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A Descriptive Study of Clinical Profile of Children with Cerebral Palsy and Microcephaly

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ABSTRACT

Microcephaly defined as HC < 3 SD, Z score < -3SD is observed only among 0.1% of general population, but its prevalence is 15- 20% in children with developmental delay. When brain is growing rapidly, it is more susceptible to disturbance and there is a once daily opportunity for proper growth.[1]

Etiology of cerebral palsy are closely related. Adverse perinatal factors play a prominent role in interference with the development of brain. In the aetiology of CP, mechanical injuries are of limited importance when compared with hypoxia. Mild hypoxia can cause neuronal damage either focal or diffuse accounting for symptoms of CP and MR.[3]

Neuroimaging becomes important in all cases of microcephaly and its correlation guides in appropriate management. Head MRI was considered indispensable in the investigation of the causes of microcephaly and in determining the neurological prognosis of affected patients.[9]

In the present study which included 40 children with cerebral palsy and microcephaly, 70% had NICU admission at birth, with perinatal asphyxia being the main etiology (68%). 46% of the children had spastic quadriparesis and 80% had abnormal brain MRI findings with most common findings being periventricular leukomalacia and multicystic encephalopathy

Keywords

Microcephaly, Cerebral Palsy, MRI brain, Developmental Delay

INTRODUCTION

Microcephaly defined as HC < 3 SD, Z score < -3SD. Microcephaly is observed only among 0.1% of general population, but its prevalence is 15- 20% in children with developmental delay. When brain is growing rapidly, it is more susceptible to disturbance and there is a once daily opportunity for proper growth.[1]

Etiology of cerebral palsy are closely related. Adverse perinatal factors play a prominent role in interference with the development of brain. In the aetiology of CP, mechanical injuries are of limited importance when compared with hypoxia. Mild hypoxia can cause neuronal damage either focal or diffuse accounting for symptoms of CP and MR.[3]

In small premature neonates, apnoea may occur with little or no warning. And conditions like IVH, all of these which are risk factors for CP. All these emphasize vulnerability of child during perinatal period and need for constant vigilance at a time when minor adverse effects interfere with construction/ cause destruction of brain.[3]

Neuroimaging becomes important in all cases of microcephaly and its correlation guides in appropriate management. Head MRI was considered indispensable in the investigation of the causes of microcephaly and in determining the neurological prognosis of affected patients.[9]

Assessment of microcephaly requires a multidisciplinary approach with important clinical and imaging components. Careful history taking can help exclude common environmental factors such as fetal alcohol syndrome or TORCH infections, and imaging can help detect such as non accidental injury.

An understanding of the association of microcephaly in children with cerebral palsy and presence of other comorbidities will help in better and specific management in these children.

METHODOLOGY

SOURCE OF DATA

Data collected from children attending Outpatient department (OPD) and Inpatient department (IPD) facilities of Department of Pediatrics at Vani Vilas hospital, Bangalore Medical College and Research Institute.

DESIGN OF STUDY

Descriptive non-interventional study.

STUDY PERIOD

January 2023-February 2023

PLACE OF STUDY

OPD and IPD facilities**,** Department of Pediatrics, Vani Vilas Hospital, BMCRI, Bangalore.

INCLUSION CRITERIA

- Children clinically diagnosed with Cerebral Palsy with microcephaly in the age group 2 to 18yrs.
- Parents of children willing to give informed consent to participate in study.

EXCLUSION CRITERIA

- Children with Cerebral palsy without microcephaly
- Parents of children not willing to give informed consent to participate in study.

METHODOLOGY

Total of 50 children with cerebral palsy were studied in OPD and IPD facilities of Vani Vilas hospital during the study period. A written informed consent was taken from the parents. The head circumference was measured by placing a non-stretchable tape

around the cranial vault to include the widest part of the forehead and the most prominent part of the occipital area to arrive at the largest possible measurement.[8] Microcephaly was defined as head circumference less than 3 SD or Z score <-3.[1] Z scores were calculated using WHO charts. Detailed history (antenatal, birth, and developmental), clinical, and neurological examination was carried out as per standard protocol. Relevant investigations like MRI brain was done. Types of CP, age, antenatal risk factors, NICU duration, developmental quotient, convulsions, hearing impairment, nutritional status, vision abnormalities were studied and correlated. MRI was done for all these children and results were correlated.

Assessment Tools

- Head circumference measurement- measured from the prominent part on occipital protruberance to supraorbital ridges on left temporal side.
- MRI brain- T1 and T2 weighted images were taken in all children with sagittal, coronal and axial view.

