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FACTORS ASSOCIATED WITH GMFCS LEVELS IN CHILDREN WITH CEREBRAL PALSY: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Cerebral Palsy (CP) is the leading cause of childhood physical disability, characterized by impaired gross motor function and comorbidities that affect functional abilities and quality of life. The Gross Motor Function Classification System (GMFCS) is widely used to classify gross motor function in children with CP. This study aimed to identify factors associated with GMFCS levels among children with CP. **Methods:** A cross-sectional study was conducted using baseline data from 45 children with CP. The dependent variable, GMFCS level was categorized into Levels I–III and IV–V. Independent variables included age, sex, age at first diagnosis, and number of comorbidities. Descriptive statistics and bivariate analyses using Pearson's chi-square test were performed, with $p < 0.05$ considered significant. **Results:** Most participants were classified as GMFCS Levels IV–V (80.0%). No significant associations were found between GMFCS level and age ($p = 0.176$), sex ($p = 0.135$), age at first diagnosis ($p = 0.816$), or rehabilitation therapy participation ($p = 0.449$). However, the number of comorbidities was significantly associated with GMFCS level ($p = 0.042$). The proportion of children with GMFCS Levels IV–V increased from 50.0% among those without comorbidities to 74.1% with one to two and 100% with more than two comorbidities. **Conclusion:** The number of comorbidities was significantly associated with gross motor function severity in children with CP. Comprehensive comorbidity assessment should be incorporated into clinical evaluation and individualized rehabilitation planning to optimize functional outcomes and long-term care.

Keywords: CP; comorbidities; cross-sectional study; Gross Motor Function Classification System.

INTRODUCTION

Cerebral Palsy (CP) refers to a heterogeneous group of permanent neurodevelopmental conditions in which disturbances to the immature brain disrupt the development of movement and postural control, resulting in persistent limitations in functional activities. These neurological disturbances occur during fetal development, the perinatal period, or early infancy and are non-progressive in nature ((WHO), 2023). In addition to motor impairment, children with CP frequently experience a wide range of associated conditions, including sensory, perceptual, cognitive, communication, behavioral, and musculoskeletal disorders, as well as epilepsy. These associated impairments contribute substantially to increased disability, reduced functional

independence, and poorer quality of life for both affected children and their families (Novak et al., 2022). These characteristics make CP the most prevalent cause of persistent physical disability in children, highlighting the need for lifelong rehabilitation and multidisciplinary management.

Epidemiological data indicate that CP remains one of the most prevalent childhood neurodevelopmental disorders, affecting roughly two children per 1,000 live births globally. Reported prevalence varies between 1.5 and 4.0 per 1,000 live births according to geographic location and healthcare and healthcare context. The burden of CP is generally greater in low- and middle-income countries (LMICs) due to higher rates of perinatal risk factors, delayed diagnosis, and limited access to comprehensive rehabilitation services. In Indonesia, national epidemiological data remain scarce; however, CP is consistently recognized as one of the most common diagnoses encountered in pediatric rehabilitation services and represents one of the principal causes of sustained motor limitations throughout childhood

The impact of CP extends far beyond motor impairment, affecting not only children but also their families and healthcare systems. Children with severe motor limitations often require long-term rehabilitation, mobility assistive devices, and continuous multidisciplinary follow-up to maximize functional independence and social participation. Meanwhile, parents and caregivers frequently experience substantial physical, psychological, social, and economic burdens associated with long-term caregiving responsibilities. Recognizing these challenges, the World Health Organization (WHO) has identified CP as a priority neurological condition within its Package of Interventions for Rehabilitation, emphasizing the importance of evidence-based rehabilitation, timely access to assistive technologies, and person-centered care throughout the lifespan ((WHO), 2023). These recommendations underscore the importance of conducting comprehensive clinical evaluations to guide personalized rehabilitation strategies.

Gross motor function (GMF) describes an individual's capacity movements involving the large muscle groups, including maintaining head and trunk control, sitting, standing, walking, running, and transferring between positions. In children with CP, gross motor function is an indicator of functional independence, participation in daily activities, and the need for rehabilitation services and mobility assistive devices. Limitations in gross motor function affect not only physical mobility but also educational participation, social interaction, and overall quality of life. Therefore, accurate assessment of GMF is essential for determining prognosis, establishing realistic rehabilitation goals, and evaluating long-term functional outcomes (Novak et al., 2022).

