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Original Article

Functioning profile and gross motor function of children with congenital Zika virus syndrome

Perfil de funcionalidade e função motora grossa de crianças com síndrome congênita do Zika vírus

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Abstract

Objective: To describe the functioning profile and gross motor function of children with congenital Zika virus syndrome (CZS). **Method:** Eleven children aged zero to six years were assessed using the Gross Motor Function Measure (GMFM), the Gross Motor Function Classification System (GMFCS), and the Core Set of the International Classification of Functioning, Disability and Health (ICF). **Results:** The mean age of the children was 4.45 ±1.96 years, and all (n = 11, 100%) presented microcephaly. Among them, 91% (n = 10) had severe motor impairment (GMFCS levels IV and V), and 9% (n = 1) had mild motor impairment (GMFCS level I). Children with severe motor impairment achieved the lowest mean score in item C(crawling and kneeling: 0.57 ±0.78; median 0.00), whereas the child with mild impairment obtained lower means across all dimensions (A, B, C, D, and E). **Conclusion:** The functioning profile revealed more pronounced losses in neuromusculoskeletal and movement-related functions, as well as greater difficulties in mobility and personal care. Social attitudes and health services, systems, and policies were identified as barriers, whereas the immediate family was considered the main facilitator. CZS negatively affects the gross motor function and overall functionality of children.

Keywords: Microcephaly; Zika virus infection; International Classification of Functioning, Disability and Health; motor skills.

Resumo

Objetivo: Descrever o perfil de funcionalidade e a função motora grossa de crianças com SCZ de um Centro Especializado em Reabilitação II (CER II), na Bahia, Brasil. **Método:**

Received on Dec. 6, 2024; Revision on Jan. 21, 2025; Accepted on Sep. 29, 2025.

Estudo realizado com 11 crianças de 0-6 anos de idade, avaliadas respectivamente com o Gross Motor Function Measure (GMFM), Gross Motor Function Classification System (GMFCS) e um Core Set da Classificação Internacional de funcionalidade, incapacidade e saúde (CIF). **Resultados:** A idade média das crianças foi de 4,45 (±1,96) anos e todas (n=11, 100%) com diagnóstico de microcefalia. Destas, 91% (n=10) com comprometimento motor grave (GMFCS IV e V) e 9% (n=1) comprometimento motor leve (GMFCS I). Aquelas com comprometimento motor grave alcançaram menor pontuação média no item C – engatinhar e ajoelhar (0,57 ±0,78; mediana 0,00), enquanto àquelas com comprometimento leve alcançaram em todas as dimensões (A, B, C, D e E). **Conclusões:** O perfil funcional demonstrou maiores prejuízos nas funções neuromusculoesqueléticas e relacionadas ao movimento, maiores dificuldades na mobilidade e cuidado pessoal, sendo as atitudes sociais e serviços, sistemas e políticas de saúde as maiores barreiras, e a família imediata o maior facilitador. A SCZ compromete gravemente a função motora grossa e a funcionalidade destas crianças.

Palavras-chave: Microcefalia, Infecção por Zika vírus, Classificação Internacional de Funcionalidade, Incapacidade e Saúde, Destreza Motora.

Introduction

World Health Organization declared some international public health emergencies in the last years, including the Zika virus epidemic, which occurred from 2015 to 2016 in Brazil (World Health Organization, 2022). Zika virus has a high teratogenic potential that results in signs and symptoms in children born to infected mothers, which is named congenital Zika virus syndrome (CZS) (Estévez-Herrera et al., 2021). Although not fully known, the spectrum of CZS presents degrees of severity in neurological, sensory, and orthopedic manifestations that may impair the motor development and functioning of children with CZS (de Albuquerque et al., 2018; Sobral da Silva et al., 2020).

