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A CROSS-SECTIONAL STUDY OF CLINICAL PROFILE OF CEREBRAL PALSY PATIENTS VISITING A GOVERNMENT TERTIARY CARE HOSPITAL FROM MAHARASHTRA, INDIA

KEY WORDS: Cerebral palsy, Child Guidance Clinic, Developmental Delay.

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ABSTRACT

Cerebral palsy has emerged as one of the major causes of childhood disability in India. In low and middle income countries there are gaps in knowledge in the spheres of epidemiological research, intervention and service utilization.

AIMS AND OBJECTIVES: This study describes the clinical features associated problems of children with CP visiting a government tertiary care Hospital from Maharashtra, India.

Materials and Methods: This was cross sectional retrospective observational study conducted on 78 children of cerebral palsy.

Result: Among 78 enrolled children, maximum 50%(n=39) of children were between1-3yr age group with male to female ratio was 1.05:1. History of consanguinity was seen in 35.9% (n=28) subjects, 69.2%(n=54)of subjects were from the urban area. 78.2% (n=61) subjects were born term , 65.3%(n=51) cases had a history of NICU stay with the most common etiological factor being birth asphyxia seen in 38.4 %(n=30) subjects followed by sepsis in 29.5% subjects (n=23). Most common type of cerebral palsy was spastic 87.1% followed by dyskinetic 10.2%. Most of the participants were at GMFCS level IV and V (23.1% and 47.4% respectively). 78.2% subjects were having feeding problems, 43.6% had associated epilepsy. Majority of our subjects had Microcephaly (69.2%) and malnutrition (74.3%). MRI was done in only 34.6% of subjects with most common finding being periventricular white matter injury (PVWMI)).

Conclusion: It is suggested that rehabilitation clinics should be set up for CP patients at every government medical college so that parents can be made aware of the disease, associated disabilities, prognosis, and management.

INTRODUCTION

Cerebral palsy (CP) is a diagnostic term used to describe a group of permanent disorders of movement and posture causing activity limitation that are attributed to non progressive disturbances in the developing fetal or infant brain. CP is caused by a group of developmental, genetic, metabolic, ischemic, infectious, and other acquired etiologies that produce a common group of neurologic phenotypes[1]. Cerebral palsy (CP) is a leading cause of childhood disability worldwide with the greatest burden found in developing countries. Motor impairments are the hallmarks of CP, but in many individuals, other impairments such as vision, hearing, speech, cognition, behaviour, and epilepsy may at times produce even greater activity limitations in daily life[2].

The prevalence of cerebral palsy is generally estimated at 2 to 2.5 per 1000 of birth survivors in high-income countries, but recent studies have shown a trend toward decreasing incidence.[3,4]Its incidence in India is 3 cases per 1000 live births,however the actual figure may be much higher. There are increasing evidences suggesting rise in prevalence of CP[5]

Since CP is a continuing problem, it is important to study and explore the causes and newer aspects of the condition for proper understanding and management. In high-income countries, CP registers have made substantial contributions to our understanding of CP[6]. However, there remains a relative paucity of corresponding information about cerebral palsy in low- and middle-income countries and in these countries there are gaps in knowledge especially in spheres of epidemiological research, intervention, and appropriate services[7,8].

Therefore we planned to report the clinical spectrum, etiological factors and associated comorbidities with cerebral palsy children from Maharashtra a representative of low socioeconomic state in India to know rehabilitation needs, and for primary prevention is in present part of population.

METHODS

This is a retrospective cross sectional observational study conducted among the children visiting outpatient Department of Pediatrics in a tertiary care Government Medical College in Aurangabad, Maharashtra.

It included 78 children with diagnosis of cerebral palsy who attended the CGC(child guidance clinic) clinic over a period of 1 year from November 2018 to December 2019.[35]

Participants:

All patients attending the CGC clinic OPD between the age of 1- 12 yr who were confirmed to have CP from history and clinical assessment were included in the study. Children who had other motor disorders apart from CP and children outside the age criteria were excluded.

CP was categorised according to neurological subtype and severity. Subtype stratification was based on the topographic pattern of the affected limbs, and the predominant quality of motor impairment in those limbs.

