

Study of clinico-etiological profile and associated co-morbidities in cerebral palsy children

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Abstract

Background: Cerebral palsy is the most common developmental disability seen in pediatric age group. Cerebral Palsy is primarily a disorder of movement and posture. **Aim:** To study the etiology, clinical profile and associated co-morbidities in Cerebral Palsy patients. **Materials and Methods:** All the Cerebral Palsy patients admitted or attending pediatric department aged 6months to 15 years were included in study. A detailed history was taken, neurological examination was done. Screening for co-morbidities was done. **Results:** Majority of patients (48.33%) were 13 months- 5 years of age group. Delayed milestones were the main presenting symptom, which was present in 100% of patients. Birth asphyxia is being the most common high risk factor for CP, accounting for 53.33%. Microcephaly and Mental Retardation (intellectual disability) were the commonest comorbidity seen in 83.33% of cases. Quadriplegic CP was the commonest spastic type seen in 64.58% of cases. Periventricular leukomalacia was the commonest MRI abnormality seen in 35% of patients. **Conclusion:** Cerebral palsy is the most common developmental disability seen in children. Maximum number of CP patients presented between 1-5 year of age group. Birth asphyxia and prematurity were the commonest high risk and etiological factors. Epilepsy, Microcephaly and Intellectual disability were the most common comorbid conditions. **Key Words:** Cerebral Palsy, Convulsions, Birth Asphyxia, Developmental Delay.

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INTRODUCTION

Cerebral palsy (CP) is the most common developmental disability seen in pediatric age group. It is primarily a disorder of movement and posture.¹ CP develops when the areas of brain that control movement and posture do not develop correctly or get damaged. It is often associated with epilepsy and abnormality of speech, vision, intellect etc. Clinical spectrum and etiology of CP is different in developing and developed countries.² In developing countries like India, researchers found birth asphyxia in higher proportion as a cause than developed countries. Acquired causes of like kernicterus, postnatal infection,

acute meningitis, neonatal seizures, and hypoglycemia contributed to significant portion of CP in developed countries.³ CP is not an independent disease, but a syndrome associated with various etiologies affecting the central nervous system. The etiology of CP is very diverse and multifactorial and a common lifelong developmental disability. It is more prevalent in deprived socioeconomic populations. The causes are congenital, genetic, inflammatory, infection, anoxic, traumatic and metabolic. The injury to the developing brain may be prenatal, natal or postnatal.⁴ We have conducted this study, as very few studies have been done in developing countries to find out the possible etiological and high risk factors, clinical comorbidities in CP patients.

MATERIAL AND METHODS

This was a prospective cross-sectional study comprising of 60 Cerebral Palsy children over a period of 2 years at Bharati Hospital, Sangli. All children presenting with clinical symptoms suggestive of cerebral palsy were evaluated in detail in hospital IPD basis. The approval from Institutional Ethical Committee was obtained for this study. A detailed history including

antenatal, intranatal, postnatal, developmental history and obstetric history of mothers especially of birth asphyxia and prolonged labour review of developmental milestones, and a thorough neurological examination and observation of the child in various position such as supine, prone, sitting, standing, walking and running was made. Present history and symptoms of past history related with abnormality were taken. Findings were correlated on reconstructed proforma with special emphasis on developmental profile and developmental quotient. Necessary investigations like EEG, MRI, OAE/BERA etc. was done in all patients. IQ, DQ and behavioral problems like ADHD was assessed by clinical psychologist. Hearing assessment was done by audiologist with OAE and BERA. CP was classified based on the type of neuromuscular deficit into (1) spastic (2) Dyskinetic (3) Ataxic (4) Hypotonic and (5) Mixed. Further classification was done based on topographical classification. Complete evaluation of a child with CP included as assessment of associated co-morbidities such as vision, speech and hearing, oromotor evaluation, epilepsy and cognitive functioning, orthopedic evaluation and psychiatric assessment. All relevant data was filled into Microsoft Excel. The analysis was done with the help of MS Excel.