The magnitude of manifestations is related to the gestational period at the time of Zika virus infection. Thus, children with intrauterine exposure in the first trimester present greater severity (Brady et al., 2019; Pool et al., 2019) as microcephaly (Aragao et al., 2017). In this sense, postural changes, spasticity, and other signs of pyramidal release that alter sensory and motor function, similar to cerebral palsy (CP), are considered obstacles to the acquisition of motor and functional skills (Ferreira et al., 2018; Ribeiro et al., 2022; Sobral da Silva et al., 2020).

The variability of comorbidities present in children with CZS (such as: arthrogryposis, dysphagia and epilepsy) may exacerbate clinical vulnerability and reduce motor repertoire (Frota et al., 2020; Marques et al., 2025). The literature has described impairments in language functions, social functions, and movements, as well as severe limitations in maintaining body position and movements, among other damages in gross motor functions not totally clear in the literature. These impairments added to the context of children and families affected may reduce social participation, functioning, and a better prognosis (Ferreira et al., 2018; Hamanaka et al., 2022; Borba et al., 2025).

CZS becomes a severe public health problem because of the clinical severity and extent of functional impairment. Thus, understanding CZS by monitoring gross motor function and motor development is essential to knowing the prognosis and improving healthcare guidance (Hamanaka et al., 2022; Melo et al., 2020). Examples of tools include Core Sets from the International Classification of Functioning, Disability and Health (ICF), Gross Motor Function Classification System (GMFCS), and Gross Motor Function Measure (GMFM) (Hamanaka et al., 2022; Melo et al., 2020).

Children with CSZ are attended by health care centers, especially rehabilitation centers, but no studies have described the functioning and gross motor function of children with CZS in these centers in Bahia, Brazil. Thus, the aim of this study was to describe the functioning profile and gross motor function of children with CZS treated at a specialized rehabilitation center II (SRH II) in Bahia, Brazil.

Methods

A descriptive study was conducted from April to August 2022 with children with CZS at SRH II in Bahia, Brazil. SRH II is a specialized care in rehabilitation of the Care Network for People with Disabilities (Rede de Cuidados à Pessoa com Deficiência), established in the Brazilian Unified Health System via Ordinance GM/MS No. 793 of April 24, 2012 (Brasil, 2012), and is a reference for physical and intellectual rehabilitation, orthoses, prostheses, and mobility aids for cities in central north macro-region of Bahia. This study was approved by the Ethics Committee of the State University of Bahia, through ethical opinion CAAE 52526221.0.0000.0057 and all those responsible signed the Free and Informed Consent Form.

Inclusion criteria encompassed caregivers of children aged from zero to six years old presenting a confirmed or probable diagnosis of CZS who attended SRH II. Those with a discarded diagnosis of CZS or who were inaccessible (i.e., children and caregivers [or both] unable to establish contact) during the data collection period were excluded.

Data collection instruments and procedures

Sociodemographic data (maternal, clinical, and health characteristics) of the children presenting CZS diagnosis (confirmed or presumed) were collected from electronic medical records of the institution, and the caregivers answered a questionnaire via Google Forms®, which contained questions about the child (sex, age and diagnosis of microcephaly) and information about the caregiver (characterization of the caregiver with sex and age). The caregivers signed an informed consent form and informed assent form authorizing their participation (caregivers and their children). Consent for recording, storage, and scientific use of audiovisual data was obtained for all children.

Regarding gross motor function, each child was evaluated by a physiotherapist experienced in motor development and trained to apply GMFM and GMFCS. The assessments were recorded on video and scored later by the same physiotherapist.

The GMFM is a quantitative tool that evaluates changes in gross motor function in children with CP, but it is also applicable to children with CZS who have severe motor

impairments compatible with CP (Einspieler et al., 2019; Frota et al., 2020). The tool comprises five dimensions: (A) lying and rolling, (B) sitting, (C) crawling and kneeling, (D) standing, and (E) walking, running, and jumping. The GMFM was used to provide a more detailed description of motor function in young children or children with severe impairments (Takahasi et al., 2021). All items were rated on a zero to three scale; a maximum of three attempts were allowed for each item (Cyrillo & Galvão, 2015), and the best attempt was recorded. The score for each dimension was expressed as a percentage considering the maximum score; the total score was given by the mean of percentage from all dimensions (Cyrillo & Galvão, 2015).