These subtypes were spastic quadriplegia, spastic hemiplegia, spastic diplegia (spasticity in the lower extremities far in excess of any observable spasticity in the upper extremities), dyskinetic (dystonic or athetoid) and ataxic. The GMFCS was used to describe functional motor severity, using scores ranging from most able (Level I) to least able (Level V). The last available CP subtype and GMFCS level data were used in this study[33].

Informed consent was taken from parent or guardian of the child. Ethical clearance taken from institutional ethical committee.

Clinical Assessment included: history, sociodemographic profile, risk factors, clinical subtypes (topographic types), severity of motor outcome scored by GMFCS (gross motor function classification system) scale for CP, impairment on vision or on hearing were undertaken and recorded in a predesigned proforma. Ophthalmic examination in the form of visual acuity, refraction, and fundoscopy was performed in all participants. A screening test for hearing assessment was performed by Brainstem evoked response audiometry (BERA).

Cognition was evaluated by calculating the social quotient using the Vineland Social Maturity Scale for children younger than 6 years and intelligence quotient using Binet Kamat Scale for children older than 6 years.[36,37]

DQ (developmental quotient) was assessed using denver developmental scale II and neuroimaging was advised in all cases[34].

Data is entered and analysed by Epi-Info Version 7.3.3.1

The data is described in terms of frequencies and percentage of categorical variables.

Table1: Socio-demographic Distribution Of Cerebral Palsy Patients

FACTORS	NO OF SUBJECTS(n=78)	PERCENTAGE	
AGE DISTRIBUTION	1-3 yrs	39	50
	4-6 yrs	24	30.8
	7-9 yrs	11	14.1
	10-12 yrs	4	5.1
SEX	MALE	40	51.3
	FEMALE	38	48.7
CONSANGUINITY	YES	28	35.9
	NO	50	64.1
RESIDENCE	RURAL	24	30.8
	URBAN	54	69.2
MOTHER'S EDUCATION	UNEDUCATED	13	16.7
	PRIMARY SCHOOL	17	21.8
	MIDDLE SCHOOL	23	29.5
	SSC	16	20.5
	HSC	5	6.4
	GRADUATE	4	5.1
	POST GRADUATE	0	0

Results

Total 78 patients between 1yr to 12 years of age were enrolled for the study.

Most of the subjects 50 %(n=39) were between 1-3 years age group , followed by children between 4-6 years{30.8%(n=24)}. Age group Sex distribution among enrolled subjects was comparable with slight male preponderance (1.05:1). History of consanguinity was seen in 35.9 %(n=28) of subjects. 69.2% subjects were from urban area. Among enrolled subjects in 16.7% subject's mothers were uneducated, while in maximum 29.5% subjects mothers were educated till middle school. **(Table1)**

Among the enrolled subjects 96.1 %(n=75) of subjects were hospital delivered while 3.9 % subjects were home delivered.89.7 %(n=70) subjects were delivered through normal vaginal delivery while 10.2 % delivered through LSCS delivery.78.2 %(n=61) subjects were delivered term (37-42 weeks), while 21.8 % subjects were preterm (<37 weeks) delivered. 65.3 %(n=51) subjects required NICU admission. The most common etiological factor being birth asphyxia seen in 38.4 %(n=30) subjects followed by sepsis in 29.5% subjects (n=23)**(Table 2)**

Most common presenting complaint was delayed developmental milestones (n=63, 80.7%). Other common presenting complaints were developmental delay and cognitive problem (n=39,50%), seizures (n=18, 23%),behavioral problems (n=5,6.4%) and speech delay (n=3,3.8%).add (Table 3)

Most common type of cerebral palsy was spastic 87.1% followed by dyskinetic 10.2%. 2.6% subjects each were Ataxic and mixed type. Among the spastic CP quadriplegia was seen in maximum subjects (60.6% %) followed by spastic diplegia 27.3%%.Spastic hemiplegia was seen in 12.1%**(figure1).** Most of the participants were at GMFCS level IV and V (23.1% and 47.4% respectively) while GMFCS level III was seen in 15.4%(n=12) subjects.80% and 61.1% of quadriplegic CP and diplegic CP were at GMFCS level IV and V respectively, while only 25% of hemiplegic CP cases were at GMFCS LEVEL IV and V. **(Table 4)**

Majority of the subjects(n=61, 78.2%) had associated feeding problem. Epilepsy was seen in 43.6%(n=34) subjects, Other associated comorbidities were cognitive impairment seen in 50% of subjects, speech defects 35.9% and behavioral problems16.7%.Majority of our subjects had Microcephaly (69.2%) and malnutrition (74.3%).**(Table 5)**

