

Original Research Article

Clinical characteristics and associated factors of cerebral palsy in pediatric population: a tertiary care centre clinicoepidemiological study

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ABSTRACT

Background: Although, a highly prevalent disease, the etiology of cerebral palsy is still poorly understood thereby eluding a definitive prevention strategy. Our study aimed to evaluate the etiological, clinical and prognostic factors associated with cerebral palsy in children of western Rajasthan.

Methods: All cases of non-progressive neurological disorder in the age group of 6 months to 14 years were enrolled in the present study. Detailed assessment, CNS examination and related neuroimaging were performed. Statistical analysis was done by standard statistical methods.

Results: Maximum number of patients in current study were in the age group of 1-3 years. In our study according to sex, 40 (66.67%) were males and 20 (33.33) were females. Most of the patient in the present study were spastic quadriplegic type (40%) followed by spastic diplegia in 20% cases. As per gross motor function classification system (GMFCS) grading, maximum number of cases were 16 (26.67%) from grade 4. The most common sequelae in cerebral palsy were speech delay in 49 (81.66%) patients. Cortical atrophy was the most commonly (71.73%) seen abnormality on neuroimaging with CT-scan.

Conclusions: Cerebral palsy is a non-progressive CNS disorder which has a major physical as well as psychological effects on the children as well as their families. The present study highlights the importance of understanding epidemiological and etiological aspects of the disease in Indian scenario.

Keywords: Cerebral palsy, Diplegia, Gross motor function classification system, Quadriplegia

INTRODUCTION

The diagnostic term “cerebral palsy” refers to a collection of long-lasting movement and postural abnormalities that limit an individual’s activities and are linked to nonprogressive disruptions in the developing fetus or infant brain.¹ There are several possible causes of cerebral palsy: genetic, prenatal, perinatal, and postnatal (CNS infection, hypoxia, trauma, low birth weight, birth trauma, birth asphyxia, prematurity, hyperbilirubinemia, hypoglycemia, and CNS infections). Prenatal causes include structural malformations of the nervous system, congenital or intrauterine infections, maternal or obstetric complications, and teratogens.² Prenatal, natal, and postnatal variables thus play a role in the

etiopathogenesis of this extremely distressing illness.³ A cure for cerebral palsy (CP) has not yet been discovered, hence, a need for primary prevention of disease. But unfortunately, the etiology of cerebral palsy is poorly understood thereby eluding a definitive prevention strategy. Our study aimed to evaluate the etiological, clinical and prognostic factors associated with cerebral palsy in children of western Rajasthan.

METHODS

This prospective cross-sectional study was conducted at department of pediatrics of the Sardar Patel Medical college, Rajasthan, India from January 2022 to December 2022. All cases of non-progressive neurological disorder

in the age group of 6 months to 14 years were included in the present study. Exclusion criteria included children diagnosed as cerebral palsy aged >14 years and age <6 months and children having active neurological disease. Complete information about these patients including age, sex, religion, paternal and maternal age, place of residence was recorded in a specially designed Performa. Thorough and complete obstetric histories including antenatal, natal, postnatal and developmental abnormalities were recorded. Anthropometric measurements and CNS examination was carried out. Related neuroimaging and some diagnostic tests like CT scan or MRI of head and IgM or IgG for TORCHS in baby were performed.

RESULTS

This prospective cross sectional study included a total of 60 patients over a period of one year. Male to female ratio was 3.6:1 with mean age was 5.32 years with SD ±3.38. The mean paternal age at birth was 28.15±3.78 years and mean maternal age was 24.22±4.51years.

Table 1: Demographic characteristics of patients of cerebral palsy.

Demographic characteristics	Number
Age distribution	
1-3	26
4-6	11
7-9	14
10-12	7
>12	2
Mean age	5.32±3.38
Gender	
Male	40
Female	20
Area of residence	
Urban	41
Rural	19
Mean maternal age	24.22±4.51
Mean paternal age	28.15±3.78

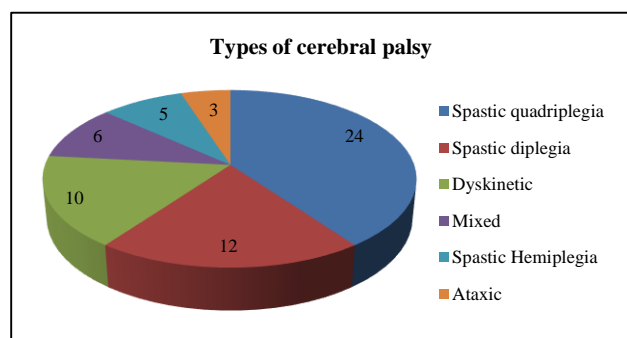


Figure 1: Types of cerebral palsy.