The GMFCS classified the severity of gross motor impairment in children without judging the quality or potential for improvement. This scale stratifies independence and functioning at an increasing level from I (the best repertoire of gross motor skills) to V (the highest level of impairment, with a smaller gross motor repertoire and greater dependence) (Cyrillo & Galvão, 2015; Palisano et al., 2009).

Functional profiles of the children were drawn up, and, since there is no validated Core Set available for SCZ, we applied the version designed for children with CP aged zero to six years. The Core Set was applied during child observation and through direct questions to the caregiver. This list was originally developed by Schiariti et al. (2015), and its use was justified by the clinical characteristics of SCZ being consistent with those of CP, such as pyramidal signs and spasticity (Ferreira et al., 2018). The Core Set is a summary list of essential and relevant categories from the ICF within the domains of body functions and structures, activities and participation, and environmental factors for specific conditions (Schiariti et al., 2015).

The Core Set was filled out using the electronic tool: https://icf-core-sets.org/index.php. Functioning profiles were outlined according to the qualifiers ranging from 0 to 4 (0 = no problem, 1 = mild problem, 2 = moderate problem, 3 = severe problem, and 4 = complete problem). In the categories corresponding to environmental factors, 0 represented no barrier and 4 a complete barrier, with ranged from +1 to +4 facilitators (+1 = mild, +2 = moderate, +3 = substantial, and +4 = complete) and 1 to 4 barriers (1 = mild barrier, 2 = moderate barrier, 3 = substantial barrier, 4 = complete barrier). Qualifier 8 was used when the information was not possible to specify.

Statistical analysis

GMFM scores from dimension and total scores were converted into percentages using the Gross Motor Ability Estimator software (GMAE-2). The data were analyzed descriptively using measures of central tendency and dispersion. For the total scores and each dimension, differences in means and standard deviations of each functional impairment group were examined (Hamanaka et al., 2022; Woodruff & Duffield, 2002). For the Core Set, the analysis considered the percentages obtained for the qualifiers in each category, and all analyses were conducted in SPSS (version 24.0).

Results

The final sample included 11 children with CZS (six boys and five girls) with a mean age of 4.45 (± 1.96) years, and all presented microcephaly. Their caregivers were mothers (100%, n = 11) with a mean age of 30.77 (± 7.24) years. Their educational level ranged from elementary school to university, with the majority having a secondary education level (54.5%). Regarding socioeconomic status, most of them were unemployed (72.7%).

According to the GMFCS, most children (91%, n = 10) have level IV and V, only 9% (n =1) level I, and no child was classified as level II or III (Figure 1).

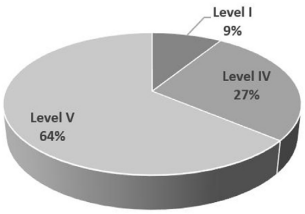

Figure 1. Classification into levels of children gross motor function according to the GMFCS (levels I, IV, and V).

In the assessment of gross motor function, the GMFCS IV and V scored in dimensions A, B, and C of the GMFM, with a lower average score in item C (0.68 ±1.17), and at dimensions D and E has a median of 0.00 and a score of 0. While the GMFCS I scored in all dimensions (A, B, C, D, and E).

The lowest scores were observed in level V children (median: 7.40), suggesting essential limitations in basic tasks and a significant impact on the functionality of those more affected. On the other hand, the child classified with level I (median: 90.5), when able to achieve dimension E skills, manifested fewer limitations in gross motor function. Table 1 presents the GMFM scores by dimension, according to the GMFCS level of the participating children.

Table 1. Gross motor function according to the GMFM dimensions and classification into GMFCS levels.