All the patients of cerebral palsy had delayed developmental milestones, the overall mean DQ of all varieties of CP was 34.86% with fine motor DQ being 33.43±25.9, 30.97±25.8 for gross motor DQ, 35.14±29.3 for social DQ and 37.92 ±31 for language DQ**.**

Among 78 subjects MRI was advised to all but only 34.7 %(N=27) of subjects followed up with MRI report. Most common MRI finding was changes of periventricular white matter injury (44.4%). Other findings were agenesis of corpus callosum (11.1%), cortical and subcortical damage (14.8%), basal ganglia damage (7.4%), Other CNS malformations (11.1%), while MRI was normal in (7.4%) subjects. (**Figure 2**)

TABLE 2: List of etiological factors causing cerebral palsy

FACTORS		NO OF SUBJECTS (n=78)	PERCENTAGE
PLACE OF DELIVERY	HOSPITAL	75	96.1
	HOME	3	3.9
MODE OF DELIVERY	NORMAL VAGINAL	70	89.7
	LSCS	8	10.2
BIRTH MATURITY*	TERM	61	78.2
	PRETERM	17	21.8
CRIED AFTER BIRTH*	YES	48	61.5
	NO	30	38.4

ADMISSION TO NICU	YES	51	65.3
	NO	27	34.6
POST NATAL EVENTS	JAUNDICE	13	16.7
	SEIZURES	8	10.2
	HYPOGLYCEMIA	2	2.6
	MAS	5	6.4
	SEPSIS	23	29.5

***Data in above table is mutually inclusive**

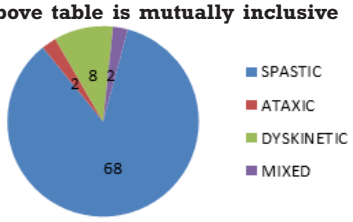


Figure 1: Types Of Cerebral Palsy

Discussion

The prevalence and pattern of CP differs between different geographical regions due to different etiological factors. European countries have reported a significant decrease in the prevalence and severity of CP subtypes and associated impairments, mostly due to advancements in obstetric and newborn care.

CP can affect both genders equally however, boys are affected slightly higher than girls. In this current study, 40 were boys and 38 were girls, with a ratio of 1.05:1. Male sex preponderance has been reported in a number of studies by Tatavarti *et al.*[9]Johnson[10]in Europe, Laisram *et al.* [11]and Das *et al.*[12]in India. The higher health-seeking behavior for males as compared to girls probably acts as an additional factor contributing to the higher male to female ratio in studies from India. Sex of a child is an important factor in health care–seeking behavior especially in rural areas, where sons are favored and more valued than in urban areas.[13]

Age of presentation to medical CGC clinic in our study was between 1-3yrs in 50% of cases. While 30% presented between 4-6 yrs of age group. Gowda *et al.* studied 100 children with CP at a tertiary care teaching hospital observed that age at presentation 1–4 years in 65% which is similar to our study.[14]

History of Consanguinity was present in 35.9% of subjects, consanguineous marriage is now supposed to be one of the factors of congenital cerebral palsy. A study conducted in Saudi Arabia reported 2.5 fold increase in occurrence of CP in consanguineous families [15,16]

In our study maximum number of subjects were from urban area i.e.69.2%, this may be due to lack of awareness of the disease in rural population and maybe due to stigma associated with public appearance of children with CP which could result in under reporting of cases from rural area. In majority of cases (30%) mother were educated only up to middle school, this could be one of the reasons for higher levels of motor disabilities among enrolled subjects and less reporting of cases from rural areas.

Table 3: Presenting Complains in Cerebral Palsy Patients

Presenting complain	No. of subjects(n=78)	Percentage
Developmental delay	63	80.7
Developmental Delay and cognitive problems	39	50
seizures	18	23
speech Delay	3	3.8
Isolated Motor delay	3	3.8
Behavioral problems	5	6.4

Data in above table is mutually inclusive.

