOTAL  | P-Value |
| Male  | 123 | 71 | 194 | 0.471\*\* |
| Female  | 47 | 33 | 80 |
| Age |   |   |   |   |
| ≤ 8 years  | 97 | 58 | 155 | 0.834\*\* |
| > 8 years  | 73 | 46 | 119 |
| Weight |   |   |   |   |
| ≤ 20 Kg  | 65 | 38 | 103 | 0.778\*\* |
| > 20 Kg  | 105 | 66 | 171 |
| Height |   |   |   |   |
| ≤ 95 cm  | 58 | 34 | 92 | 0.808\*\* |
| > 95 cm  | 112 | 70 | 182 |

The mean weight was 21.95±6.89 kg, with range of 30.8(8.3–39.1) kg. The mean height was 96.03±35.50 cm, with range of 126.7(15.8–142.5) cm. The descriptive statistics of age, weight and height groups are presented in Table 1.

The factors leading to epilepsy were evaluated individually, the results showed that history of neonatal seizure was positive in 219 (79.9%) patients, family history of seizure was positive in 73 (26.6%) patients, and quadriplegic type cerebral palsy was found positive in 170 (62.0%) patients.

The stratification according to gender, age, weight, and height was done. Post stratification association of outcome was observed with these modifiers using chi square test considered p≤0.05 as significant.

The results showed that all three studied factors were not significantly associated with gender, age, weight, and height with p-value. The detailed results are presented in Table2-4.

**DISCUSSION**

The term "cerebral palsy" refers to intellectual and physical/motor dysfunction that may result from injury to the developing brain. It is characterized by ataxia, muscle weakness, involuntary movements, changes in muscle tone (usually spasticity or stiffness), or combination of these abnormalities. The symptoms are non-progressive and are the result of brain dysfunction. Early childhood is a time when tone and postural issues may become more obvious, but overall qualitative changes are rare.9 Epilepsy, mental retardation, visual impairment, and hearing issues are typically associated with CP. 10

Children with CP experience seizures five times more frequently than children without a major neurological disease. Nearly 50% of children with CP go on to have an epileptic disease. 11,12 Depending on the research group, the prevalence of epilepsy ranges from 34% to 94% in children with CP10.The most common type of epilepsy is the spastic variety.12

Epilepsy affects between 3 and 6 people out of every 1,000 children in the general population, according to known statistics.13 However, 41.4 to 89.9% of patients with cerebral palsy were reported to have epilepsy.11,14,15

In a Pakistani study, epilepsy was found to occur in 58.6% of children with cerebral palsy.7 Similar findings have been found by other investigations. In research including 1,918 children, the average percentage of CP patients who developed epilepsy was 43% (with a range of 35 to 66%).16 Another study performed in Atlanta, from 1991 to 1993, reported that 32% of children with CP also suffered from epilepsy.8 It was reported that 60.5% of 74 children with CP also suffered from epilepsy.9 The percentages reported in the literature vary widely; the differences between the studies can be explained by the different duration of follow-up periods and the different average age of the patients.

Disabilities like physical dependence and lack of orientation in CP children with EPI is strongly associated with duration of seizures. The severity increased if seizures started early in life or were primary or secondary generalized seizures. 16,17 The children with EPI but without CP tend to do better in physical activities and have a mild handicap. When CP is added to EPI the handicap score slightly increases.16,18

Infantile seizures have proven to be a reliable indicator of development of epilepsy in children with cerebral palsy.19 About,70% of the children with CP experienced seizures before their first birthday. 20 In contrast to previous research, 88% of the patients in a Pakistani study experienced their first seizure while they were infants.7

To identify risk variables that impacted the development of epilepsy, Zelnik et al. 5 followed up 132 children with only cerebral palsy and 65 patients with cerebral palsy plus epilepsy. According to their findings, epilepsy developed in 22 of 27 (81.5%) cerebral palsy patients with a history of newborn seizures. No study that revealed the contrary findings was discovered in a review of the literature on this subject. Thus, having a history of newborn seizures in cerebral palsy increases their likelihood of developing epilepsy and having a bad prognosis for developing it. Our study's subjects had a history of newborn seizures in 79.9% of cases.

One study found that 23.2% of patients who had a family history of epilepsy, had a 5.5-fold increased risk of developing epilepsy.4 All studies in the literature consistent with our study that a family history of epilepsy increases the risk of developing epilepsy in individuals with cerebral palsy.15,21,22 Our study had 26.6% patients with a positive family history of epilepsy.

The quadriplegic forms of CP were most associated with epilepsy. The rates of epilepsy associated with quadriplegic CP were 71.5% and 65% with hemiplegic CP, respectively. Data from another study of 1,918 people also showed that children with spastic tetraplegia (94%) or hemiplegia (30%) were more likely to develop epilepsy. Other studies have observed epilepsy in 54% of tetraplegic patients, 34-60% of hemiplegic patients, 27% of diplegic patients, and 23-26% of dystonic cerebral palsy patients. 23 In our study, 62.0% of patients had quadriplegic cerebral palsy.

**CONCLUSION**

It was concluded by our results that history of neonatal seizure is the most common factor with 79.9% followed by quadriplegic type cerebral palsy with 62.0%, and family history of seizure with 26.6%.A history of neonatal seizures, occurrence of seizures in the first year of life warrant a close evaluation and appropriate follow up for early detection of epilepsy in children with cerebral palsy.

**Author’s Contribution:**

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| Concept & Design of Study: | Mohammad Hanif Memon |
| Drafting: | Saima Kashif, Shahina Hanif |
| Data Analysis: | Farhan Saeed, Erum Saboohi, Abdul Hadi Hassan Mallick |
| Revisiting Critically: | Mohammad Hanif Memon, Saima Kashif |
| Final Approval of version: | Mohammad Hanif Memon |

**Conflict of Interest:** The study has no conflict of interest to declare by any author.

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