	GMFM											
	DIMENSION A		DIMENSION B		DIMENSION C		DIMENSION D		DIMENSION E		TOTAL	
GMFCS	Mean*/ SD	Median	Mean*/ SD	Median	Mean*/ SD	Median	Mean*/ SD	Median	Mean*/ SD	Median	Mean*/ SD	Median
Level I (n=1)	100.00 (-)	100.00	100.00 (-)	100.00	85.70 (-)	85.70	84.60 (-)	84.6	81.90 (-)	81.90	90.5 (-)	90.5
Level IV (n=3)	43.80 (±5.95)	45.10	17.76 (±0.92)	18.30	0.80 (±1.38)	0.00	0.00 (±0.00)	0.00	0.00 (±0.00)	0.00	12.46 (±0.77)	12.70
Level V (n=7)	23.54 (±10.14)	25.50	10.67 (±3.27)	13.00	0.68 (±1.17)	0.00	0.00 (±0.00)	0.00	0.00 (±0.00)	0.00	7.00 (±2.51)	7.40

GMFM: Gross Motor Function Measure; GMFCS: Gross Motor Function Classification System; SD: standard deviation. *Mean values of the percentages.

Frequencies calculated for each domain of ICF and its categories demonstrated the severity of the impairments, degree of difficulty in conducting activities, participation restrictions, and influence of environmental factors on the lives of children with CZS. Then, a functioning profile of the study sample was outlined using the ICF electronic tool.

The body functions most seriously affected were the mental functions of language b167 (72.7%, n = 8) and control of voluntary movement functions b760 (72.7%, n =8). In contrast, most children had no history or diagnosis of impairments in hearing functions b230 (72.7%, n = 8). Regarding the structure of the body, information from medical records and reports from caregivers evidenced the structure of brain (s110) with emphasis on microcephaly, but without specifying the extent of the structural involvement. This information is detailed in Table 2.

Table 2. The functioning profile of the body functions and structures domains based on the Core Set qualifiers (for children with CP aged zero to six years).

DOMAINS	Categories	QUALIFIERS					
		0 None Impairment	**1 Mild Impairment**	**2 Moderate Impairment**	**3 Severe Impairment**	**4 Complete Impairment**	**8 Unspecified**
Body functions	b117 (Intellectual functions)	18.2% (n=2)	N/A	18.2% (n=2)	63.6% (n=7)	N/A	N/A
	b134 (Sleep functions)	18.2% (n=2)	36.4% (n=4)	18.2% (n=2)	27.3% (n=3)	N/A	N/A
	b167 (Mental functions of language)	9.1% (n=1)	9.1% (n=1)	9.1% (n=1)	72.7% (n=8)	N/A	N/A
	b210 (Seeing functions)	27.3% (n=3)	18.2% (n=2)	36.4% (n=4)	18.2% (n=2)	N/A	N/A
	b230 (Hearing functions)	72.7% (n=8)	N/A	27.3% (n=3)	N/A	N/A	N/A
	b280 (Sensation of pain)	63.6% (n=7)	27.3% (n=3)	9.1% (n=1)	N/A	N/A	N/A
	b710 (Mobility of joint functions)	9.1% (n=1)	N/A	54.5% (n=6)	36.4% (n=4)	N/A	N/A
	b735 (Muscle tone functions)	9.1% (n=1)	N/A	18.2% (n=2)	63.6% (n=7)	9.1% (n=1)	N/A
	b760 (Control of voluntary movement functions)	9.1% (n=1)	N/A	18.2% (n=2)	72.7% (n=8)	N/A	N/A
Body Structures	s110 (Structure of brain)	N/A	N/A	N/A	N/A	N/A	100% (n=11)

N/A: Not applicable; n: sample size.

Table 3 presents the activities and participation domain. The most seriously affected functions were maintaining body position d415 (90.9%, n = 10) and basic interpersonal interactions d710 (63.6%, n = 7). In addition, a higher frequency of complete difficulties was found in fine hands use d440 (45.5%, n = 5), walking d880 (81.8%, n = 9), toileting d530 (81.8%, n = 9), and eating d550 (54.5%, n = 6). The most mildly encountered difficulties were related to family relationships d760 (36.4%, n = 4); however, this category was also considered seriously affected by the same percentage of patients.

