

Epidemiological and Functional Profile of Children With Cerebral Palsy Assisted at the Unicamp Clinical Hospital

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Introduction: Cerebral Palsy (CP) is caused by multiple risk factors bringing motor and postural control disruptions with a variety of clinical signs.

Objective: To describe the epidemiological and functional profile of children with CP attended at the Physiotherapy Clinic for Motor Rehabilitation (PCMR) of the Clinical Hospital (CH) of the University of Campinas (Unicamp).

Methods: Children up to 12 years old with CP were included. Epidemiological data were collected through interviews, followed by the scales: Gross Motor Function Classification System (GMFCS), Pediatric Evaluation of Disability Inventory (PEDI), Gross Motor Function Measure (GMFM-66), International Classification of Functioning, Disability, and Health for Children and Youth with CP (ICF-CY-CP) Core Sets, and the GMFCS Family Report Questionnaire.

Results: A total of 37 children were assessed, with an average age of 7 years. It was found that 87% of the mothers received prenatal care, 61% of the children were born at a low weight, with 36% of cases being extreme or very premature births. The primary perinatal complication was neonatal anoxia (50%), while the most common postnatal complication was stroke (11%). CP was diagnosed at an average age of 12 months, with bilateral spastic CP being the most prevalent (63%). Orthopedic complications were present in 80% of cases, even though only 39% of children had orthopedic monitoring. In the functional analysis, 65% were classified at levels IV and V of the GMFCS, highly correlated with GMFCS Family Report Questionnaire (Kappa = 0.88; 95% IC 0.79–0.96). The scores of 3 and 4 on the ICF-CY-CP Core Sets in most activities involving motor functions, along with scores below 30 on the PEDI, indicate severe motor impairment.

Conclusion: Parents had a realistic perception of the children's functionality. The results highlight the severity of motor impairment in these children and emphasize the need for multidisciplinary assistance.

Keywords: motor function analysis, physiotherapy, epidemiological profile

Introduction

Chronic Non-Progressive Encephalopathy, or Cerebral Palsy (CP), involves motor and postural control disorders due to brain injury during development. These changes can interfere with the ability of the children to carry out daily activities. Besides, the manifestation of these changes may vary over time, depending on the treatment the child receives and the neuroplasticity of the nervous system.^{1–4}

The prevalence of CP in high-income countries is, on average, 2.1 cases per 1.000 live births.^{1,5} However, Brazil has no consolidated data on this information.^{6,7} Given the country's continental size and regional diversity, prevalence rates likely vary across the regions.^{6,8}

CP is a multifactorial condition with risk factors that vary across the prenatal, perinatal and postnatal periods. Prenatal factors such as maternal infections, placental complications, intrauterine growth restriction, preeclampsia, multiple gestations, structural malformations, and genetic alterations play a significant role. Perinatal risk factors include complications during labor, prematurity, low birth weight, meconium aspiration, vascular accidents, hyperbilirubinemia, and hypoxic-ischemic encephalopathy. Postnatal risks include infections, traumatic brain injuries, cardiac or brain surgeries, strokes, and hypoxic events.^{2,4}

The development of children with CP is often marked by musculoskeletal complications that progressively worsen over time, regardless of the period in which they arise. These alterations include muscle contractures, bone deformities, and joint misalignment. Such complications can lead to pain and reduced mobility, and are frequently associated with functional impairment in CP, which ultimately directly affect the children's independence, such as mobility, self-care and social interaction.²⁻⁴ By better understanding these issues, it becomes possible to promote more effective approaches to minimize musculoskeletal deformities and other issues associated with CP, and to maximize the functional potential of children with CP.

The Clinical Hospital (CH) of the University of Campinas (Unicamp) is one of the main university hospitals in Brazil, located in the city of Campinas, São Paulo. Furthermore, it is a public, highly complex university hospital managed by the Sistema Único de Saúde (SUS).⁹ SUS is a public system that provides universal, free, and comprehensive access to the Brazilian population and foreigners.¹⁰

It is important to note that the CH-Unicamp is a reference hospital for a large area encompassing 86 municipalities with a total population of over 6.5 million individuals.^{9,11} Despite its critical role in providing specialized care, no data is currently available on the epidemiological and functional profile of children with CP treated in this hospital. This study aimed to address this gap by describing the epidemiological and functional characteristics of children with CP treated at Physiotherapy Clinic for Motor Rehabilitation (PCMR) - CH - Unicamp. Understanding these profiles will offer valuable insights into the children's functionality, allowing for more precise multidisciplinary treatments and contributing to the enhancement of healthcare services provided to this population.