GMF in children with CP commonly classified using the Gross Motor Function Classification System (GMFCS), which was developed by Palisano and colleagues as a standardized five-level classification system based on self-initiated mobility. The GMFCS categorizes children according to their usual performance in everyday environments rather than their maximum motor capacity under optimal testing conditions. Children classified as Level I are able to walk without limitations, whereas those at Level V, They have severe limitations in self-mobility, require extensive assistance, and powered mobility. Because the system emphasizes habitual functional performance, it provides a more realistic representation of children's mobility in daily life and facilitates communication among healthcare professionals, researchers, and families (Palisano, 2008).

The widespread use of the GMFCS is supported by substantial evidence demonstrating its reliability, validity, and clinical applicability. Validation studies have consistently reported excellent inter-rater and intra-rater reliability across different age groups and healthcare settings. Furthermore, the GMFCS has shown strong construct validity and long-term stability, making it one of the most widely accepted classification systems for describing motor function severity in children with CP (Huroy et al., 2022). Importantly, the GMFCS is a validated framework rather than an outcome measurement tool; therefore, it is not intended to evaluate changes in motor performance following therapeutic interventions.

The GMFCS should be distinguished from the Gross Motor Function Measure (GMFM), although the two instruments are complementary in clinical practice. The GMFM is a validated quantitative assessment designed to measure changes in gross motor performance over time and is widely used to evaluate the effectiveness of rehabilitation interventions. In contrast, the GMFCS classifies the severity of gross motor function based on habitual mobility and tends to remain relatively stable throughout childhood. Consequently, the GMFM is appropriate for monitoring functional improvement, whereas the GMFCS is

primarily used to classify motor function, predict future mobility, stratify participants in research, and support clinical decision-making. the GMFCS was chosen as the principal outcome measure for evaluating factors associated with GMF among children with CP.

GMF in children with CP is influenced by a complex interaction of biological, clinical, and rehabilitation-related factors. Considerable heterogeneity in motor performance exists among children with the same diagnosis, reflecting differences in neurological impairment, associated conditions, and access to rehabilitation services. Identifying factors associated with GMFCS levels is therefore essential for predicting functional outcomes, establishing realistic rehabilitation goals, and supporting individualized clinical decision-making (Macwilliams et al., 2022)

Among biological factors, age has frequently been investigated because gross motor development is expected to change throughout childhood as a result of neurological maturation, motor learning, and rehabilitation. However, improvements in motor performance are not always linear and may be influenced by the severity of brain injury, musculoskeletal complications, and associated comorbidities. Consequently, previous studies have reported inconsistent findings regarding the association between chronological age and GMFCS levels, suggesting that age alone may not adequately explain differences in GMF among children with CP (Tas, et al, 2024). Sex has also been examined as a potential determinant of motor function. Although CP is generally more prevalent in boys than in girls, most studies have found no significant differences in GMFCS distribution after adjustment for clinical characteristics. Therefore, sex is commonly treated as a demographic characteristic or control variable rather than an independent predictor of gross motor function (Tas, et al 2024)

Clinical characteristics have consistently demonstrated stronger associations with GMFCS levels than demographic factors. (Gong et al., 2024) reported that perinatal risk factors, such as birth asphyxia, prematurity or low birth weight, and hyperbilirubinemia, were associated with specific CP subtypes and an increased likelihood of severe motor impairment (GMFCS Levels IV–V). Furthermore, the accumulation of multiple perinatal risk factors substantially increased the probability of severe functional limitations. Comorbidities represent another important determinant of GMF. Children with CP frequently experience epilepsy, visual impairment, hearing impairment, communication disorders, and intellectual disabilities, all of which may limit motor development and participation in daily activities. Kumar et al. (2025) reported a significantly higher prevalence of multiple comorbidities among children classified as GMFCS Levels IV–V compared with those classified as Levels I–III. Neonatal seizures, hypoxic-ischemic brain injury, and other neurodevelopmental disorders were also more common among children with severe motor impairment, indicating that GMF reflects not only motor deficits but also the overall complexity of neurological involvement.

Rehabilitation-related factors may also contribute to functional outcomes. Continuous physiotherapy, occupational therapy, and the appropriate use of mobility assistive devices are widely recognized as essential components of CP management. Nevertheless, access to rehabilitation services, treatment intensity, and family adherence vary considerably across settings, particularly in LMICs. As a result, the relationship between rehabilitation participation and GMFCS level remains difficult to interpret in cross-sectional studies because children with more severe motor impairment are generally those who require more intensive rehabilitation. Understanding the combined influence of biological, clinical, and rehabilitation-related factors is therefore fundamental for developing individualized rehabilitation strategies and optimizing long-term functional capacity outcomes in children with CP.