Table 3. Functioning profile of the activities and participation domain according to the Core Set qualifiers.

Categories	QUALIFIERS					
	0 None Difficulty (Capacity)	1 Mild Difficulty (Capacity)	2 Moderate Difficulty (Capacity)	3 Severe Difficulty (Capacity)	4 Complete Difficulty (Capacity)	8 Unspecified
d 133 (Language acquisition)	18.2% (n=2)	N/A	9.1% (n=1)	54.5% (n=6)	18.2% (n=2)	N/A
d 155 (Acquiring skills)	N/A	9.1% (n=1)	9.1% (n=1)	54.5% (n=6)	27.3% (n=3)	N/A
d 415 (Maintaining a body position)	9.1% (n=1)	N/A	N/A	90.9% (n=10)	N/A	N/A
d 440 (Fine hand use)	9.1% (n=1)	N/A	18.2% (n=2)	27.3% (n=3)	45.5% (n=5)	N/A
d 450 (Walking)	9.1% (n=1)	N/A	N/A	9.1% (n=1)	81.8% (n=9)	N/A
d 460 (Moving Around in different locations)	9.1% (n=1)	N/A	N/A	45.5% (n=5)	45.5% (n=5)	N/A
d 530 (Taileting)	9.1% (n=1)	N/A	9.1% (n=1)	N/A	81.8% (n=9)	N/A
d 550 (Eating)	9.1% (n=1)	N/A	9.1% (n=1)	27.3% (n=3)	54.5% (n=6)	N/A
d 710 (Basic interpersonal interactions)	18.2% (n=2)	9.1% (n=1)	9.1% (n=1)	63.6% (n=7)	N/A	N/A
d 760 (Family relationships)	36.4% (n=4)	N/A	27.3% (n=3)	36.4% (n=4)	N/A	N/A
d 880 (Engagement in play)	18.2% (n=2)	9.1% (n=1)	36.4% (n=4)	36.4% (n=4)	N/A	N/A

N/A: Not applicable; n: sample size.

The description of the contextual factors that may positively or negatively influence aspects of functionality is shown in Table 4. The category considered by most as a

complete barrier was societal attitudes e460 (55.6%, n = 5), and the substantial barrier was related to health services, systems, and policies e580 (71.4%, n = 5). For the environmental factors considered as facilitators, the most significant was in products and technology for personal indoor and outdoor mobility, and transportation e120 (50.0%, n = 5) and health professionals e355 (50.0%, n = 5), which were considered moderate and substantial facilitators, respectively.

Table 4. Frequencies of the Environmental Factors domain component according to the qualifiers for the barriers and facilitators of the Core Set for children with CP aged zero to six years, n =11.

Categories	1 Mild Barrier	2 Moderate Barrier	3 Severe Barrier	4 Complete Barrier	0 No facilitator/No barrier	+1 Mild Facilitator	+2 Moderate Facilitador	+3 Substantial Facilitador	+4 Complete Facilitador
e 115 Products and technology for personal use in daily living	N/A	100.0% (n=2)	N/A	N/A	N/A	11.1% (n=1)	33.3% (n=3)	22.2% (n=2)	33.3 % (n=3)
e 120 Products and technology for personal indoor and outdoor mobility and transportation	N/A	N/A	100.0 % (n=1)	N/A	N/A	10.0% (n=1)	50.0% (n=5)	10.0% (n=1)	30.0 % (n=3)
e 125 Products and technology for communication	N/A	50.0% (n=1)	50.0% (n=1)	N/A	n=2	28.6% (n=2)	28.6% (n=2)	28.6% (n=2)	14.3 % (n=1)
e 150 Design, construction and Building products and technology of buildings for public use	N/A	50.0% (n=5)	30.0% (n=3)	20.0% (n=2)	N/D	N/D	100.0% (n=1)	N/A	N/A
e 310 Immediate Family	N/A	N/A	N/A	100.0% (n=1)	N/A	10.0% (n=1)	30.0% (n=3)	30.0% (n=3)	30.0 % (n=3)
e 320 Friends	N/A	25.0% (n=1)	25.0% (n=1)	50.0% (n=2)	n= 2	40.0% (n=2)	20.0% (n=1)	20.0% (n=1)	20.0 % (n=1)