Materials and Methods

This is a cross-sectional observational study.

Ethical Aspects

This study was conducted following Brazilian legislation on research involving humans, which aligns with the principles outlined in the Declaration of Helsinki, and complied with all applicable ethical standards and regulations. The research protocol was reviewed and approved by the Research Ethics Committee of Unicamp, CAAE n°42675220.1.0000.5404 on December, 1st, 2021. The study was conducted at the PCMR- CH- Unicamp and only took place after ethical approval. The legal guardians of the children were invited to participate and freely signed the written informed consent form after receiving clarification from the researchers involved. The participants' data were anonymized and stored in a secure password-protected institutional environment, accessible only to authorized personnel.

Recruitment and Participants

Recruitment was carried out consecutively, over 14 months, between April 2022 and June 2023. The inclusion criteria were children up to 12 years old¹² with a clinical diagnosis of cerebral palsy, who were undergoing treatment at PCMR-CH-Unicamp. The exclusion criteria were: (i) children without a diagnosis; (ii) transient developmental delay; (iii) diagnosis of genetic syndromes with motor dysfunction; (iv) history of tumors; (v) primary neuromuscular diseases.

Data Collection and Functional Assessment Tools

Epidemiological data were collected through interviews with the children's parents or legal guardians using a structured questionnaire developed by the researchers. The questionnaire was administered in person and in real-time by the interviewer, ensuring clarity and minimizing any potential misunderstanding by the respondent. It is important to note that the interviewers received detailed orientation from senior researchers to ensure they were

familiar with the survey's objectives and protocols, and all data collection activities were conducted under close supervision to maintain consistency and accuracy. The questionnaire covered the following topics: (i) demographics, (ii) family context, (iii) social assistance, (iv) prenatal, perinatal, and postnatal history, and (v) clinical characteristics. Since caregiver-reported interviews may be subject to bias, additional data were collected from hospital records to supplement the information. It is important to note that this study adhered to the Checklist for Reporting of Survey Studies (CROSS) to ensure the clarity, transparency, and reproducibility of the survey methods and findings.¹³

The functional variables were obtained using validated tools, as described below, and were always administered by the same physiotherapist.

GMFCS

The movements of children with CP, initiated voluntarily, were analyzed, involving sitting, transfers, and mobility on five different motor levels (level I – lesser motor impairment, up to level V – greater motor impairment).¹⁴

PEDI

This assessment was conducted through a structured interview with parents/caregivers, analyzing the mastery of functional skills in self-care, mobility, and social function. Raw scores were transformed into normative scores based on the children's age. For children over 7 years and 6 months, the scores of this same age were considered.¹⁵

GMFM-66

The children's gross motor function was assessed by requesting the activity or stimulating with a toy. None of the children used mobility devices. All scores were then processed by the Gross Motor Ability Estimator (GMAE-2) computer program to provide the total score and the confidence interval.¹⁶

ICF Core Set CJ PC

We verified the children's activities and participation in the following ICF codes: d415- Maintaining body position, d440- Fine hand use, d450- Walking, d460- Moving around in different locations, d530- Toileting, d550- Eating, d710- Basic interpersonal interactions, d760- Family relationships. The generic qualifiers used were: 0 = No problem, 1 = Mild problem, 2 = Moderate problem, 3 = Severe problem, 4 = Complete problem, 8 = Not specified, and 9= Not applicable. The qualifiers were determined by analyzing the GMFM-66 and PEDI assessments, which addressed these skills, as well as by questioning parents/caregivers.¹⁷

GMFCS Family Report Questionnaire

This research included children under 2 years of age in the 2 to <4 years age group, and children aged 12 years or older in the 6 to <12 years age group. Parents/caregivers were provided with a printed sheet to indicate, based on their perception, which option represented the child's functionality.¹⁸