RESULTS

A clinical study with 60 patients with cerebral palsy was undertaken to study the clinical profile of patients. In this study majority of the patients (48.33%) were 13 months-5 years of age group followed by 6th year-10th year (25%), 11th year-16th year (16.66%) and 6 months-12 months (10%). Study showed male predominance(60%). It was found that 65% patients were from non-consanguineous marriage and 35% from consanguineous marriage.

Table 1: Presenting symptoms of CP patients

Symptoms	No. of patients	Percentage (%)
Delayed milestones	60	100%
Convulsions	31	51.66%
Feeding difficulties	29	48.33%
Acute febrile illness	16	26.66%
Acute watery diarrhoea	04	06.66%
Lower respiratory tract infection	04	06.66%
Vomiting	02	03.33%

Delayed milestones were the main presenting symptom, which was present in 100% of patients. Convulsions were present in 51.66% of patients followed by acute febrile illness in 26.66% (Table 1). In our study, 22 (36.66%) babies were preterm, 34 (56.66%) were term and post maturity was seen in 4 (6.66%) of CP patients. Out of 22 (36.66%) preterm babies, 15 (68.88%) were below 32 weeks and 7 (31.81%) were between 32-37 completed weeks.

Table 2: Causes in CP in children

Causes	No. of patients	Percentage (%)
Kernicterus	06	10.00%
Sepsis	05	08.33%
Structural malformation	03	05.00%
Persistent hypoglycaemia	02	03.33%

Out of 60 patients, kernicterus and sepsis were seen in 10% and 8.33% of cases respectively (Table 2).

Table 3: High risk factors/ probable causes for development of CP in children

High Risk Factors	No. of patients	Percentage (%)
Birth asphyxia	32	53.33%
Low birth weight	29	48.33%
Premature	22	36.66%
IUGR	07	11.66%
Oligohydramnios	07	11.66%
PIH	06	10.00%
Non progress of labour	04	06.66%
Forceps delivery	03	05.00%
Others	03	05.00%
Antepartum haemorrhage	02	03.33%
PPROM	02	03.33%
TORCH	01	01.66%

Birth asphyxia was observed as the most common high risk factor for CP, accounting for 53.33%. Low birth weight and prematurity were accounted for 48.33% and 36.66% respectively (Table 3). Microcephaly and mental retardation (intellectual disability) were the commonest co-morbidity seen in 83.33% of cases followed by epilepsy (51.66%), feeding difficulties (48.33%), visual defects were seen in 43.33% of cases in our study, of which non paralytic squint in 46.15% followed by blindness (optic atrophy) were seen in 38.46%. Corneal ulcer was seen in one patient. Hearing defects were found in 33.33% of cases, of which severe sensory neural deafness was found in 20% of cases. Speech abnormality and behavioural disorders were seen in 30% of cases. Dental caries and constipation were the other general comorbidities found in 25% and 23.33% of cases.

Table 4: Associated co-morbidities in CP children

Associated Defects	No. of Patients	Percentage (%)
Microcephaly	50	83.33%
Intellectual disability	50	83.33%
Epilepsy	31	51.66%
Visual defects	26	43.33%
Auditory defects	20	33.33%
Speech defects	18	30.0%
Behavioural disorder	18	30.0%
Dental caries	15	25.0%
Constipation	14	23.33%
Others	06	10.0%

Spastic CP was the commonest type of CP, seen in 76.66% of patients in our study. This was followed by dyskinetic CP (16.66%), ataxic CP (3.33%) and mixed variety was seen in (3.33%) of cases.

Table 5: Topographical classification of spastic cerebral palsy

Topographic Type	No. of patients (N=48)	Percentage (%)
Quadriplegic	31	64.58%
Diplegic	12	25.00%
Hemiplegic	05	10.41%

In topographical classification of Spastic CP, quadriplegic CP was the commonest spastic type seen in 64.58% of cases. Diplegic CP was seen in 25% of cases followed by hemiplegic CP seen in 10.41% of cases.

Table 6: MRI findings of cerebral palsy children

MRI findings	No. of patients (n=60)	Percentage (%)
Periventricular leukomalacia	21	35%
Cerebral atrophy	15	25%
Multifocal cystic encephalomalacia	10	16.66%
Infarcts (MCA territory)	05	8.33%
Structural brain malformation	03	5%
Porencephalic cyst	03	5%
Normal	03	5%

Periventricular leukomalacia was the commonest MRI abnormality seen in 35% of patients, followed by diffuse cortical atrophy seen in 25% and multifocal cystic encephalomalacia seen in 16.66% of cases. MCI territory infarcts was seen in 8.33% of cases. Structural malformation of brain in the form of lissencephaly and scizencephaly were seen 5% of cases. Porencephalic cyst was seen in 5% of cases.