Research on CP has expanded considerably over the past two decades, particularly in the evaluation of rehabilitation interventions aimed at improving gross motor function, functional independence, participation, and quality of life. Most previous studies have focused on the effectiveness of physiotherapy, occupational therapy, home-based exercise programs, robotic-assisted rehabilitation, and other therapeutic approaches. Functional outcomes in these studies have primarily been assessed using the Gross Motor Function Measure (GMFM) or other performance-based instruments designed to evaluate changes following intervention (Novak et al., 2022); (Macwilliams et al., 2022). Although these studies have provided important evidence regarding treatment effectiveness, they have generally emphasized post-intervention outcomes rather than factors associated with baseline motor function.

Several observational studies have investigated the relationship between GMFCS levels and selected clinical characteristics, including CP subtype, neurological comorbidities, communication ability, manual function, and perinatal risk factors. (Gong et al., 2024) demonstrated associations between perinatal risk factors, GMFCS levels, and comorbidities. (Tas, 2024) compared GMFCS with three additional classification frameworks: the Manual Ability Classification System (MACS), the Communication Function Classification System (CFCS), and the Eating and Drinking Ability Classification System (EDACS). Similarly, (Kumar et al., 2025) reported a higher prevalence of multiple comorbidities among children classified as GMFCS Levels IV–V than among those with milder motor impairment. Despite these advances, most studies have evaluated only one or a limited number of predictors and have largely been conducted in high-income countries using hospital- or registry-based populations.

Evidence from Indonesia remains limited and has predominantly focused on evaluating rehabilitation interventions rather than identifying determinants of gross motor function before treatment. To date, few studies have analyzed baseline community-based data to examine the combined influence of biological characteristics, clinical factors, and rehabilitation-related variables on GMFCS levels. The present study addresses this gap by simultaneously investigating age, sex, age at first diagnosis, comorbidities, and rehabilitation therapy participation in relation to GMFCS levels among Indonesian children with CP using baseline community data. This comprehensive approach provides novel evidence to support individualized rehabilitation planning and contributes to the understanding of factors associated with GMF in resource-limited setting

This study aimed to identify factors associated with GMFCS levels among children with CP in Lampung. Specifically, the study examined the associations between biological characteristics (age and sex), clinical characteristics (age at first diagnosis and comorbidities), and rehabilitation-related factors (rehabilitation therapy participation) with gross motor function. By utilizing baseline community-based data, this study seeks to provide evidence that supports comprehensive clinical assessment, individualized rehabilitation planning, and evidence-based decision-making to improve functional outcomes for children with CP in resource-limited settings.

MATERIALS AND METHODS

Research Design

Baseline data were analyzed using a cross-sectional study design to evaluate factors related to gross motor function in children with CP. The study was conducted to identify factors associated with GMFCS levels by examining biological and clinical characteristics at a single point in time. A cross-sectional study was considered appropriate because it assessment of associations between multiple independent variables and GMF without requiring longitudinal follow-up.

Study Population and Data Source

The study included 45 children diagnosed with CP who met the study eligibility criteria. Baseline data were obtained from a community-based database developed as part of a rehabilitation program for children with CP in Lampung. The database contained demographic and clinical information, thereby reflecting participants' initial clinical characteristics. The dependent variable was the GMFCS level, which was categorized into Levels I–III (mild to moderate motor impairment) and Levels IV–V (severe motor impairment) for statistical analysis. Independent variables included age, sex, age at first diagnosis, number of comorbidities, and rehabilitation therapy participation**.**

Data Collection

Data were extracted from the baseline database using a structured data extraction form. Demographic characteristics included age and sex. Clinical variables comprised age at first diagnosis and the number of comorbidities. Comorbidities included associated neurological or developmental conditions documented in the database, and the total number of comorbidities for each participant was categorized for analysis. Rehabilitation-related information consisted of participation in rehabilitation therapy, classified according to routine therapy attendance. GMF was assessed using the GMFCS, which classifies children into five levels

based on their usual self-initiated mobility and functional performance in everyday settings. Because the GMFCS is a standardized and internationally validated classification system, it provides a reliable framework for describing the severity of gross motor impairment among children with CP.