Data Analysis

For the descriptive analyses, frequencies were used for categorical variables and measures of central tendency and dispersion for numerical variables. The association between the GMFCS and the GMFCS Family Report Questionnaire was analyzed, using the Symmetry Test and the weighted Kappa coefficient. The magnitude of the Kappa coefficient was defined as follows: values greater than or equal to 0.75 indicate excellent agreement, values between 0.75 and 0.40 indicate good agreement, and values less than or equal to 0.40 indicate no agreement. The Fisher test was employed to assess correlations between GMFCS levels and PEDI results, orthopedic complications, and the ICF Core Set. Comparisons between PEDI and GMFM-66 results were performed using the Mann–Whitney test, while comparisons between PEDI and the ICF Core Set were conducted using the Fisher test. Analyses were performed using the SAS System for Windows (Statistical Analysis System), version 9.4. SAS Institute Inc, 2002–2012, Cary, NY, USA, and the accepted significance level was $p \leq 0.05$.

Results

Participants

Throughout the study, 41 participants were recruited. Three children were excluded: two due to loss of follow-up, and one for not having a definitive clinical diagnosis of CP. This resulted in 38 children being evaluated in this study with all caregivers participating in the survey or consenting to the interview.

Epidemiological Data

In this study, the average age of the children at the moment of data collection was 7 years. The primary caregiver for most of the children was their mother ([Supplementary Material 1](#)). Regarding maternal data, the average age of the mothers at the time of childbirth was 25 years, with 45% having completed secondary education. Additionally, a high prevalence of hospital births (97%) was found, with 55% delivered by cesarean section. Of the children who received prenatal care (87%), 68% were born prematurely, with 36% of these cases being extreme or very premature births, with 61% of the children were born at a low weight. Among the perinatal complications, neonatal anoxia was the most prevalent. Regarding the Apgar scores at birth, among 38 children assessed, data were successfully collected for 27 children (71.05%). Of those with available data, 7 children (25.93%) had normal results (Apgar scores above 9 at the first minute and 10 at five minutes), while 20 children (74.07%) had below-normal results. Within the group of 20 children with below-normal results, at the fifth minute, 3 children (15.0%) had Apgar scores of up to 4, and 9 children (45%) had scores between 5 and 8.

Considering the postnatal period, stroke was the most common, occurring in 11% of cases ([Supplementary Material 2](#)). Additionally, 77% of children received social assistance, with government financial assistance as the most common support ([Supplementary Material 3](#)), showing that the most of children in this study was dependent on government assistance.

Regarding children's data, the age at the time of PC diagnosis was 12 months, most of them presenting bilateral spastic CP ([Table 1](#)). Orthopedic complications were present in 80% of cases, with muscle shortening and joint limitations being the most prevalent, despite almost half of these cases being monitored by the orthopedics service ([Table 2](#)). In addition, it was observed that most children were assisted by multidisciplinary professionals, with many of them relying on mobility aids, orthoses, and wheelchairs ([Supplementary Material 4](#)).

Functional Data

The majority of the assessed children were classified at levels IV and V of the GMFCS, indicating severe functional impairment. This finding aligns with caregivers' reports, as they rated the children's functionality at level V of the GMFCS Family Report Questionnaire ([Table 3](#)). The agreement analysis between the GMFCS and GMFCS Family

Table 1 Distribution of Cerebral Palsy Types

Variables	n (%) 38 (100%)
PC Type	
Unilateral spastic CP	5 (13%)
Bilateral spastic CP	24 (63%)
Unilateral dyskinetic CP	1 (3%)
Bilateral dyskinetic CP	4 (11%)
Ataxic PC	1 (3%)
Mixed PC with a spastic predominance	1 (3%)
Mixed spastic and dyskinetic PC	2 (4%)

Abbreviation: CP, Cerebral Palsy.

Table 2 Orthopedic Complications Associated With Cerebral Palsy

Variables	n (%) 38 (100%)
Orthopedic Complications	
Yes	28 (80%)
No	7 (20%)
Types of Orthopedic Complications	
Muscle shortening	24 (69%)
Joint limitations	24 (69%)
Joint Hypermobility	1 (3%)
Hip Dislocation	8 (23%)
Spinal abnormalities	5 (14%)
Orthopedics Monitoring	
Yes	15 (39%)
No	22 (59%)
No information	1 (3%)

Table 3 Functional Data Based on the GMFCS and the GMFCS Family Report Questionnaire

GMFCS	n=38	GMFCS Family Report Questionnaire	n=38
Nível I	5 (13%)	Nível I	4 (11%)
Nível II	4 (10%)	Nível II	5 (12%)
Nível III	3 (8%)	Nível III	4 (11%)
Nível IV	11 (29%)	Nível VI	9 (24%)
Nível V	15 (40%)	Nível V	16 (42%)

Abbreviation: GMFCS, Gross Motor Function Classification System.

