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Original Research

TOPOGRAPHIC PROFILE OF CEREBRAL PALSY IN POST BIRTH ASPHYXIA CHILDREN AT RANI CHANDRAMANI DEVI GOVERNMENT HOSPITAL VISAKHAPATNAM

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Abstract:

Background: Cerebral pal sy (CP) poses significant challenges in understanding its diverse manifestations and associated factors, particularly in resource-limited settings.

Objective: This study aims to comprehensively investigate the demographic profile, topographical classifications, risk factors, and comorbidities among children with CP in a tertiary hospital.

Methodology: A hospital-based cross-sectional descriptive study was conducted, enrolling children with CP, adhering to the Rosenbaum et al. definition. Demographic data, topographical classifications, and risk factors were collected through detailed history, physical examinations, and consultations with specialists. Comorbidities were assessed clinically and through relevant investigations. The Gross Motor Function Classification System (GMFCS) was employed for functional classification. Data were analyzed using SPSS 17.0.

Results: Out of 115 enrolled children, the majority were male (73.91%), with 76.52% aged 5 years or below. Quadriplegia (44.62%) and diplegia (35.38%) were prominent topographical classifications. Perinatal factors, such as perinatal asphyxia and prematurity, were prevalent risk factors (64.54%). Comorbidities included visual problems (20.50%), hearing problems (28.87%), malnutrition (40.22%), feeding problems (51.44%), speech problems (52.32%), and epilepsy (58.34%).

Conclusion: This study reveals the complex landscape of CP, emphasizing the importance of understanding topographical classifications, recognizing pivotal risk factors, and addressing prevalent comorbidities. The findings offer insights for tailored interventions, preventive strategies, and multidisciplinary care approaches, especially in resource-limited settings. Further research is warranted to explore unidentified risk factors and validate these findings across diverse populations.

Keywords: Cerebral palsy, Demographics, Topographical classification, Risk factors, Comorbidities, Pediatric neurology, Resource-limited settings.

Introduction

Cerebral Palsy (CP) poses a significant health challenge globally, and the Indian scenario reflects a complex interplay of socio-economic factors, healthcare infrastructure, and cultural perceptions.[1] With a population of over 1.3 billion people, India is home to a diverse demographic landscape, contributing to variations in the prevalence and management of CP. The burden of CP in India is substantial, with estimates suggesting that it affects approximately 3 to 4 per 1000 live births, though regional variations may exist.[2]

India's socio-economic diversity, coupled with challenges in healthcare accessibility, impacts the early identification, diagnosis, and management of CP. Limited awareness and social stigma surrounding disabilities, including CP, contribute to delays in seeking medical attention and intervention.[3] Additionally, disparities in healthcare resources and infrastructure across different states and regions further compound the challenges in addressing CP effectively.[4]

In recent years, there have been efforts to enhance disability management and healthcare services in India, but the progress remains uneven.[5] The country's transition from a low-income to a lower-middle-income status has brought about improvements in various sectors, yet the healthcare system grapples with the demand for specialized care for conditions like CP. Moreover, cultural beliefs and societal attitudes toward disabilities may influence the extent to which families seek medical assistance and support for children with CP.[6]

Research studies focusing on CP in the Indian context are crucial for understanding the unique challenges and developing targeted interventions. While advancements in disability management worldwide are noteworthy, there is a pressing need for tailored strategies that consider the intricacies of the Indian healthcare landscape and societal perceptions.

Material and Methods:

The present study, a hospital-based cross-sectional descriptive analysis, aimed to comprehensively understand the clinical profile of children with cerebral palsy (CP) at Rani Chandramani Devi Hospital in Visakhapatnam, India. The study adhered to ethical guidelines, with written informed consent obtained from parents or caregivers, and assent from children, where applicable. Duration of study was Jan 2018 to Dec 2018.

The study included children presenting with features consistent with CP, excluding those with neurodegenerative disorders and disabilities arising from causes other than CP.The diagnostic criteria for CP were based on the definition provided by Rosenbaum et al.[7] Clinical evaluation included detailed history-taking using a pre-designed proforma, followed by a comprehensive physical, developmental, and neurological examination conducted by pediatricians.

To characterize CP, pediatricians employed Minear's physiological and topographical classifications and the Gross Motor Function Classification System (GMFCS).[8] These classifications were selected due to the absence of a specific consensus on a classification system at our center.Clinical assessment of risk factors (antenatal, perinatal, and postnatal) was conducted

along with a review of available documents. Comorbidities such as epilepsy, visual, hearing, speech, feeding, orthopedic issues, and intellectual disability were clinically evaluated by pediatricians, often in collaboration with specialists. Diagnostic criteria for epilepsy followed the International League Against Epilepsy (ILAE) 2014 guidelines, and intellectual disability was defined based on the Diagnostic and Statistical Manual of Mental Disorders (DSM-5).Anthropometric measurements were obtained and interpreted using World Health Organization (WHO) and Centre for Disease Control (CDC) Growth Charts for assessing malnutrition.Neuroimaging, in the form of ultrasound cranium, computed tomography head, or magnetic resonance imaging (MRI) brain, was performed based on clinical indication and feasibility.