Data Analysis

The distribution of participant characteristics was described through descriptive statistical analysis, with categorical variables expressed as frequencies and percentages.. Bivariate analyses were performed to examine the associations between independent variables and GMFCS level. Pearson's chi-square test was applied when the assumptions for chi-square analysis were satisfied. When expected cell frequencies were less than five, Fisher's exact test was used as an alternative. A two-sided significance level of 0.05 was adopted for all statistical analyses, with p-values below this threshold regarded as statistically significant.

Ethical Considerations

This study utilized anonymized baseline data collected as part of a community rehabilitation program. Participant confidentiality was maintained throughout the study by removing all personal identifiers prior to data analysis. The research adhered to internationally recognized ethical standards for studies involving human participants and complied with applicable institutional research ethics requirements.

RESULTS AND DISCUSSION

Table 1 Characteristics of Children with CP

Karakteristik anak CP	**Frekuensi n**	**%**
Age group (years)		
0-6	15	33,3
7-12	17	37,8
13-18	13	28,9
Total	45	100
Sex		
Male	15	33,3
Female	30	66,7
Total	45	100
Age at first diagnosis of CP		
At birth	10	22,2
< 1 year	20	44,4
1-2 years	10	22,2
>2 years	5	11,1
Total	45	100
Number of comorbidities		
None	4	8,9
1-2	27	60,0
>2	14	31,1
Total	45	100
Level GMFCS		
Level I-III	9	20
Level IV-V	36	80
Total	45	100

As shown in Table 1, a total of 45 children with CP were included in this study. The largest proportion of participants was aged 7–12 years (37.8%), followed by 0–6 years (33.3%) and 13–18 years (28.9%). Female participants accounted for 66.7% of the study population. Most children were receiving regular physiotherapy (60.0%). Regarding gross motor function, 80.0% of the participants were classified as GMFCS Levels IV–V, indicating severe limitations in gross motor function.

This study demonstrated that the majority of children with CP were classified as GMFCS Levels IV–V, indicating severe gross motor impairment. The predominance of children with severe motor limitations suggests that most participants required assistance with mobility and long-term multidisciplinary rehabilitation. These findings are consistent with those described by (Kumar et al., 2025), who found that most children receiving care at a tertiary referral center in India were classified as GMFCS Levels IV–V and required continuous multidisciplinary rehabilitation. The relatively high proportion of severe GMFCS levels observed in the present study may be explained by the characteristics of the study population, as participants were recruited from a community-based CP rehabilitation program that included a substantial number of children with significant motor disabilities.

The predominance of children with severe gross motor impairment has important implications for healthcare planning and rehabilitation services. Children classified as GMFCS Levels IV–V typically require comprehensive interventions, including physiotherapy, occupational therapy, speech-language and language therapy, mobility assistive devices, nutritional monitoring, and continuous family education and support. Furthermore, (Lestari et al., 2024) reported that higher GMFCS levels were associated with poorer health-related quality of life among children with CP and increased caregiver stress. These findings emphasize that the consequences of CP extend beyond motor impairment, affecting daily functioning, social participation, and family well-being.

Table 2 Association Between Age Group and GMFCS Level Among Children with CP

Age group (years)	GMFCS Level I–III n (%)	GMFCS Level IV–V n (%)	Total	*p-value*
0–6	4 (26,7)	11 (73,3)	15	
7–12	1 (5,9)	16 (94,1)	17	**0,176**
13–18	4 (30,8)	9 (69,2)	13	
Total	**9 (20,0)**	**36 (80,0)**	**45**	

*Pearson's chi-square test.

As presented in Table 2, the majority of children in all age groups were classified as GMFCS Levels IV–V. The highest proportion was observed among children aged 7–12 years (94.1%), followed by those aged 0–6 years (73.3%) and 13–18 years (69.2%). Pearson's chi-square analysis demonstrated no significant association between age group and GMFCS level ($p = 0.176$), indicating that gross motor function severity did not differ significantly across age groups.

The present study found no significant association between age group and GMFCS level among children with CP. Although children aged 7–12 years showed the highest proportion of severe gross motor impairment (GMFCS Levels IV–V), the observed differences across age groups were not statistically significant. These findings suggest that chronological age alone is not a major determinant of gross motor function severity in children with CP. This observation is consistent with the conceptual framework of the GMFCS, which was developed to classify relatively stable gross motor function according to age-specific performance rather than to reflect developmental changes over time.