RESULTS

In our study 62% of CP children were male and 38% were females. M=Male : Female ratio being 1.6:1.

Total Children	50
Male	31 (62%)
Female	19 (38%)

It is seen that 56% of CP children belonged to 2-3 years age whereas 22% were 4-5 years age, 12% 6-7 years age and 10% were above 7 years.

Total Children	50
2-3yrs	28 (56%)
4-5yrs	11 (22%)
6-7yrs	6 (12%)
>7yrs	4 (8%)

In our study it was noted that 68% of CP children had perinatal asphyxia, 6% had hypoglycemia and prematurity as etiology, 4% had epilepsy, kernicterus, postencephalitic sequelae or syndromic cause, 2% had arachidonic cyst or TORCH infections.

ETILOGY	FREQUENCY (%)
Perinatal asphyxia	34 (68%)
Hypoglycemia	3 (6%)
Kernicterus	2 (4%)
Post encephalitic sequelae	2 (4%)
Epilepsy	2 (4%)
Prematurity	3 (6%)
Syndromic	2 (4%)
Torch	1 (2%)
Arachnoid cyst	1 (2%)
Total	50 (100%)

About 90% of children had associated developmental delay with DQ less than 70.

46% of children had spastic quadriparesis, 22% had spastic diplegia, 12% had dyskinetic CP.

Type of CP	Frequency (%)
Hypotonic CP	2 (4%)
Dyskinetic	6 (12%)
Spastic Quadriparesis	23 (46%)
Spastic Diplegia	11 (22%)
Spastic Hemiplegia	4 (8%)
Spastic Triplegia	3 (6%)
Mixed Type	1 (2%)
Total	50 (100%)

72% of children had malnutrition among which 6% of children had severe acute malnutrition.

MRI brain revealed significant abnormalities in 80% of children with microcephaly. Findings included Periventricular leukomalacia, multicystic encephalomalacia, corpus callosal agenesis, hyperintense basal ganglia, mitochondrial encephalopathy, bilateral hyperintense gangliocapsular region and thalamus and bilateral periventricular calcifications.

DISCUSSION

Etiology of microcephaly reveals genetic etiology, metabolic disorder and cerebral palsy.

In study by Anju Aggarwal et al out of 414 children with developmental delay, 231 had microcephaly.2

Indian children with cerebral palsy were studied by Prasad et al, in 2010. Of 102 children, reported observations were prematurity (18%), severe birth asphyxia (62%).11This was similar to our study as birth asphyxia was the most common cause of cerebral palsy.

MRI findings were suggestive of HIE changes in majority (76%), malformations (3%), focal lesions (6%). In present study abnormalities in neuroimaging was noted in 80% cases and most common finding was HIE changes and Periventricular leukomalacia.

80% of children with microcephaly had neuroimaging abnormalities as compared to 43% in those with z score between -2 to -3SD in study by Custer et al. It also concluded that abnormal neuroimaging results correlate better with developmental performance than degree of microcephaly. In our children with cerebral palsy, microcephaly was associated with developmental delay and neuroimaging abnormalities in 80% cases.10

According to AAN recommendation neuroimaging should be carried out in all children with microcephaly, it helps in identifying structural anomalies.

Microcephalic children were more likely to be associated with spasticity, growth retardation, cerebral palsy epilepsy, neuroimaging abnormalities in the study by Wattenberg et al. Similar findings were seen in our study.5

In study by Rajniti Prasad et al, Periventricular white matter injury was the most common MRI abnormality in spastic diplegia, whereas in quadriplegia diffuse encephalopathy was common. MRI scans help in revealing pathologic basis of CP and had strong correlations with clinical findings.4 In our study HIE changes was the most common finding in spastic quadriparesis.

In study by Ashwal et al, it showed that children with severe microcephaly (head circumference <-3 SD) are more likely (approximately 80%) to have imaging abnormalities and more severe developmental impairments than those with milder microcephaly (-2 to -3 SD; approximately 40%). Similar findings were noted in our study. 80% cases of microcephaly had significant neurological abnormality.7

Because children with cerebral palsy are at risk for microcephaly, health care providers may consider monitoring them for early signs so that supportive treatment can be initiated. As cerebral palsy children are at risk for developing acquired microcephaly, serial head circumference monitoring should be followed.

CONCLUSION

Children with cerebral palsy are at risk for microcephaly. Health care providers should consider monitoring them for early signs so that early intervention in children with CP can be initiated. As children with cerebral palsy are at risk for developing acquired microcephaly, serial head circumference monitoring should be followed.

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