Table 1 shows that distribution of various demographic factors in our cases of cerebral palsy showing a male

preponderance. The children from rural background outnumbered the children from urban areas. There was no clear relationship with extremes of paternal or maternal age when any of the types of cerebral palsy.

The most common type of cerebral palsy was spastic quadriplegia in our study (Figure 1).

Table 2: Antenatal and perinatal factors associated with cerebral palsy.

Antenatal history	Number
Fever	10
Hypertension	2
Diabetes mellitus	2
Drug intake	2
Antepartum hemorrhage	0
Normal	43
Place of delivery	
Hospital	46
Home	14
Length of pregnancy	
<28	0
29-31	3
33-36	19
>36	19
Duration of labour	
Normal	28
Prolonged	32
Type of delivery	
Vaginal delivery	57
Lower segment cesarean section	3
Time of first cry	
Normal	26
Delayed	34
First feed	
Within 24 hours	22
Delayed	38
Evidence of neonatal encephalopathy	
Present	36
Absent	24
Birth weight	
<1 kg	3
1.0-1.5 kg	14
1.6-2.5 kg	25
>2.5 kg	18
Perinatal history	
O ₂ /ventilator/ICU Stay	41
Resuscitative efforts	45
Neonatal hypoglycemia	13
Neonatal jaundice	10
Meconium aspiration syndrome	17
Neonatal meningitis	36
Birth trauma	2
IC bleed/IVH	1

Table 3: Neurological examination findings in patients of cerebral palsy.

Findings	Number
Tone	
Decreased	14
Dystonic	11
Increased	41
Cranial nerve palsy	
Present	8
Absent	52
Tone	
1	8
2	10
3	36
4	6
Presence of superficial reflexes	
Plantar	10
Abdominal	56
Cremaster	56
Gait	
Hemiplegic	5
Dyskinetic fast	10
Diplegic	18
Cannot be assessed	27

Table 2 shows various antenatal and perinatal factors associated with cerebral palsy. Maternal pyrexia was the commonest antenatal factor seen in 16.67% patients with cerebral palsy followed by hypertension, diabetes mellitus and drug intake present in only 3.33% patients respectively. As far as length of pregnancy was concerned, 19 (31.66%) of patients had 33-36 weeks and >36 weeks of gestation respectively while 3 (5%) had 29-31 weeks of gestation. In the current study, 46 (76.67%) were hospital delivered and 14 (23.33%) were home delivered.

Out of 60 children included in the current study, 34 (56.66%) had history of birth asphyxia. A history suggestive of ICU stay/O₂/ventilator was found in 41 (68.33%) patients, while resuscitative efforts was needed in almost same number 45 (75%) patients. Neonatal hypoglycemia was found in 13 (21.66%). Neonatal meningitis was found in 36 (60%) patients. Other factors being neonatal jaundice in 10 (16.67%) and meconium aspiration syndrome in 17 (28.33%). Birth trauma and IC bleed in 2 (3.33%) and 1 (1.66%) patients respectively.

Malnutrition was present in 52.16% patients with 13.58% patients had severe degree of malnutrition. In the current study, 42 (70%) cases had microcephaly.

Table 4: CT/MRI findings in patients of cerebral palsy.

CT/MRI scan findings	Spastic quadriplegic	Spastic diplegic	Spastic hemiplegic	Ataxic	Dykinetic	Mixed	Total (%)
Infract	5	6			7	6	24 (40)
Diffuse cerebral atrophy	13	5		3	2		23 (38.33)
Focal cortical atrophy	1		3				4 (6.66)
Periventricular leukomalacia	2	1	2				5 (8.33)
Other pachygyria	2						2 (3.33)
Hydrocephalus	1						1 (1.66)
Normal study							1 (1.66)
Total	24	12	5	3	7	6	

A thorough neurological examination was performed. Tone was increased in 41 (68.33%) out of 60 patients followed by decreased tone in 14 (23.33%) and dystonic in 11 (23.33%). Cranial nerve palsies were present in 8 (13.33%) patients out of 60. As far as grading of deep reflex were concerned, there were 36 (60%) patients in grade 3, followed by grade 2 which were 10 (16.66) patients. 8 (13.33%) and 6 (10%) in grade 1 and grade 4 respectively. Out of 60 cases in the current study, there were 27 (45%) patients in which gait cannot be assessed followed by diplegic gait in 18 (30%) dyskinetic fast in 10 (16.66%) and hemiplegic in 5 (8.33%) (Table 3).

Gross motor function classification system (GMFCS) and MACS, manual ability classification system were used and cases were classified into grade 1 to 5 (Figure 2).