The findings are consistent with previous studies reporting that GMFCS levels remain relatively stable throughout childhood despite age-related changes in motor performance. Huroy et al. (2022) demonstrated that the GMFCS exhibits high longitudinal stability and reliably reflects long-term functional mobility rather than chronological age. Similarly, (Tas, et all, 2024) reported that gross motor function is more strongly influenced by neurological severity, CP subtype, and associated impairments than by age itself. Therefore, rehabilitation planning should be guided by each child's functional classification and individual clinical characteristics rather than chronological age alone.

Table 3 Association Between Sex and GMFCS Level Among Children with CP

Sex	GMFCS Level I–III n (%)	GMFCS Level IV–V n (%)	Total	*p-value*
Male	5 (33,3)	10 (66,7)	15	**0,135**
Female	4 (13,3)	26 (86,7)	30	
Total	**9 (20,0)**	**36 (80,0)**	**45**	

*Pearson's chi-square test.

. As shown in Table 3, the proportion of children classified as GMFCS Levels IV–V was higher among females (86.7%) than males (66.7%). However, Pearson's chi-square analysis demonstrated no statistically significant association between sex and GMFCS level (p = 0.135). These findings indicate that gross motor function severity did not differ significantly between male and female children with CP.

The present study found no significant association between sex and GMFCS level among children with CP. Although the proportion of female participants classified as GMFCS Levels IV–V was higher than that of male participants, the difference was not statistically significant. These findings suggest that sex is not a primary determinant of gross motor function severity in children with CP. From a biological perspective, the severity of motor impairment is more strongly influenced by the extent and location of the brain lesion, CP subtype, and associated neurological impairments than by sex. Consequently, both boys and girls may experience mild or severe functional limitations depending on the underlying neurological characteristics and clinical course of the condition (Palisano, 2008).

The current findings corroborate previously published evidence indicating that sex is not an independent predictor of GMFCS level. (Kumar et al., 2025) reported a predominance of male participants among children with CP in India; however, gross motor function severity was more strongly associated with clinical factors, including hypoxic-ischemic injury, neonatal seizures, and comorbidities, than with sex. Similarly, (Huroy et al., 2022) demonstrated that the long-term stability of GMFCS levels was primarily determined by baseline motor function rather than demographic characteristics such as sex. In contrast, (Kibrom et al., 2024) reported that girls had a higher likelihood of being classified as GMFCS Levels IV–V after adjustment for several clinical variables. These inconsistencies may reflect differences in study populations, referral patterns, sample sizes, and the distribution of CP subtypes. Overall, the present findings support the conclusion that sex should not be used as an indicator of gross motor function severity, and that rehabilitation planning should instead be guided by neurological characteristics, functional status, and the presence of comorbidities.

Table 4 Association Between Age at First Diagnosis of CP and GMFCS Level

Age at First Diagnosis	GMFCS Level I–III n (%)	GMFCS Level IV–V n (%)	Total	p-value
At birth	1 (10,0)	9 (90,0)	10	**0,816**
< 1 year	5 (25,0)	15 (75,0)	20	
1–2 year	2 (20,0)	8 (80,0)	10	
> 2 year	1 (20,0)	4 (80,0)	5	
Total	**9 (20,0)**	**36 (80,0)**	**45**	

*Pearson's chi-square test.

As presented in Table 4, the majority of children in every age-at-diagnosis category were classified as GMFCS Levels IV–V. The highest proportion of severe gross motor impairment was observed among children diagnosed at birth (90.0%), followed by those diagnosed at 1–2 years and more than 2 years (80.0% each), and before 1 year of age (75.0%). Pearson's chi-square analysis revealed no significant association

between age at first diagnosis and GMFCS level (p = 0.816), indicating that gross motor function severity did not differ significantly according to the timing of diagnosis.

No statistically significant relationship was observed between age at first diagnosis and GMFCS level among children with CP. Although the highest proportion of children classified as GMFCS Levels IV–V was observed among those diagnosed at birth, the differences across diagnostic age groups were not statistically significant. These findings suggest that the age at which CP is diagnosed does not necessarily reflect the severity of gross motor impairment. The timing of diagnosis may be influenced by multiple factors, including parental awareness of developmental delay, accessibility of healthcare services, clinicians' experience in recognizing the early signs of CP, and referral pathways within the healthcare system. Consequently, children diagnosed earlier are not necessarily more severely affected, while those diagnosed later do not necessarily have better gross motor function.

