Original paper

Cerebral palsy – preschool and school education from the perspective of a social model of disability

Mózgowe porażenie dziecięce – edukacja przedszkolna i szkolna z perspektywy społecznego modelu niepełnosprawności

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Key words: cerebral palsy, disability, inclusion, social model.

Słowa kluczowe: mózgowe porażenie dziecięce, niepełnosprawność, inkluzja, model społeczny.

Abstract

Introduction: Inclusive education has been implemented in European countries in recent decades. It involves supporting the education of children with disabilities in mainstream schools to build an inclusive society. Cerebral palsy (CP) is a condition characterized by persistent motor disorders often accompanied by sensory, cognitive, communication, perceptual, behavioural, epilepsy, and secondary musculoskeletal problems. The nature and severity of disabilities can influence the choice of educational setting. For mainstream schools, the presence of a student with CP with mobility problems, speech, or sensory disorders, is a challenge. The presence of such a student at the lesson forces the use of special methods of work.
Aim of the research: To assess the prevalence of inclusive education among children and adolescents with CP as a factor influencing social participation.
Material and methods: The study included a group of 205 patients diagnosed with CP aged 0–18 years. Classification systems such as GMFCS, MACS, and CFCS were used in the study.
Results and conclusions: The presence of associated disabilities, excluding intellectual disabilities, was found in 79% of the participants. The presence of one disability was observed in 34% of the participants, 2 disabilities in 25%, and 3 disabilities in 17% of the participants. Significant associations were found between the type of school, CP subtype, intellectual disability, and levels of functioning in terms of mobility, fine motor skills, and communication ($p < 0.001$). In total, 23% of the participants attended mainstream schools, and 13% attended inclusive schools. Inclusion of children with CP in mainstream schools was mainly limited to students with normal cognitive functions (IQ ≥ 70).

Streszczenie

Wprowadzenie: W ostatnich dziesięcioleciach edukacja włączająca jest wprowadzana w krajach europejskich. Obejmuje ona wspieranie kształcenia dzieci niepełnosprawnych w placówkach ogólnodostępnych w celu zbudowania społeczeństwa integracyjnego. Mózgowe porażenie dziecięce jest zespołem trwałych zaburzeń układu ruchu, którym często towarzyszą zaburzenia zmysłowe, poznawcze, komunikacji, postrzegania, zachowania, epilepsja oraz wtórne problemy mięśniowo-szkieletowe. Charakter i stopień niepełnosprawności mogą wpływać na wybór rodzaju placówki edukacyjnej. Dla szkół masowych obecność ucznia z mózgowym porażeniem dziecięcym, zwłaszcza mającego problemy z poruszaniem się, zaburzeniem mowy, wzroku, słuchu, stanowi wyzwanie. Obecność takiego ucznia na lekcji wymusza konieczność zastosowania specjalnych metod i form pracy, zasobniejszej bazy dydaktycznej oraz poświecenia znacznie większej uwagi i czasu.
Cel pracy: Ocena rozpowszechnienia edukacji włączającej w grupie dzieci i młodzieży z mózgowym porażeniem dziecięcym jako czynnika wpływającego na partycypację społeczną.
Materiał i metody: Badaniem objęto grupę 205 pacjentów z mózgowym porażeniem dziecięcym w wieku 0–18 lat. W badaniu wykorzystano systemy klasyfikacji: GMFCS, MACS i CFCS.
Wyniki i wnioski: Obecność towarzyszących niepełnosprawności, z wyłączeniem niepełnosprawności intelektualnej, stwierdzono u 79% badanych. Wystąpienie jednej niepełnosprawności wykazano u 34%, dwóch u 25%, trzech u 17% badanych. Odnotowano istotny związek między rodzajem szkoły, postacią mózgowego porażenia dziecięcego, niepełnosprawnością intelektualną i poziomem funkcjonowania w zakresie lokomocji, motoryki małej i komunikacji ($p < 0,001$). Ogółem 23% badanych uczęszczało do szkół ogólnodostępnych, a 13% do szkół integracyjnych. Włączenie dzieci z mózgowym porażeniem dziecięcym do szkół ogólnodostępnych było ograniczone głównie do uczniów z prawidłowymi funkcjami poznawczymi (IQ > 70).

Introduction

Cerebral palsy (CP) is the most common motor impairment in childhood, characterized by movement and posture disorders that limit activity [1]. CP primarily affects sensory motor function, but it can also involve disturbances in sensation, cognition, communication, perception, and behaviour [1]. Due to the diverse developmental challenges, children with CP may experience specific learning difficulties in areas such as concentration, visual-spatial cognition, language and communication skills, imagination, problem-solving, attention, memory, and executive functioning [2, 3]. Therefore, CP should not be viewed solely as a physical disability. A comprehensive approach that encompasses additional care, education, socialization, and medical services is needed.

Inclusive education is an approach that ensures equal educational rights for all students, regardless of the presence or absence of disabilities. It is based on adapting teaching conditions to develop the individual potential of people with disabilities, enabling their full integration into social life. Inclusive education counteracts social isolation and fosters peer relationships. It aligns with the social model of disability, advocating for a departure from both segregated and integrated teaching models [4–8].

Aim of the research

The aim of this study was to assess the prevalence of inclusive education among children and adolescents with CP as a factor influencing social participation.

Material and methods

Study group

The study included 205 patients diagnosed with CP up to the age of 18 years. The research was conducted among patients at rehabilitation centres in southern and central Poland. The patients were included regardless of their functional status and coexisting dysfunctions. Data were collected through questionnaires.