In our study 89.7% cases were born by normal delivery, 61.5% had delayed cry after birth and 65.3% cases required admission in N.I.C.U. This is similar to Indian studies done by Sharma et al, Anwar S et al, and Singhi et al. [17,18,19]Torfs et al, Blair et al, Sharma et al, Suanand et al and others found similar higher risk up to 53 % of CP in Birth asphyxia. Majority of them were patients of spastic quadriplegia (87%). 12 (15.3%) patients were having documentary evidence of hypoxic ischemic encephalopathy.[20, 21, 22].On analysis of various postnatal factors neonatal sepsis was single most common factor in 29.5% of patients followed by jaundice in16.7%, seizures in 10.2% and hypoglycemia in 2.6 % .Singhi et al in his study reported neonatal sepsis in 30.6% and neonatal jaundice in 35.1%.[2]

In present study, majority (87%) of the children had spastic CP, of which 58% were quadriplegic and 27% diplegic. Singhi *et al.* in 2002, in a study from North India, reported quadriplegic spastic CP in 61% and diplegic CP in 20% of the total CP children.[23] In another study in 2013, Singhi *et al.* reported 51.5% spastic quadriplegia and 34.5% diplegia.[2] Das *et al.* reported 43% spastic quadriplegia and 12% spastic diplegia, Gowda *et al.* reported 71% spastic quadriplegia and 16% spastic diplegia.[12, 24, 25] Hence, our results are consistent with all these Indian studies**.** The probable explanations of this finding might be more hospital delivery rate (96.1% hospital delivery in our cases. On the other hand most of the European countries have over the past three decades observed shifts in the types of CP manifestations with decreasing incidence of spastic quadriplegia as a result of improved perinatal care and better equipped newborn intensive care units. Hagberg *et al.* in a study of 216 children of CP from Sweden, born between 1987 and 1990, observed that hemiplegic, diplegic, and tetraplegic syndromes accounted for 22%, 66%, and 7% of preterm's and 44%, 29%, and 10% of term children.[26]

80.7% patients presented with developmental delay while 50% cases among this also had cognitive problem, 3.8% of patients also present with isolated motor and language delay each**.** These results were correlating with the DQ(developmental quotient) of the cases with average DQ being 34.86% with most delay seen in motor milestone(30.97%), These results were consistent with study done by Sharma et al[17]**.**

In present study 69.2 %(54) children had Microcephaly. Similar incidence of 50%-75% is seen in other studies.[27] some of the easily preventable causes of microcephaly are maternal infections ,severe malnutrition, exposure to drug and alcohol.

Table 4: Distribution of GMFCS levels in relation to CP subtypes

GMFCS Level	Spastic quadriplegic	Spastic hemiplegic	Spastic diplegic	Dyskinetic	Ataxic	Mixed	Total
I	1(2.5%)	2(25%)	1(5.5%)	0	0	0	4(5.1%)
Ii	5(12.5%)	2(25%)	0	0	0	0	7(9%)
Iii	2(5%)	2(25%)	6(33.3%)	0	2(100%)	0	12(15.4%)
Iv	12(30%)	0	3(16.6%)	3(37.5%)	0	0	18(23.1%)
V	20(50%)	2(25%)	8(44.4%)	5(62.5%)	0	2(100%)	37(47.4%)
Total	40	8	18	8	2	2	78(100%)

Epilepsy was present in 43.6% of cases. The reported incidence of epilepsy in CP in literature varies from 30% (Hagberg et al. 1996[26]) to 70% (Stanley et al. 1993)[28].Singhi et al.[2] in various studies reported epilepsy to be present in 32%–35.4% children with CP.[29] similar to recently published study and is consistent with most of the world-wide studies (30%-50%).[27]

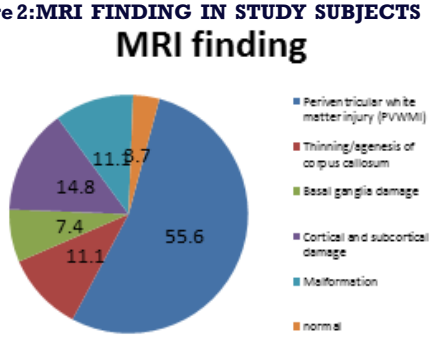
Other significant finding were cognitive impairment in 50% and language problem seen in 35.9% subjects, visual problem in 6.4%,hearing loss in 1.3% subjects. Srivatava et al[11] in his study reported speech defects in 35.9%, visual and hearing impairment in 9.1% 2.94% cases respectively while Sharma et al[17] reported speech defect in 53.5% and ocular defect in 35.8% cases. Speech defect in cp are multifactorial in origin like due to impaired hearing, cortical damage, incordination or paresis. Although it is difficult to exactly delineate association of these factors in the present study.