Report Questionnaire showed excellent concordance, indicating that family members/caregivers accurately understood the children's functionality (Table 4).

The participants' normative scores for self-care, mobility, and social function of the participants on the PEDI showed lower performance compared to Brazilian children of the same age group (See [Supplementary Material 5](#)). Moreover, most children classified in levels IV and V of the GMFCS exhibited delays in all three domains of the PEDI (Table 5).

Children at GMFCS levels IV or V mostly received qualifiers 3 or 4 in the Core Set codes, indicating lower functional performance for those with greater impairment levels (Table 6).

Most children classified in levels I, II, and III, as well as levels IV and V of the GMFCS, presented with orthopedic complications (Table 7) during the investigation into orthopedic complications and GMFCS levels.

Children who experienced delays in all areas of the PEDI scored lower on the GMFM-66 (Table 8). Those who showed delays in the self-care, mobility, and social function domains of the PEDI were more likely to be assigned qualifiers 3 and 4 compared to those without delays (Tables 9–11).

Table 4 Relationship Between GMFCS Results and the GMFCS Family Report Questionnaire

Categorical Variables	GMFCS Family Report Questionnaire					n=38
Percentage (GMFCS)	Level 1	Level 2	Level 3	Level 4	Level 5	Total
Level 1	7.89	5.26	0.0	0.0	0.0	13.16
Level 2	2.63	7.89	0.0	0.0	0.0	10.53
Level 3	0.0	0.0	5.26	2.63	0.0	7.89
Level 4	0.0	0.0	5.26	21.05	2.63	28.95
Level 5	0.0	0.0	0.0	0.0	39.47	39.47
Total	10.53	13.16	10.53	23.68	42.11	100.00

Notes: Weighted Kappa = 0.8769; 95% CI (0.7958; 0.9579) – excellent agreement between the scales.

Abbreviation: GMFCS, Gross Motor Function Classification System.

Table 5 Relationship Between GMFCS Results and PEDI Scores

GMFCS				
PEDI	(Levels I,II e III) n=12	(Levels IV,V) n=26	n=38	Value – P
Self- care				
1	6 (50%)	24 (92%)	30 (79%)	0.0066 ^a
2	6 (50%)	2 (8%)	8 (21%)	
Mobility				
1	5 (46%)	26 (100%)	31 (84%)	0.0002 ^a
2	6 (54%)	0 (0%)	6 (16%)	
Social function				
1	4 (33%)	21 (81%)	25 (66%)	0.0086 ^a
2	8 (67%)	5 (19%)	13 (34%)	

Notes: 1= score <30 - represents delayed development of the domain, 2= score 30 to 70 - represents normal development of the domain. ^aFisher's test.

Abbreviation: GMFCS, Gross Motor Function Classification System.

Table 6 Correlation Between GMFCS Levels and ICF Core Set Findings

GMFCS				
ICF Core Set	(Levels I,II e III) n=12	(Levels IV, V) n=26	n=38	Value – P
d415 - Maintaing body position				
0-1-2	12 (100%)	11 (42%)	23 (60%)	0.0008 ^a
3-4	0 (0%)	15 (58%)	15 (40%)	
d440 - Fine hand use				
0-1-2	11 (92%)	9 (35%)	20 (53%)	0.0011 ^b
3-4	1 (8%)	17 (65%)	18 (47%)	

(Continued)

Table 6 (Continued).

GMFCS				
ICF Core Set	(Levels I,II e III) n=12	(Levels IV, V) n=26	n=38	Value – P
d450 - Walking				
0-1-2	11 (92%)	0 (0%)	11 (29%)	<0.0001 ^a
3-4	1 (8%)	26 (100%)	27 (71%)	
d460 - Moving around different locations				
0-1-2	11 (92%)	2 (8%)	13 (34%)	<0.0001 ^a
3-4	1 (8%)	24 (92%)	25 (66%)	
d530 - Toileting				
0-1-2	10 (83%)	6 (23%)	16 (42%)	0.0005 ^b
3-4	2 (17%)	20 (77%)	22 (58%)	
d550 - Eating				
0-1-2	11 (92%)	8 (31%)	19 (50%)	0.0005 ^b
3-4	1 (8%)	18 (69%)	19 (50%)	
d710 - Basic interpersonal interactions				
0-1-2	10 (83%)	7 (28%)	17 (46%)	0.0016 ^b
3-4	2 (17%)	18 (72%)	20 (54%)	
d760 - Family relationships				
0-1-2	10 (83%)	12 (46%)	22 (58%)	0.0309 ^b
3-4	2 (17%)	14 (54%)	16 (42%)	