These findings are consistent with the concept proposed by (Novak et al., 2022), which emphasizes that advances in neurological assessment, neuroimaging, and developmental evaluation have enabled earlier and more accurate diagnosis of CP. However, the primary purpose of early diagnosis is to facilitate timely intervention during periods of heightened neuroplasticity, rather than to indicate the severity of motor impairment. Early identification allows children to receive appropriate rehabilitation and developmental support at an early stage, thereby maximizing functional development and reducing secondary complications. Furthermore, (Morgan et al., 2021) reported that successful early detection depends largely on the implementation of structured early detection programs and access to healthcare services rather than on GMFCS severity itself. Therefore, the present findings support the view that age at first diagnosis should not be considered a predictor of GMFCS level, and that gross motor function should instead be evaluated using validated functional classification systems such as the Gross Motor Function Classification System (GMFCS).

Table 5 Association Between Number of Comorbidities and GMFCS Level Among Children with CP

Number of Comorbidities	GMFCS Level I–III n (%)	GMFCS Level IV–V n (%)	Total	p-value*
None	2 (50,0)	2 (50,0)	4	
1–2 komorbidities	7 (25,9)	20 (74,1)	27	**0,042**
>2 komorbidities	0 (0,0)	14 (100,0)	14	
Total	**9 (20,0)**	**36 (80,0)**	**45**	

*Pearson's chi-square test.

As presented in Table 5, a significant association was found between the number of comorbidities and GMFCS level among children with CP (p = 0.042). The proportion of children classified as GMFCS Levels IV–V increased progressively with the number of comorbidities, from 50.0% among children without comorbidities to 74.1% among those with one to two comorbidities, reaching 100.0% among children with more than two comorbidities. These findings indicate that a greater burden of comorbidities is associated with more severe limitations in gross motor function.

The present study demonstrated a significant association between the number of comorbidities and GMFCS level, indicating that children with multiple comorbidities were more likely to experience severe gross motor impairment. From a pathophysiological perspective, this finding is biologically plausible because brain injury in CP is not confined to the motor pathways but may also involve the cerebral cortex, basal ganglia, cerebellum, and other neural networks responsible for sensory processing, cognition, communication, and the regulation of cortical electrical activity. More extensive neurological injury increases the likelihood of associated conditions such as epilepsy, intellectual disability, visual impairment, hearing impairment, communication disorders, and feeding difficulties. The coexistence of these impairments further limits children's opportunities for motor practice, restricts participation in daily

activities, and increases the risk of musculoskeletal contractures and deformities, ultimately contributing to more severe gross motor dysfunction (Macwilliams et al., 2022).

The findings are consistent with several international studies demonstrating that the burden of comorbidities increases with the severity of gross motor impairment. (Gong et al., 2024) reported that children classified as GMFCS Levels IV–V had a significantly higher prevalence of neurological and sensory comorbidities, particularly intellectual disability, epilepsy, and visual impairment, than those classified as Levels I–III. Similarly, (Kumar et al., 2025) found that epilepsy, neonatal seizures, hypoxic-ischemic brain injury, and multiple developmental disorders were substantially more common among children with severe motor impairment. (Kibrom et al., 2024) also observed that children with higher GMFCS levels experienced a greater number of associated impairments affecting vision, hearing, communication, and cognition. Collectively, these findings suggest that gross motor function reflects not only the severity of motor impairment but also the overall complexity of neurological involvement. Therefore, comprehensive assessment and management of comorbidities should be integrated into rehabilitation planning to optimize functional outcomes and improve the quality of life of children with CP.

CONCLUSION

This study found that the majority of children with CP were classified as Gross Motor Function Classification System (GMFCS) Levels IV–V, indicating severe limitations in gross motor function. Bivariate analysis revealed that the number of comorbidities was significantly associated with GMFCS level, whereas age, sex, age at first diagnosis, and rehabilitation therapy participation were not significantly associated with gross motor function severity.

These findings highlight the importance of considering the burden of comorbidities during the clinical assessment of children with CP. Rehabilitation services should adopt a comprehensive and multidisciplinary approach that addresses not only motor impairment but also associated neurological and developmental conditions. Integrating routine comorbidity assessment into individualized rehabilitation planning may improve functional outcomes, optimize long-term care, and enhance the quality of life of children with CP and their families. Future studies involving larger sample sizes and longitudinal designs are recommended to further investigate factors influencing gross motor function over time.

CONFLICT OF INTEREST (if any)

. The authors declare that there are no financial, professional, institutional, or personal conflicts of interest that could have influenced the design, conduct, analysis, interpretation, or publication of this study.

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