



EXPLORING THE DISTRIBUTION OF MOTOR TYPES IN CEREBRAL PALSY: A RETROSPECTIVE STUDY

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ABSTRACT

Purpose: The study is to compare the distribution of types of motor disorder in children with cerebral palsy, reporting to Physiotherapy unit of tertiary care hospital with the established trends of motor type distribution and to describe clinical parameters associated with these children. **Methodology:** This is the retrospective study conducted in tertiary care hospital in which the data from last five years (2015-2020) was analysed with respect to demographic characteristics along with distribution of motor impairment, type of Cerebral palsy, topographic classification of Cerebral palsy, birth weight, birth cry, birth history, type of delivery of their mothers, family history and Gross motor function classification status. The proportion of each motor types are been calculated and is being compared with the data extracted from the previously published literature. Other parameters are also being analysed. **Result:** The findings of the study contribute to the understanding of distribution of subtypes of Cerebral palsy along with motor impairments and it showed that most of the patients with Spastic Diplegic Cerebral palsy (65.71%) and GMFMC level IV (45.71%) are commonly seen. **Conclusion:** The study found the information regarding the distribution of motor types of cerebral palsy in Ahmednagar city. The study concludes that highest prevalence of Spastic Diplegic Cerebral palsy was found relative to prematurity, low birth weight, delayed birth cry and GMFMC level IV.

KEYWORDS : Cerebral palsy, prevalence, Motor type, Topographical classification.

I. INTRODUCTION

Cerebral palsy is the most common cause of serious motor impairment in young children. It is a group of permanent disorders of the development of the movement and posture which causes activity limitation that is attributed to non-disturbances that occurs in developing infant brain.¹ The motor disorders of cerebral palsy are often accompanied by disturbances of sensation, perception, cognition, communication, behaviour, epilepsy and by secondary musculoskeletal problems. There are many causes of the brain damage which includes abnormal development of the brain, anoxia, intracranial bleeding, excessive neonatal asphyxia, trauma, hypoglycaemia and virus and other infections.² The causes of Cerebral Palsy take place in prenatal, perinatal, and postnatal periods.

Topographically cerebral palsy is classified as Monoplegia, Diplegia, Hemiplegia and Quadriplegia and the motor types of cerebral palsy are further classified as spastic types, athetoid (Dyskinetic) types and ataxic type. There is a hypotonic type which either becomes a spastic, athetoid or ataxic type.^{2,3}

It affects 1.5 to 3 children per 1000 live births, and children who were born preterm and those of multiple pregnancies are especially prone to develop this disability.³ As the time passes the prevalence of cerebral palsy rate also changes. According to previous studies, they have shown that an increase in prevalence of Cerebral palsy mainly in the children who are born pre term during the last decades of the 20th century.⁴

According to the previous studies, 50% of the children born after full term pregnancy also had delayed birth cry which occur due to birth asphyxia or other causes of acute brain injury occurring around the time of birth are considered to be responsible for the development of Cerebral palsy.⁵

One of the survey, describing problems in Cerebral palsy reported that, 77% of Cerebral palsy children were having problems with spasticity, 80% had contractures and 18% had pain. The increase in muscle tone is responsible for relative failure of muscle growth and may produce functional problems.^{5,6}

The aim of this study is to compare the distribution of types of motor disorder in children with cerebral palsy, reporting to Physiotherapy unit of the hospital with the established trends of motor type distribution and to describe clinical parameters associated with these children.

II. METHODOLOGY

This study is conducted in Dr. Vitthalrao Vikhe Patil Medical Hospital, Ahmednagar, India and data is collected from Physiotherapy department as well as Cerebral palsy centre situated in the Ahmednagar city. The children age ranged from 1 year to 15 years diagnosed with cerebral palsy are included in the study. The children diagnosed according to monoplegia, diplegia, hemiplegia and quadriplegia cerebral palsy and also depending on the motor type that is spastic, dystonic and ataxic cerebral palsy were screened. The data of the children are obtained on their demographic features which included birth weight, birth cry was present immediately or delayed, then type of delivery of their mothers whether it was normal delivery or caesarean section, blood group of the mother and baby, family history and depending upon their Gross motor function classification status.

The subtype of cerebral palsy is classified according to the topographic classification and type that are spastic-quadruplegic cerebral palsy which results in involvement of all four limbs with greater spasticity in the upper extremities, spastic-hemiplegic cerebral palsy in which spasticity is restricted to one side of the body with relative variable involvement of the upper and lower extremity, spastic-diplegic cerebral palsy which leads to involvement of lower extremities, dyskinetic cerebral palsy which includes athetosis, chorea, or dystonia and ataxic-hypotonic cerebral palsy.

Gestational age is divided into the following categories: preterm birth - between 28- and 36-weeks gestation; and term birth - at least 37 weeks gestation.⁷ Prenatal referred to the period of pregnancy until the onset of labour resulting in delivery, perinatal to the period from the onset of labour until the seventh day of life, neonatal to the period up to day 28 and postnatal to the period from day 29 to 2 years of age. Birthweight is divided into three categories: less than 1.5 kg,

1.5 kg to 2.5 kg and 2.5 kg or more.⁹

Gross motor abilities were classified using the Gross Motor Function Classification System (GMFCS) at the time of examination. The GMFCS has five levels and they are classified as follows children in levels I and II walk without difficulties or with mild support, children in level III can walk with moderate support, whereas children in levels IV and V are not able to walk. We grouped the children as follows; children at GMFCS levels I and II (mild motor impairment) are merged into one group, children at level III are kept in one group, and children at levels IV and V (major motor impairment) are merged into one group.^{8,16}