Notes: Nominal definition of qualifiers: 0- No problem, 1- Mild problem, 2- Moderate problem, 3- Severe problem, 4- Complete problem, and 8 – Not specified; ^a Fisher's test.; ^b Chi-square test;

Abbreviation: GMFCS, Gross Motor Function Classification System.

Table 7 Relationship Between GMFCS Levels and Orthopedic Complications

GMFCS			
Categorical Variables	(Levels I, II e III) n=12	(Levels IV, V) n=23	Value – P
Orthopedic complications			
Yes	7 (58%)	21 (91%)	0.0331 ^a
No	5 (42%)	2 (9%)	
Total	12	23	

Notes: ^a Fisher's test.

Abbreviation: GMFCS, Gross Motor Function Classification System.

Table 8 Correlations Between PEDI Scores and the Mean GMFM-66 Scores

Categorical Variables	n=38	Categorical Variables	Value – P
PEDI		GMFM66 (average $\pm$ SD (N))	
Delay in Self-Care	30 (79%)	27.01 $\pm$ 18.91	0.0017 ^a
Normal self-care	8 (21%)	62.50 $\pm$ 27.99	
Mobility Delay	31 (82%)	26.63 $\pm$ 19.79	0.0002 ^a
Normal mobility	6 (16%)	74.48 $\pm$ 10.23	
Delay in social function	25 (66%)	21.53 $\pm$ 17.96	<0.0001 ^a
Normal social function	13 (34%)	59.39 $\pm$ 17.81	

Notes: ^a Mann–Whitney test.

Abbreviations: PEDI, Pediatric Evaluation of Disability Inventory; GMFM-66, Gross Motor Function Measure 66 items.

Table 9 Correlation Between the Self-Care Domain of the PEDI and ICF Core Set CJ PC

PEDI			
ICF Core Set CJ PC	Self-Care (Delay) n=30	Self-Care (Normal) n=8	Value – P
d415 - Maintain body position			
0-1-2	16 (53%)	7 (88%)	0.1143 ^a
3-4	14 (47%)	1 (12%)	
d440 - Fine hand use			
0-1-2	13 (43%)	7 (88%)	0.0450 ^a
3-4	17 (57%)	1 (12%)	
d530 - Toileting			
0-1-2	9 (30%)	7 (88%)	0.0054 ^a
3-4	21 (70%)	1 (12%)	
D550 - Eating			
0-1-2	12 (40%)	7 (88%)	0.0422 ^a
3-4	18 (60%)	1 (12%)	

Notes: Qualifiers: 0-1-2: none to moderate problem; 3-4: severe to complete problem. ^a Fisher's test.

Abbreviation: PEDI, Pediatric Evaluation of Disability Inventory.

Significant Findings

The majority of the children treated at CH-Unicamp had spastic CP classified as levels IV and V on the GMFCS, representing the highest levels of severity. Interestingly, there was a high level of agreement between the GMFCS Family Report Questionnaire and the GMFCS assessment conducted by the physiotherapist. Among the comorbidities, orthopedic findings were the most prevalent, predominantly present deformities associated with soft tissue contractures and joint limitations.

Table 10 Correlation Between the Mobility Domain of the PEDI and ICF Core Set CJ PC

PEDI			
ICF Core Set CJ PC	Mobility (delay) n=31	Mobility (normal) n=6	Value – P
D450 - Walking			
0-1-2	5 (16%)	6 (100%)	0.0002 ^a
3–4	26 (84%)	0 (0%)	
D460 - Moving around in different locations			
0-1-2	7 (23%)	6 (100%)	0.0007 ^a
3–4	24 (77%)	0 (0%)	

Notes: Qualifiers: 0-1-2: none to moderate problem; 3–4: severe to complete problem. ^aFisher's test.