Statistical Analysis: All collected data were entered into Microsoft Excel and analyzed using SPSS 17.0 statistical software, employing simple descriptive statistics such as mean, median, and percentages. Ethical clearance was taken from institutional ethical committee.

Results

Table -1- Demographic profile of subjects.

Characteristic	No. (%) or Median (IQR)
Gender	
Male/Female	85/30 (73.91/26.09)
Age	
≤ 5 years	88 (76.52)
6–10 years	18 (15.65)
11–15 years	9 (7.83)
Median age	3 (2.00–4.75)
Physiological classification	
Spastic	66 (57.39)
Dyskinetic	18 (15.65)
Ataxic	4 (3.48)
Mixed	27 (23.48)
Topographical classification	
Quadriplegia	29 (44.62)
Diplegia	23 (35.38)
Hemiplegia	13 (20.00)
Monoplegia	1 (1.54)
GMFCS classification	
GMFCS I	3 (2.61)
GMFCS II	21 (18.26)
GMFCS III	47 (40.87)
GMFCS IV	32 (27.83)
GMFCS V	9 (7.83)

In this study, the characteristics of a cohort of individuals with cerebral palsy (CP) were systematically examined, employing a cross-sectional design. The demographic distribution revealed a male/female ratio of 73.91/26.09, underscoring a predominant representation of males in the study population.

The age distribution demonstrated a majority of individuals falling within the age group of 5 years and below (76.52%), followed by 15.65% between 6 and 10 years, and 7.83% between 11 and 15 years. The median age was reported as 3 years, with an interquartile range (IQR) of 2.00–4.75, providing a central tendency and dispersion measure.

The physiological classification of CP indicated a notable prevalence of spasticity (57.39%), followed by dyskinetic (15.65%), ataxic (3.48%), and mixed (23.48%) types. This classification offers insights into the primary motor characteristics of the studied population.

Topographical classification elucidated the distribution of motor impairment, with quadriplegia being the most prevalent (44.62%), followed by diplegia (35.38%), hemiplegia (20.00%), and monoplegia (1.54%). These classifications shed light on the extent and localization of motor deficits in the CP cohort.

The Gross Motor Function Classification System (GMFCS) further categorized individuals based on functional abilities, with notable proportions distributed across GMFCS levels. GMFCS I (2.61%), GMFCS II (18.26%), GMFCS III (40.87%), GMFCS IV (27.83%), and GMFCS V (7.83%) provided a comprehensive overview of functional limitations within the studied population.

Fig.-1- Topographic Classification of CP.

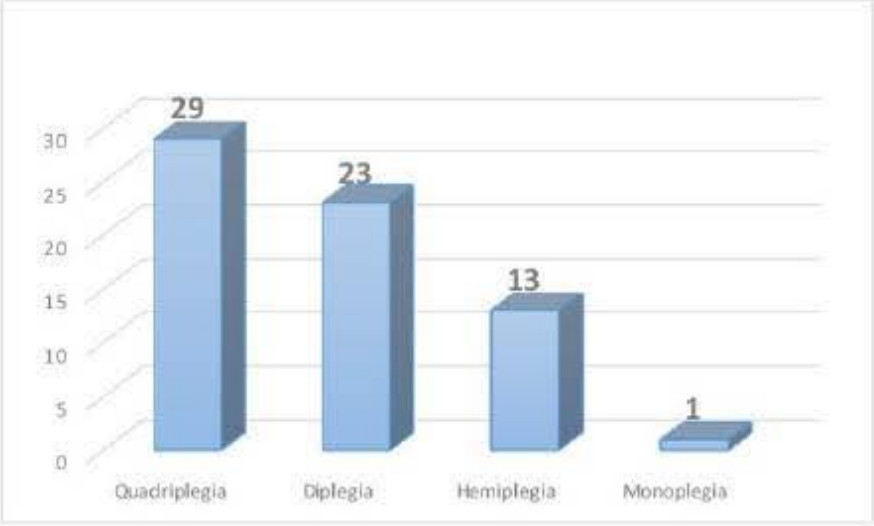


Table -2- risk factor assessment for CP.