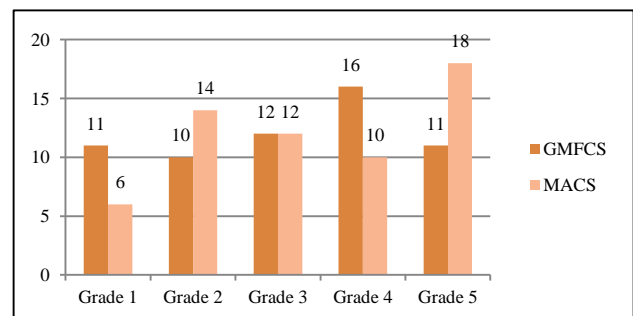


Figure 2: GMFCS and MACS grading in patients of cerebral palsy.

Detailed radiological assessment was done using CT scan/MRI among the patients (Table 4).

Developmental quotient (DQ) grading was assessed in age less than 5 years in which maximum patients 29 (48.33%) were in severe delay while mild-moderate delay grading was found in 2 (3.33%).

Intellectual disability was also assessed in children more than 5 years in which 19 cases (65.51%) had profound delay, 9 cases (31.03%) had severe delay and 1 case (3.44%) showed moderate delay.

DISCUSSION

Cerebral palsy is a well-recognized neurodevelopmental condition beginning in early childhood and persisting through the lifespan. Cerebral palsy has substantial effects on function and health related quality of life of patients and their caregivers. The interest of clinicians in cerebral palsy has fluctuated markedly over the years and has been influenced by epidemiological studies, etiological factors, diagnostic considerations and pattern of care available for children with cerebral palsy.^{1,3}

Maximum number of patients in current study were in the age group of 1-3 years. In our study according to sex, 40 (66.67%) were males and 20 (33.33) were females. Similar male preponderance has been reported earlier in so many other studies also.^{3,4}

Most of the patients in the present study were spastic quadriplegic type 40% followed by spastic diplegia in 20%. Other types were spastic hemiplegic in 8.33%, dyskinetic in 16.66%, mixed in 10% and 5% in ataxic type of cerebral palsy. Eicher et al in their study reported that spastic quadriplegia was the commonest variety (27%).⁵ Surprisingly, Sharma et al reported spastic diplegia (54%) to be the commonest type of cerebral palsy.⁶ This high incidence may be due to a chance clustering of patients with spastic diplegia during a given time.

In our study, home delivery were 14 (23.33%) and rest were hospital 46 (76.67%). Out of these 46 hospital deliveries, 3 (5%) were delivered by caesarean section. No clear association was observed between LSCS deliveries and cerebral palsy. Our findings were similar to Powell et al who reported that caesarean section was not significantly associated with CP.⁷

As per their living area no specific pattern of CP with rural 41 (68.33%) or urban 19 (31.67%) background was found in review of literature.⁸

Out of 60 children included in the current study, 42 (70%) had microcephaly. Similar observations were also made by Aneja et al who reported microcephaly in 64% cases of CP.⁹

Seizure was found in 47 (78.33%) out of 60 patients. Our findings were supported by a pioneer study conducted by

Dale et al which showed seizures in 37.4% in their study.¹⁰

According to current study, gross motor function classification system (GMFCS) grading, maximum number of cases were 16(26.67%) from grade 4 (26.67%) followed by 12 (20%) cases in grade 3 and grade 5, grade 1 had 11 (18.33%) while least number in grade 2 (16.67%). Gorter et al conducted a study on the stability of the gross motor function classification system (GMFCS) in which findings indicate that GMFCS classification in infants is less precise than classification over time in older children.¹¹ In conclusion, children can be classified by the GMFCS early on, but there is a need for reclassification at age 2 or older as more clinical information becomes available.

Neuroimaging as cranial ultrasound, CT-scan, MRI, SPECT, PET etc.; have been used to find out structural CNS abnormalities in patients with CP. In the current study, CT scan /MRI showed that 24 (40%) patients had infarct. Diffuse cerebral atrophy were revealed in 23 (38.33%) patients of cerebral palsy and periventricular leukomalacia in 5 (8.33). 4 (6.66%) patients had focal and global cortical atrophy. Other findings detected were pachygyria 2 (3.33%), hydrocephalus and normal study were noted in 1 (1.66%) patient. Our MRI/CT scan findings were similar to the observations made by Aneja et al.⁹ They observed variable degree of cerebral atrophy in 43.1% cases. Periventricular leukomalacia and porencephaly have also been reported in quite significant proportion of patients of CP by various other workers. The most common sequelae in cerebral palsy were speech delay in 49 (81.66%) patients in the present study.

The major limitation of our study included small sample size. Larger studies can be conducted for better understanding of the disease.

CONCLUSION

Cerebral palsy is a non-progressive CNS disorder which has a major physical as well as psychological effects on the children as well as their families. The present study highlights the importance of understanding epidemiological and etiological aspects of the disease in Indian scenario. Since, the disease is not curable, it is imperative to know the primary preventive measures and early identification of risk factors. Our study contributes to the existing literature and knowledge of the disease.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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