Abbreviation: PEDI, Pediatric Evaluation of Disability Inventory.

Table 11 Correlation Between the Social Function Domain of the PEDI and ICF Core Set CJ PC

PEDI			
ICF Core Set CJ PC	Social Function (Delay) n=25	Social Function (Normal) n=13	Value – P
D710 - Basic interpersonal interactions			
0-1-2	4 (17%)	13 (100%)	<0.0001 ^a
3–4	20 (83%)	0 (0%)	
D760 - Family relationships			
0-1-2	9 (36%)	13 (100%)	0.0002 ^a
3–4	16 (64%)	0 (0%)	

Notes: ^a Chi-square test.

Abbreviation: PEDI, Pediatric Evaluation of Disability Inventory.

Discussion

CP can impact various systems in a child's body, including the musculoskeletal system, potentially affecting their functionality and quality of life. It is known that socioeconomic background plays a critical role in the outcomes of rehabilitation for children with CP. Factors such as limited access to specialized services, difficulties in treatment continuity, and lack or low level of parents' education and socioeconomic support can compromise functional progress and may influence the rehabilitation outcome.^{2,3,5} This study aimed to understand the main risk factors, the socioeconomic, and support conditions of the children treated in the CH-Unicamp to better understand this population. Understanding these factors is essential for implementing equitable and inclusive strategies to optimize results, particularly in vulnerable populations.

The children assessed in this study had an average age of seven years ([Supplementary Material 1](#)). Previous epidemiological studies conducted in large, government-funded secondary healthcare rehabilitation centers have shown a predominance of younger children, aged two to six years.^{6,19} Studies led in primary care and a philanthropic hospital have shown a predominance of children aged seven to eight.^{8,20} These findings demonstrate diversity in children's age in different centers.

In this study, 66% of the children were under maternal care ([Supplementary Material 1](#)), which is consistent with the literature.^{20,21} Although this was not a topic investigated in this study, it is known that exclusive maternal caregiving can negatively impact the mother's quality of life. Concerning governmental assistance, most children received some form of assistance, with financial aid being the most common ([Supplementary Material 3](#)), which is consistent with previous studies.^{8,20} This data highlights that a significant proportion of the study population depend on this type of support.

Regarding the prenatal period, 87% of the mothers received prenatal care, with 68% of birth being premature. This is consistent with studies by Santos et al (2019) and Binha et al (2018), but differs from a study in Bangladesh, which reported fewer mothers receiving prenatal care.^{6,22} Another study in Japan highlighted a higher prevalence of gestational age between 28 and 31 weeks.²³ These differences may be attributed to varying health conditions and cultural differences between countries.

Perinatal data revealed an average maternal age of 25 years at delivery, with most births occurring in hospitals, predominantly by cesarean sections. These findings differ from another study that reported an average maternal age of 22 years at delivery and a prevalence of home births attended by traditional midwives.²¹ On the other hand, a Canadian study found a maternal age range of 25 to 35 years, with a predominance of vaginal deliveries in hospitals.²⁴ Brazilian studies consistently report a high rate of cesarean sections, reflecting cultural and healthcare system factors.^{6,21}

Research data showed that 61% of the children had low birth weight and perinatal complications, with neonatal anoxia being the most prevalent ([Supplementary Material 2](#)). Santos et al (2019) similarly found low birth weight in 40% of cases, with neonatal complications such as asphyxia, prematurity, and kernicterus accounting for 60% of these cases.²¹ However, other studies reported a predominance of normal birth weight,^{22,24} reflecting the influence of economic and healthcare system differences on birth outcomes. In the postnatal period, stroke was the most prevalent finding, representing 11% of cases ([Supplementary Material 2](#)). This contrasts with a study from Singapore, where infections were the primary postnatal complication.²⁵ While infections were not a leading factor in this study, they remain an important risk factor globally, underscoring the need for effective public health interventions.