Risk Factors	No. (%)
Perinatal	
Perinatal asphyxia	41 (35.65)
Prematurity	25 (21.74)
Intra Uterine Growth Retardation (IUGR)	12 (10.43)
Jaundice	6 (5.22)
Neonatal hypoglycemia	1 (0.87)
Prolonged labour	5 (4.35)
Postnatal	
Central Nervous System infection (meningitis)	23 (20.00)
Neonatal sepsis	18 (15.65)
Antenatal	
Antepartum haemorrhage	8 (6.96)
Infertility treatment	2 (1.74)
Pregnancy-induced Hypertension (PIH)	1 (0.87)
Alcohol exposure	1 (0.87)
No identified risk factor	24 (20.87)

This study meticulously examined the various risk factors associated with cerebral palsy (CP) within the studied population. The risk factors were categorized into perinatal, postnatal, and antenatal domains, providing a comprehensive understanding of the multifactorial etiology of CP.

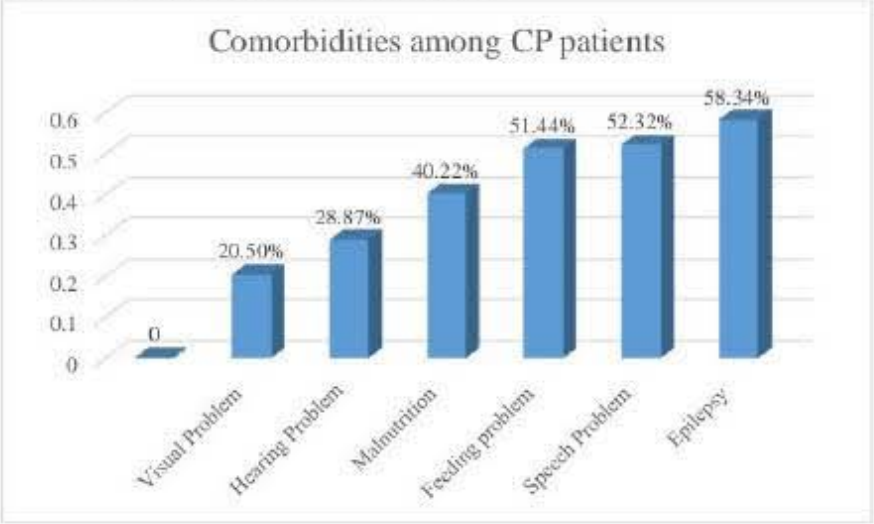
The perinatal period revealed a range of factors contributing to CP. Perinatal asphyxia emerged as the most prevalent risk factor, accounting for 35.65% of cases. Additionally, prematurity (21.74%), intrauterine growth retardation (IUGR) (10.43%), jaundice (5.22%), neonatal hypoglycemia (0.87%), and prolonged labor (4.35%) were identified as significant contributors to perinatal risk.

Postnatally, central nervous system infections, specifically meningitis (20.00%), and neonatal sepsis (15.65%) constituted substantial risk factors for the development of CP. These findings emphasize the importance of infections during the postnatal period as contributors to neurological impairment.

Antenatal risk factors included antepartum hemorrhage (6.96%), infertility treatment (1.74%), pregnancy-induced hypertension (PIH) (0.87%), and alcohol exposure (0.87%). These antenatal factors offer insights into the potential impact of maternal health and pregnancy-related conditions on the occurrence of CP.

Remarkably, a subset of cases (20.87%) did not exhibit any identified risk factors, indicating the complexity and diversity in the etiological pathways leading to CP. The presence of cases without identified risk factors underscores the need for ongoing research to uncover additional factors contributing to CP.

Fig. -2- Comorbidities among CP Patients.



Approximately 20.50% of the individuals with CP in this study presented with visual problems, underscoring the prevalence of sensory impairments within the cohort. Visual problems may significantly impact daily functioning and require targeted interventions for optimal management.
Hearing problems were reported in 28.87% of CP patients, highlighting the considerable burden of auditory impairments within the studied population. These findings emphasize the importance of comprehensive healthcare approaches that address both motor and sensory aspects in individuals with CP. A substantial 40.22% of individuals with CP were identified as experiencing malnutrition. Malnutrition poses additional challenges to the overall health and well-being of individuals with CP, necessitating a holistic approach to care that includes nutritional interventions. Feeding problems were prevalent among 51.44% of the CP patients in this study. The high incidence of feeding difficulties underscores the intricate nature of motor and oral-motor coordination in individuals with CP, necessitating targeted interventions to address nutritional needs. Over half of the individuals with CP (52.32%) exhibited speech problems, indicating the significant impact of motor impairments on communication abilities. Speech therapy and assistive communication strategies may be crucial components in the holistic management of individuals with CP. A striking 58.34% of CP patients in this study were identified as having epilepsy. This high prevalence emphasizes the association between neurological disorders and CP, necessitating vigilant monitoring and appropriate interventions to manage seizures effectively.