DISCUSSION

Cerebral palsy is a commonest cause of physical and mental disability in children. Despite many studies done in this field in many cases, cause remains unknown. Birth asphyxia is still a leading cause of cerebral palsy in term babies of developing countries like India. Children with Quadriplegic CP and Hypotonic CP are associated with higher frequencies of comorbidities and cognitive dysfunction. This study aimed at highlighting some of the major clinical presentation and etiological risk factors which may help in forming the action plan for reducing the disease burden in India. In our study 35% CP patients were born to 2nd degree and 3rd degree consanguineous married couple and 65% didn't have any history of consanguinity. It has been found that CP is found in higher frequency in children born with history of consanguinity. Inborn errors of metabolism like phenylketonuria, hyperglycemia which are autosomal recessive disorders are seen more frequently in consanguineous marriages. In the study done by Bangash AS *et al*, history of consanguinity was found in 50% of the patients.⁵ Similar results were observed in study done by Hai MSBA *et al*.⁶ In his study there was 2.5 times more chance of developing CP among the parents who

had consanguineous marriage history. Consanguineous marriage and lack of antenatal care were community related risk factors which were more commonly seen in Muslim population and South Indian states. In present study, delayed milestones was the commonest presenting symptom seen in 100% cases. Convulsions, feeding difficulties were seen in 51.66% and 48.33% of patients. Feeding difficulties were more commonly seen in spastic quadriplegic and hypotonic CP babies. The reason may be oro-motor dysfunction and pseudobulbar palsy, which leads to swallowing difficulties. Similar results were observed in the study done by Gedam DS *et al* and AlAsmari *et al*.^{7,8} In study done by Gedam *et al* developmental delay was seen in 98% of patients, convulsions 36%, feeding difficulties 38% and speech defects were seen in 34%.⁷ The above results are matching with our study. Multiple factors which were acting at prenatal, antenatal, intranatal and postnatal were responsible for development of cerebral palsy. It is very difficult to directly correlate one to one casual effect with development of cerebral palsy. In most of our cases more than one high risk factors were responsible or contributing for the development of cerebral palsy. In our study it was found that gestational age was the most important factor which contributed for the development of CP. Neonate survivors born before 33 weeks were 30 times more likely to risk of CP than the babies born at term. With increase in number of preterm newborn in the recent era, the incidence of diplegic CP has been showed gradual increasing curve. Post term and IUGR babies are more susceptible for intrapartum and postpartum asphyxia, which intern lead to long term neurological sequelae in the form of CP. In post-natal conditions kernicterus and sepsis were seen in 10% and 8.33% of cases. Similar results were observed in the study done by Gedam *et al*.⁷ In his study sepsis accounted for 8% of cases, neonatal seizures in 10% of cases and kernicterus in 8% of cases. From the above data it was found that many etiological or high risk factors were overleaping and many patients were having more than on etiological factors. Birth asphyxia was found with highest frequency that is 53.33% followed by prematurity seen in 36.66%. The reasons responsible for high incidence of birth asphyxia in our study were lack of antenatal care in developing countries like India, put mother and unborn baby to many antenatal, intranatal and postnatal complications and thereby increasing the risk of cerebral palsy. In our study the factors that were found antenatally and intranatally which were contributory are oligohydrammios, IUGR, non-progression of labour, instrumental delivery, antepartum haemorrhage and PIH. Similar results were observed in the study done by Gedam DS *et al* in which birth asphyxia contributed for