Table 4. Continued…

Categories	1 Mild Barrier	2 Moderate Barrier	3 Severe Barrier	4 Complete Barrier	0 No facilitator/No barrier	+1 Mild Facilitator	+2 Moderate Facilitador	+3 Substantial Facilitador	+4 Complete Facilitador
e 355 Health Professionals	N/A	100.0% (n=1)	N/A	N/A	N/A	20.0% (n=2)	20.0% (n=2)	50.0% (n=5)	10.0 % (n=1)
e 410 Individual attitudes of immediate family members	N/A	N/A	50.0% (n=1)	50.0% (n=1)	N/A	11.1% (n=1)	33.3% (n=3)	33.3% (n=3)	22.9 % (n=2)
e 460 Society attitudes	11.1 % (n=1)	N/A	33.3% (n=3)	55.6% (n=5)	n=2	N/A	N/A	N/A	N/A
e 580 Health services, systems and policies	N/A	14.3% (n=1)	71.4% (n=5)	14.3% (n=1)	N/A	50.0% (n=2)	25.0% (n=1)	25.0% (n=1)	N/A

N/A: Not applicable; n: sample size.

A sample functioning profile was created based on the highest percentages of each domain, as shown in Table 5.

Table 5. Sample functionality profile by ICF domain.

BODY FUNCTIONS		Impairment					
		0	**1**	**2**	**3**	**4**	**8**
b117	Intellectual Functions						
b134	Sleep functions						
b167	Mental functions of language						
b210	Visual functions						
b230	Hearing functions						
b280	Sensation of pain						
b710	Mobility of joint functions						
b735	Muscle tone functions						
b760	Control of voluntary movement functions						
BODY STRUCTURE		Impairment					
		0	1	2	3	4	8
s110	Structure of brain						
ACTIVITIES AND PARTICIPATION		Difficulty					
		0	1	2	3	4	8
d133	Acquiring language						
d155	Acquiring skill						
d415	Maintain body position						

Table 5. Continued…

	BODY FUNCTIONS	Impairment					
		0	**1**	**2**	**3**	**4**	**8**
d440	Fine hand use						
d450	Walking						
d460	Moving around in different locations						
d530	Toileting						
d550	Eating						
d710	Basic Interpersonal Interactions						
d760	Family relationships						
d880	Engagement in play						
	ENVIRONMENTAL FACTORS	Facilitator Barrier					
		+4	+3	+2	+1	0	1 2 3 4
e115	Products and technology for personal use in daily life						
e120	Products and technology for personal indoor and outdoor mobility, and transportation						
e125	Products and technologies for communication						
e150	Design, construction and building products and technology of buildings for public use						
e320	Friends						
e410	Individual attitudes of immediate family members						
e460	Societal attitudes						
e580	Health services, systems, and policies						

Source: Adapted from Bickenbach et al. (2020).

Discussion

The present study aimed to describe the gross motor function and functioning profile of children with CZS aged between zero and six who attended SRH II in Bahia. Previous studies neither evaluated the gross motor function of children with CZS, nor described their functioning according to the ICF domains in an age range above 36 months.

The results demonstrated that all children had microcephaly, a relevant factor since studies that evaluated children with CZS revealed that head circumference was associated with impaired movement patterns (Aragao et al., 2017; Alves et al., 2018; Einspieler et al., 2019; Carvalho et al., 2020; Cavalcante et al., 2021). According to Ribeiro et al. (2022), the greater the degree of microcephaly, the higher the impairment of movement patterns.