Discussion

The investigation into the clinical profile of individuals with cerebral palsy (CP) offers valuable insights into the diverse manifestations and challenges faced by this population. Among the significant aspects explored in this study, the topographical classification of CP emerged as a crucial element in understanding the distribution and severity of motor impairments among the studied cohort.
Topographical Classification and Motor Impairments:

The study revealed a substantial distribution across various topographical classifications, with quadriplegia, diplegia, hemiplegia, and monoplegia being prominent categories. Quadriplegia, characterized by motor impairment in all four limbs, constituted the largest subgroup. This finding aligns with the existing literature, emphasizing the predominance of quadriplegic patterns in CP, often indicative of more extensive neurological involvement.[9,10]

Diplegia, characterized by motor impairment predominantly in the lower limbs, followed as the second-largest subgroup. The prevalence of diplegia is consistent with previous studies highlighting the frequent occurrence of lower limb spasticity in individuals with CP.[11]

Hemiplegia, involving motor impairments on one side of the body, and monoplegia, affecting a single limb, were identified as less common but significant categories. These classifications, while less prevalent, contribute to the heterogeneity of CP presentations, emphasizing the varying degrees of motor involvement observed in this population.

Clinical Implications of Topographical Classification:

Understanding the topographical distribution of motor impairments in individuals with CP holds critical clinical implications. It aids in tailoring therapeutic interventions and rehabilitation strategies to address specific functional limitations associated with each subtype. For example, individuals with quadriplegia may require more extensive support for activities of daily living and mobility compared to those with diplegia or hemiplegia.[12]

Furthermore, topographical classification informs prognostic considerations, guiding healthcare providers in predicting the potential trajectory of motor development and functional outcomes for individuals with CP. This nuanced understanding is crucial for developing personalized rehabilitation plans and setting realistic expectations for families and caregivers.

The identification of perinatal, postnatal, and antenatal risk factors contributes significantly to unraveling the intricate web of events that may lead to the development of CP. Perinatal factors, such as perinatal asphyxia, prematurity, and jaundice, have been consistently recognized in the literature as significant contributors to the risk of CP.[13] The prominence of perinatal asphyxia in this study aligns with previous findings, emphasizing the critical role of adequate oxygenation during the birthing process in preventing neurodevelopmental disorders like CP.

Risk Factors

Postnatal factors, particularly central nervous system infections like meningitis and neonatal sepsis, emerged as noteworthy contributors. These findings highlight the potential impact of postnatal health conditions on the neurological integrity of infants, underscoring the importance of infection prevention strategies and early intervention.[14]

Antenatal risk factors, including antepartum hemorrhage, infertility treatment, pregnancy-induced hypertension (PIH), and alcohol exposure, offer insights into the influence of maternal health on the neurodevelopment of the fetus. Antenatal factors underscore the need for comprehensive prenatal care and early identification of potential risk factors to mitigate the risk of CP.[15]

The presence of a subset of cases with no identified risk factors (20.87%) emphasizes the complexity and heterogeneity of CP etiology. It implies the existence of additional factors or interactions that may contribute to the development of CP, warranting further exploration and research.

Comorbidities:

The high prevalence of comorbidities among individuals with CP, including visual and hearing problems, malnutrition, feeding problems, speech problems, and epilepsy, underscores the comprehensive health challenges faced by this population.

Visual and hearing problems, reported in 20.50% and 28.87% of CP patients, respectively, emphasize the importance of sensory assessments and interventions in the care of individuals with CP4. The prevalence of malnutrition (40.22%) and feeding problems (51.44%) emphasizes the need for targeted nutritional interventions and feeding support to address the specific needs of individuals with CP.[16]

Speech problems affecting over half of the CP patients (52.32%) highlight the intricate relationship between motor impairments and communication abilities. This finding underscores the importance of speech therapy and assistive communication strategies in the overall management of individuals with CP.[17]

The high prevalence of epilepsy (58.34%) among individuals with CP reiterates the association between neurological disorders and CP. Effective monitoring and management of seizures are critical components in the comprehensive care of individuals with CP.[18]

Conclusion

This study provides a comprehensive examination of cerebral palsy (CP), highlighting key demographic features, topographical classifications, risk factors, and comorbidities within the studied population. The findings underscore the multifaceted nature of CP, with implications for personalized care and early intervention. The identification of risk factors informs preventive strategies, while the topographical classifications offer insights for tailored therapeutic approaches. The high prevalence of comorbidities emphasizes the importance of holistic and multidisciplinary care. The study contributes valuable knowledge to the understanding of CP etiology and management, with implications for future research directions and the development of targeted interventions. However, the study's cross-sectional design and focus on a specific population warrant consideration, suggesting avenues for further investigation and broader applicability.

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