III. RESULTS AND DISCUSSION

Table 1 – Distribution depending on topographic classification

	Number	%
Monoplegia CP	NIL	NIL
Diplegia CP	17	48.57
Hemiplegia CP	2	5.71
Quadriplegia CP	16	45.71

Table 2 – Distribution depending on motor type

	Number	%
Spastic CP	23	65.71
Dystonic CP	11	31.42
Hypotonic CP	1	2.85

Table 3 - Distribution depending on birth weight

	Number	%
< 1.5 kg	4	11.42
1.5-2.5 kg	23	65.71
> 2.5 kg	6	17.14

Table 4 – Distribution depending on Birth history

	Number	%
Preterm (28-36 weeks)	20	57.14
Term (> 37 weeks)	15	42.85

Table 5 – Distribution depending on Type of delivery

	Number	%
Normal delivery	22	62.85
Caesarean section	13	37.14

Table 6 – Distribution depending on Birth cry

	Number	%
Immediate	10	28.57
Delayed	25	71.42

Table 7 – Distribution depending on GMFMCS level

	Number	%
Level I & II	9	25.71
Level III	7	20
Level IV	16	45.71
Level V	2	5.71

In this study we observed significant changes over time in the characteristics of Cerebral palsy. When data from 35 individual Cerebral palsy registries were reviewed and summarized, the results from the population-based register shows each of the comorbidities evaluated in cerebral palsy patients. The patients distributed according to the topographic classification results indicated as Diplegic CP (48.57%), Quadriplegic CP (45.71%) and Hemiplegic CP (5.71%).

Depending on the distribution of motor type there were Spastic CP (65.71%), Dystonic CP (31.42%) and Hypotonic CP (2.85%). Depending upon the birth weight the large number of patients identified in between 1.5 kg to 2.5 kg (65.71%), then more than 2.5 kg (17.14%) and less than 1.5 kg (11.42%).

The distribution depending birth history there was observed that most of the patients born preterm (57.14%) are common

cause of Cerebral palsy. The distribution depending upon type of delivery are normal delivery (62.85%) and Caesarean section (37.14%). According to birth cry there were large number of Cerebral palsy patients who had delayed cry (71.42%) and immediate cry (28.57).

According to distribution depending on GMFMCS level, Level II (25.71%), Level III (20%), Level IV (45.71%) and Level V (5.71%). It is clear that there have been important discrepancies in different types of CP. According to this study the result shows that most of the patients with Spastic Diplegic Cerebral palsy and GMFM level IV are commonly seen.

The Spastic Cerebral palsy is most common type accounting for up to 75% of cases. It is caused by brain abnormality or damage. In many cases, it occurs due to brain damage during or around the time of birth the most common reason for this type of Cerebral palsy is babies born prematurely and with low birth weight.⁹ This condition prevents the normal development of motor function.

According to Thorkelsson et al, their study indicated that gestational age and birthweight are important determinants of Cerebral palsy rate because the prevalence increased significantly with decreasing gestational age and birthweight. The gestational age is more reliable determinant of disability than birthweight.¹⁰

Several studies suggest that a brain insult which occurs in the antenatal period is usually the main cause of Cerebral palsy, especially among the preterm infants. An intraventricular haemorrhage is the single most common brain pathology seen in preterm infants, but white matter damage is the most common cause of Cerebral palsy in these infants.¹¹ Cerebral palsy is a clinical presentation of a wide variety of cerebral cortical or subcortical insults occurring during first year of life. The vulnerable brain is harmed during a critical period of development, primarily by known CNS complications of prematurity such as periventricular leukomalacia. In the MRI investigations it has showed that the periventricular leukomalacia is most commonly seen in Spastic diplegic patient as compared to other type of cerebral palsy, so it can be one of the reasons that the spastic diplegic is most common type of cerebral palsy.¹³

According to results of our study, dystonia is also one of the leading motor types in cerebral palsy now a days. Dystonia is frequently overlooked element of neurological presentation of cerebral palsy as compare to other two motor types that are spastic and hypotonic cerebral palsy. In dystonic cerebral palsy the injury or problem is in an area of basal ganglia of the brain that is responsible for getting messages about movement from the brain to the muscles which could be due to jaundice and the seizures occurred after the birth.¹⁵

In our study we found that there were (71.42%) patients who didn't cry immediately after birth due to accidents which could be a result of knotted umbilical cord, cord around the neck or prolapsed cord also multiple delivery of second or third infant that cause asphyxia to the brain. Asphyxia mainly refers to interruption of blood flow to placenta which leads to hypoxia, ischemia and neonatal seizures which causes permanent damage to the brain, which is mostly seen in the patients with cerebral palsy.^{13,16}

A study done by Shevell et al, the results in this study showed that there were large number of children abide in GMFMCS level IV, as well as the results of our study also showed that diagnosis of Spastic diplegic cerebral palsy is most commonly seen in this area although the severity of involvement and functional limitation varied widely so the children with level IV (45.71%) are in highest proportion in this

study.^{6,19} Further, it could be due to early possible diagnosis, treatment and the awareness of the parents the children reside in level IV of GMFMCS.

IV. CONCLUSION

This retrospective study profound the information regarding the distribution of motor types of cerebral palsy in Ahmednagar city. The study included highest prevalence of Spastic Diplegic Cerebral palsy were found relative to prematurity, low birth weight, delayed birth cry and GMFMCS level IV.

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Disclosure of Interest:

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