In present study 6.4% cases presented with behavioral problems but on further evaluation Behavioral problems like hyperactivity, restlessness, temper tantrum was seen in16.7%,which is higher than those observed by Kumar et al[6] in which it was seen in 8.5% of cases, and Das n et al[12] in which it was seen in 7% of cases.

Feeding difficulties reported were difficulties in chewing and/or swallowing, excessive drooling, and recurrent vomiting seen in 78.1% cases. Gangil A et al[30] reported an incidence of feeding problems in 50% of children with CP (chewing difficulty in 11% and swallowing problems in 19% and drooling in 20%).

In our study 80% of quadriplegic CP were at GMFCS level IV and V, while in diplegic cp 61.1% cases were been at GMFCS level IV and V. While among hemiplegic CP only 25% cases were at GMFCS level IV and V. These findings are similar to a study done by Sharma R et al[31] (2015) in which 29.6% of hemiplegic CP, 75% of quadriplegic CP were represented at level V. while Gotter et al found 3.3% with hemiplegia and 46% with quadriplegia were at level V of GMFCS. Except for hemiplegic children, GMFCS level V constituted the majority in all categories of topographical and motor impairment classification. Kulak et al[32] reported in their study, most of spastic diplegics were in level II and III, while in a Turkish study most of them were in level III and IV while in our study most of diplegic were in level IV and V.

Figure 2:MRI FINDING IN STUDY SUBJECTS



American Academy of Neurology recommended neuroimaging in all cases of CP to decide severity of injury and define etiology, predict pattern, and timing of injury, we attempted neuroimaging in all patients but 51 cases did not come for follow-up with reports. Similar to previous studies, imaging abnormalities were detected in 97.4% of our patients. The most common abnormalities were periventricular white matter injury (PVWMI), cerebral atrophy and encephalomalacia, patterns known to be associated with perinatal HIE in term neonates. Although periventricular white matter injury is the classical finding in preterm brain resulting from ischemia in watershed zones our finding are in accordance with a study done by Prasahnt Jauhari et al[19].Also in a systematic review conducted by Krägeloh-Mann and Horber, the frequency of PVWMI was found to be as high as 56%.[24]

CP is a common condition seen in developing countries and less knowledge is available about it in these countries; thus this study gives a perspective for CP in countries like India. This study focuses on etiological factors, presenting complains, associated disabilities of CP also; thus, it helps understand the correlation of severity of motor disabilities and its type with other comorbidities.

This study was carried out on 78 children with CP. Though the study has conveyed us many important information, major drawback of this study was small sample size if the study had been conducted on more number of children, it could have given us more information. This was a retrospective cross-sectional study hence the cases were not followed up over time and the course of disease and progression of various disabilities cannot be commented upon.

TABLE 5: Associated Comorbidities With Cerebral Palsy

Associated problem	No of subjects (n=78)	Percentage
Seizures	34	43.6
Intellectual disability	39	50
Speech defects	28	35.9
Behavioural problems	13	16.7
Feeding problems	61	78.2
Cortical visual problems	5	6.4
Sensorineural hearing loss	1	1.3
Microcephaly	54	69.2
Malnutrition	58	74.3

The clinical spectrum of CP in India differs from that of foreign countries due to differences in perinatal and postnatal morbidities such as septicemia, birth asphyxia, bilirubin encephalopathy, and hypoglycemia. Furthermore, the percentage of children who have undergone visual and hearing assessment and undergoing rehabilitation is quite low. Initiation of timely management and appropriate diagnosis should be ensured to decrease the incidence of CP and associated disabilities in the future. Rehabilitation clinics should be set up for CP patients at every government medical college to spread awareness in parents about the disease, handicaps, prognosis, and management.

CONCLUSION

In this era of changing world and artificial intelligence, we should think of developing a National CP population register in India to fill the knowledge gap, facilitate care, and management of these children. Medical college hospitals, where a number of these children report with their various problems, can play a central role as nodal centers for evaluation and registration of such patients. This will help in estimating prevalence and help in infrastructure development to improve care of CP patients in India. Efforts should be made to make Parent of CP children aware of the disease process, associated diabilities, and the management such as physiotherapy, visual aid, hearing aid, and treatment of other comorbidities.

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