48% and prematurity contributed for 22%.⁷The above results were correlating with our study. Similar results were also seen in other studies done by Al Asmari *et al*⁸ and Frank-Briggs *et al* in which birth asphyxia was responsible for 27.94%, Kernicterus 26.26% and CNS infections 15.95%.⁹ In our study, 48.33% of the babies were low birth weight, of which 36.66% were preterm babies and 11.66% belongs to IUGR group. There is significant association between LBW and cerebral palsy, which has been proved in various western studies. This is mainly because of survival of LBW babies due to availability of advanced premature care which indirectly increases the risk of CP. In the study done by Bangash AS *et al*, 25% babies were LBW.⁵ 22% of the babies were LBW in the study done by Gedam DS *et al*.⁷ Co-morbid conditions form the important presenting group of defects associated with cerebral palsy. Microcephaly and mental Retardation (intellectual disability) were the commonest comorbidity seen in 83.33% of cases. Most of the cases seen in our study were of secondary microcephaly. The most probable reason that can be given is the percentage of quadriplegic CP found in our study was around 64.58% and mixed CP 3.33%. Dental caries was found in higher incidence in our study because of feeding problem seen in Quadriplegic CP. Speech and language disorder were seen in 30% of children of our study. Dysarthria and aphasia were the commonest speech disorders were seen in our study. Speech problems are usually associated with poor respiratory control, laryngeal and velopharyngeal dysfunction as well as oral articulation disorders that are due to restricted movements in the oral-facial muscles. Speech problems were seen in 47% of patients in the study done by Soleimani F *et al*.¹⁰ Epilepsy was the third commonest comorbidity seen in 51.66% of CP children in our study. Primary generalised epilepsy was the commonest type seen in our study followed by bifocal epilepsy and myoclonic epilepsy. Similar results were observed in the study done by Soleimani F *et al*,¹⁰ Gedam DS *et al*⁷ and Venkateshwaran *et al*.¹¹ In the study of Gedam DS *et al* microcephaly was seen in 53% of patients followed by epilepsy (36%) and speech defects (34%). Auditory defects were seen in 8% of cases. Very low incidence of visual defects (4%) was seen in his study.⁷ In the study done by Venkateshwaran *et al*, microcephaly was seen in 58.7% of cases, epilepsy in 46.7% of cases. Visual abnormalities were found with very high frequency (79.5%), exact reason for this high incidence was not known. Feeding abnormalities was seen in 33.33% of cases.¹¹ Similar results were observed in our study. Very few reports are available on Neuroimaging abnormalities in CP patients from India. In our study MRI with 1.2 Tesla, was done in all 60 CP patients. In our study MRI abnormalities were seen in

95% of the patients. Periventricular leukomalacia was the commonest MRI abnormality seen in 35% of patients, followed by diffuse cortical atrophy seen in 25% and multifocal cystic encephalomalacia seen in 16.66% of cases. MCI territory infarcts was seen in 8.33% of cases. Structural malformation of brain in the form of Lissencephaly and Scizencephaly were seen 5% of cases. Porencephalic cyst was seen in 5% of cases. In the study done by Gedam DS *et al*, MRI abnormalities were visible in 66% of children. Similar results were observed in the study done by Martin *et al*. In this study, PVL was the commonest lesion seen in 42.5% of patients. Focal infarcts were seen in 7.4% of cases and diffuse cortical atrophy was seen in 9.4% of cases. In this study high incidence of brain malformations was seen in 9.1% of cases. The common MRI abnormalities seen in quadriplegic CP in our study, were multifocal cystic encephalomalacia and diffuse cortical atrophy. PVL finding was matching with the prematurity incidence of our study, which is the commonest MRI finding in preterm babies. So MRI scan not only help us to reveal the pathological basis of cerebral palsy, but also, the findings have strong correlation with clinical presentation. This may be useful in helping parents, clinicians and others who are involved in the care of CP patients to understand the nature of child's condition and to predict their need in the future.

CONCLUSION

Cerebral palsy is the most common developmental disability seen in children. Birth asphyxia and prematurity were the commonest high risk and etiological factors seen in our study. Lack of proper antenatal care, delivery in a non-hospital setting, inadequate neonatal care at birth and neonatal infections were the major factors contributing towards development of cerebral palsy. Co-morbidities were the main admission cause and it correlates with the severity of CP and also with prognosis. Early intervention in the form of physiotherapy, stimulation exercises, use of appropriate postures in early infancy, when the child is still in developing CP phase will be of real help in decreasing the morbidity and other complications.

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