In the present study, most children presented severe motor impairment (GMFCS levels IV and V), corroborating previous studies (Carvalho et al., 2020; Frota et al., 2020; Melo et al., 2020; Hamanaka et al., 2022; Ribeiro et al., 2022), which indicated more severe difficulties in acquiring or maintaining basic postures, sitting, and gait, performing postural changes, and a greater degree of dependence on their caregivers and aids for locomotion (Hamanaka et al., 2022). Only one child was classified at GMFCS level I and walked without assistance.

Hamanaka et al. (2022) conducted a longitudinal study in Rio de Janeiro/Brazil, with 74 children with CZS. They demonstrated an association between the level of motor impairment (GMFCS) and gross motor function, corroborating studies

conducted in different Brazilian cities (Frota et al., 2020; Melo et al., 2020; Cavalcante et al., 2021; Ribeiro et al., 2022). Besides that, higher levels IV and V of GMFCS have a negative correlation with the GMFM scores, indicating that the greater the GMFCS level, lower the GMFM score.

Although the present study was descriptive, our results corroborated the findings of other studies conducted in the country (Melo et al., 2020; Frota et al., 2020; Cavalcante et al., 2021; Hamanaka et al., 2022; Ribeiro et al., 2022) evidenced important functional changes, suggesting that the use of the ICF and its assumptions may improve the management of the functioning profile of children with CZS.

Regarding the GMFM, most children with GMFCS levels IV and V presented lower gross motor function, corroborating with Ribeiro et al. (2022) and Hamanaka et al. (2022). When observed by dimensions, our results scored A (lying down and rolling over), B (sitting), and C (crawling and kneeling), whereas the other studies scored only A and B (Hamanaka et al., 2022; Ribeiro et al., 2022). The children from Frota et al. (2020) scored minimally on item C, corroborating our results. These divergences may have occurred because the present study included older children, suggesting that they had a longer period of therapeutic intervention.

The data described highlights a brief overview of the prognosis of children with CZS. From the perspective of the ICF, the environmental factors in which the child and family were inserted allowed the understanding of the magnitude of these impairments and their impact on participation in life situations.

In literature, one study with 34 children with CZS demonstrated the functioning profile using an instrument extracted from ICF (Ferreira et al., 2018), which was used in the present study (Core Set for children with CP aged zero to six years). The study (Ferreira et al., 2018) revealed that the studied population presented complete or severe impairment in many functional areas. The authors also highlighted the mental functions of language (b167; body function domain) as complete impairment (Ferreira et al., 2018). For the activities and participation domain, performing fine hand use (d440), walking (d450), and moving around in different locations (d460) were often classified as complete disabilities; maintaining body position (d415), eating (d550), and interactions basic interpersonal interactions (d710) with severe disabilities; family relationships (d760) was not affected for most children (Ferreira et al., 2018).

The present study also exhibited the highest frequency of complete impairment in mental functions of language (b167), corroborating Ferreira et al. (2018) results, but it differs when demonstrating that it did not apply to the entire sample. In the activities and participation domain, the present study found that toileting (d530) and eating (d550) were mostly classified as a complete difficulty. Corroborating Ferreira et al. (2018) results, the abilities to move in different locations, fine use of hands, and walking were also complete difficulties. These findings evidence the greater movement-related severity and higher level of dependence of children with CZS.

In addition, functioning was more often severe in maintaining a body position (d415) and basic interpersonal interactions (d710), and the mildest difficulties were related to family relationships (d760), corroborating Ferreira et al. (2018) results.

The hypothesis for the discrepancies found between the present study and Ferreira et al. (2018) may be due to the severity classification of the patients using GMFCS: one child presented mild motor impairment and performed activities involving complex motor skills (walking [d450]); considering the small sample size, the child may have influenced the analysis of the research qualifiers, making the profile of the categories less severe. Conversely, Ferreira et al. (2018) included only severely impaired patients who could not walk and perform more developed motor tasks. Therefore, this hypothesis should considered in future studies with this population to allow for further clarification.