Considering the type of CP, it was observed that bilateral spastic CP accounted for 63% of cases, making it the most common type ([Table 1](#)), what is consistent with previous studies.^{20,26,27} It is important to highlight there was a predominance of children with orthopedic complications associated with CP, particularly muscle shortening and joint limitations ([Table 2](#)). Even though only 39% received continuous orthopedic monitoring ([Table 2](#)). Although our healthcare system faces challenges, we identified this as an area that requires further attention to improve the care for children with CP. Previous research suggested that there is a progressive development of hip displacement, especially in cases with more severe motor impairment.^{28,29} However, in the present study, the lack of proper hip monitoring made it difficult to identify dysplastic hip. This lack of proper hip monitoring can lead to serious complications such as chronic pain and loss of mobility, directly affecting the quality of life. A study conducted at a tertiary university hospital in Washington, DC involving children with CP, demonstrated that the implementation of a hip surveillance program resulted in more frequent radiographic evaluations with less need for long-term surgical interventions.³⁰ Thus, we can infer that early orthopedic follow-up provides better health care, especially for children with CP at GMFCS levels III, IV, and V. Therefore, continuous orthopedic monitoring is crucial to prevent the worsening of these conditions and to ensure better long-term functional outcomes.

In this study, 69% of children were classified as levels IV and V of the GMFCS, with 40% of total being level V ([Table 3](#)) and showed performance below age expectations on the PEDI ([Supplementary Material 5](#)). The literature supports the findings of the present study, with children classified in levels IV and V of the GMFCS predominantly seen in tertiary care while those in levels I and II are more common in secondary care.^{18,19,27}

The GMFCS Family Report Questionnaire showed excellent agreement with the GMFCS, indicating that family members and caregivers accurately perceived the children's functionality ([Table 4](#)). Additionally, the present study contrasts with other research showing only moderate agreement between GMFCS levels and the GMFCS Family Report Questionnaire, as our findings showed strong alignment between professional and caregiver assessments.³¹

Regarding the relation between GMFCS, PEDI, and ICF Core Set qualifiers, this research found that children classified in levels IV and V of the GMFCS exhibited delays in all three domains of the PEDI and worse ICF Core Set qualifiers. This is consistent with others study reporting that children at GMFCS levels IV and V had lower PEDI functional performance scores,³² supporting the link between greater motor impairments and poorer functional outcomes.³³ Other studies have also reported associations between higher GMFCS levels and worse orthopedic complications and GMFM scores,³⁴ as well as a correlation between higher GMFM scores and improved mobility on the PEDI.³⁵

This study provides a comprehensive overview of the epidemiological and functional profile of children with cerebral palsy (CP) who are treated at PCMR-CH-Unicamp. The findings highlight the severity of motor impairments in this population, especially the limited access to pediatric orthopedic care, which is essential for

a multidisciplinary approach to enhancing their quality of life. Since factors such as unequal access to healthcare facilities and socioeconomic challenges may delay treatment and reduce its effectiveness, we hope this study can help promote strategies to address these inequalities in similar populations, ensuring timely care, improved outcomes, and better quality of life for affected individuals.

Limitations of this study include its focus on children treated at a high-complexity hospital, which may bias the sample toward more severe cases. Additionally, reliance on parental reports for some data could affect the accuracy of the findings; however, we also incorporated hospital data and medical reports as additional sources of information. Some additional data could enhance the observations, provide insights, and should be considered in future studies. Data such as MRI or epilepsy history were not available for all children. While some cases of epilepsy were identified in the studied population, the available information was preliminary, limiting detailed analysis for this manuscript. Despite these limitations, this study provides valuable insights into the profile of children with CP in this setting and establishes a foundation for developing more targeted healthcare policies.

It is recommended that future studies conducted in public rehabilitation services explore, in greater depth, the approach to orthopedic complications in children with CP. Over time, these complications can significantly impact functionality and lead to pain, directly affecting the quality of life of the child and their family. Furthermore, longitudinal studies incorporating multidisciplinary interventions are warranted to track changes and better assess the long-term impact of these approaches.

Conclusion

This study emphasizes the critical role of multidisciplinary care in managing children with CP in a complex hospital environment. The findings showed that the majority of children treated at the CH-Unicamp are functionally compromised, predominantly classified as GMFCS levels VI and V, with spastic CP being the most common subtype. The children's functionality was highly correlated between parents' perception and physiotherapist analysis. Orthopedic complications, including deformities and contractures, were prevalent among this population, further underscoring the need for a coordinated, multidisciplinary approach. The epidemiological and functional profiles outlined here can guide more effective and targeted health promotion strategies, reinforcing the importance of a comprehensive multidisciplinary approach.

Data Sharing Statement

All relevant data are present within the manuscript text, tables and supplementary materials.

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Disclosure

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