Regarding the barriers and facilitators reported by caregivers, the agreement between the studies is in the attitudinal barriers category (e460), which was the most considered a complete barrier by both. The study reiterates the importance of fighting stigmas related to people with disabilities, recognizing the interventions focused on the family and the environment, which may be potentially changeable (Badia et al., 2016; Ferreira et al., 2018).

Moreover, the category e580 (health services, systems, and policies) was a substantial barrier, contradicting Ferreira et al. (2018) results, which reported as an important facilitator. Since both studies were conducted in the Brazilian Northeast, further studies must verify whether the conditions of access to health services and comprehensive care are guaranteed and offered equitably within the same region of the country.

The products and technology for personal indoor and outdoor mobility, and transportation (e120) and health professionals (e355) were considered moderate and substantial facilitators (respectively), corroborating Colver et al. (2012) and Coelho et al. (2022) findings. The authors reported that the behavior of healthcare professionals is a relevant category of the environment domain and is associated with better social participation, just as the use of assistive technology and spatial accessibility has the potential to positively impact the autonomy and participation of children with CZS. Bailey and Ventura (Bailey Junior & Ventura, 2018) stated that families who feel welcomed by professionals were more likely to deal better with the uncertainties and inevitable adversities arising from CZS.

The small sample size of the present study became a limitation, limiting robust analyses. The main reason was the small number of patients registered at the SRH II, even though it was a reference for a macro-region. Although reliable and validated instruments were used to assess the functioning of children, these instruments were more focused on gross motor function and its severity and activities and participation, unlike assessments of body functions, which were conducted using observation, collection data from medical records, and direct questions to the caregiver. Despite the importance of this survey in profiling children, longitudinal studies with more robust samples are needed to generate more detailed functioning profiles of children with CZS and allow a greater understanding of the tools extracted from the ICF, as persistent challenges have been documented (Marques et al., 2025).

The present study is the second Brazilian study with children with CZS that used an ICF Core. ICF is considered an important starting point to address the urgent need for

practical applications in child rehabilitation, as it allows the operationalization of care for children with disabilities based on the understanding of the interaction of body functions and structures, their activities, and social participation under the influence of the life contexts of the people around them (World Health Organization, 2001).

Incorporating the ICF into services using Core Sets and tools based on classification may change the focus from body-centered to user-centered intervention, in which health teams define their goals aligned with the complex needs of individuals and the context in which they are inserted, which according to Silva et al. (2019) strengthens therapeutic planning and makes it more assertive.

According to Rosenbaum (2015) and Rafani et al. (2024), the ICF framework highlights the importance of context by integrating health dimensions and people's lived experiences. It provides a solid foundation for professionals to discuss their roles and the roles of services in addressing the needs of children and families. This makes the present study particularly relevant for fostering these discussions and encouraging reflection on the care of children with disabilities and the effectiveness of health practices.

Conclusion

Children with CZS presented severe impairments in gross motor function and great difficulties in performing basic motor tasks, which directly impacted their body functions, conducted activities, and participating in life situations. When interacting with barriers related to health services, systems, and policies and with facilitators (e.g., immediate family), the functional profile of this sample demonstrated more significant impairments in neuromusculoskeletal and movement-related functions, greater difficulties in mobility, and personal care.

Knowing the functional trajectories of children with CZS may guide health, education, and other segment management professionals and have direct implications for formulating public policies. Furthermore, the perception of caregivers and family needs strengthens the biopsychosocial perspective of health care based on the ICF. Therefore, its use in rehabilitation services could facilitate user-centered treatments, requiring changes in institutional and management models and training of health teams.

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All authors were responsible for conceiving the article and approved its final version.

Data Availability

The data that support the findings of this study are available from the corresponding author, upon reasonable request.

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