Study tools

In the study, tools designed to conduct functional classification for people with CP were used: Gross Motor Function Classification System (GMFCS) – for locomotion skills; Manual Ability Classification System (MACS) – for manipulation skills; and Communication Function Classification System (CFCS) – for everyday communication performance [9–11]. Each of these systems includes level I for children with minor limitations, while children with severe functional limitations are usually classified at levels IV and V.

Intellectual disability (ID) was diagnosed based on the analysis of qualifications for education, following assessments by a team of specialists from psychological and pedagogical counselling centres. The classification of intellectual disability used in the study followed the guidelines applied in Polish jurisdiction, distinguishing between mild, moderate, severe, and profound impairment.

Parents were asked to report on the type of institution (school or kindergarten) their child attended: mainstream (inclusive education), mainstream with integration unit, or special institution. The "special institution" category included centres catering to children with profound cognitive impairment. If education took place at the child's home, it was classified as "home-schooling".

Statistical analysis

The distribution of all tested variables did not have a normal character. Non-parametric tests were used. In this study, statistically significant of $p < 0.05$ was assumed.

Ethics

The study was approved by the Ethics Committee of the Institute of Polish Mother's Health Centre in Lodz.

Results

Participants were classified according to the type of cerebral palsy, cognitive functioning assessment, GMFCS, MACS, CFCS level (I–V), and type of educational institution. Demographic and environmental variables (age, gender, place of residence) were also included in the analysis. The final data from 205 individuals were used, 13 participants were excluded from the analysis regarding intellectual disability because they had not yet been assessed due to their age (according to the assumptions of psychological diagnosis, ID should not be diagnosed in children under 5 years of age). Three children aged 1–2 years (below preschool age) were included in the "no education" group.

Table 1 shows the general characteristics of the study group. Three age categories were distinguished among the participants: early childhood age (up to 6 years old), early school age (7–12 years old), and school-adolescent age (13–18 years old). The most represented age group was between 7 and 12 years old, which comprised 83 out of 205 participants.

In the studied group, the most common form of CP was bilateral spastic CP (148 out of 205). Participants with different forms of CP did not differ significantly in their distribution across age groups (data not shown). Associated impairments, excluding intellectual disability, were found in 79% of the individu-

Table 1. Clinical description of the study group (n = 205)

Characteristics	*n* (%)
Gender:	
Male	124 (60.50)
Female	81 (39.50)
Age:	
1–6 years	54 (26.34)
7–12 years	83 (40.49)
13–18 years	68 (33.17)
Type of cerebral palsy:	
Diplegia	78 (38.10)
Hemiplegia	38 (18.50)
Tetraplegia	70 (34.10)
Extrapyramidal	19 (9.30)
Intellectual disability:	
None (IQ > 70)	58 (28.30)
Mild (IQ 69–55)	30 (14.60)
Moderate (IQ 54–35)	42 (20.50)
Significant (IQ 34–20)	33 (16.10)
Deep (IQ < 20)	29 (14.20)
Not tested	13 (6.30)
Associated impairments:	
Vision impairment	104 (50.70)
Hearing impairment	12 (5.90)
Communication impairment	90 (43.90)
Epilepsy	71 (34.60)
Behavioural problems	30 (14.60)
Area of family domicile:	
Urban	113 (55.10)
Rural	92 (44.90)

als. Among the participants, 34% had one associated impairment, 25% had 2, and 17% had 3. The most frequently reported disorders included vision impairment (51%), communication impairment (44%), and epilepsy (35%).

Intellectual disability was diagnosed in 65.40% of the participants, with moderate ID being the most prevalent (Table 1). Children and adolescents with different forms of CP differed significantly in the degree of intellectual disability. Impairment was most commonly observed in individuals with tetraplegia, less frequently in those with extrapyramidal forms, and least frequently in those with hemiplegia and diplegia (data not shown).

A statistically significant association between the type of education and the type of CP was found (Table 2). Over half of the participants with diplegia and hemiplegia attended mainstream educational institutions (inclusive education), whereas in the extrapyramidal form this percentage was 15.8% of the participants, and in tetraplegia it was 4.3%.

A total of 56 out of 205 participants (comprising the "home-schooling" group and the "no education" group) had no contact with peers, placing them at risk of social exclusion. Among this group, 31 children were engaged in home-schooling, for which teachers came to the child's place of residence and conducted individualized lessons. The majority in this group were children with tetraplegia (45%) and extrapyramidal forms (23%). Home-schooling was more frequently observed among participants residing in rural areas, older children (above 7 years old), those with profound and moderate intellectual disabilities, and participants classified at GMFCS levels IV and V (data not shown).

The studied group included 25 (12.2%) children not attending educational institutions, including 16 (64%) with tetraplegia, 6 (24%) with diplegia, and 3 (12%) with hemiplegia. Most of them (68%) were from rural areas. In milder forms of CP, the age of all individuals not attending educational institutions did not exceed the age of starting compulsory schooling (6 years old), indicating a conscious decision to forego preschool education. In the group with tetraplegia, there were 4 participants who exceeded the age of starting compulsory schooling.

Intellectual disability strongly correlated with the type of cerebral palsy, which significantly influenced the choice of education (Table 3). All participants with moderate and severe cognitive impairment attended special schools. In the case of profound cognitive impairment, they attended specialized centres. Participants with severe functional limitations (at levels IV and V of GMFCS, MACS, and CFCS) mainly attended special schools, and in the case of profound cognitive impairment, they were enrolled in separate facilities (Tables 4–6).

Discussion

In the medical model, disability is primarily perceived as a physical problem resulting from a disease or injury. In this context, the focus is on analysing the limitations arising from the disability itself (the presence of deficits or impairments), their impact on functioning, and the possibilities of applying treatments/therapies aimed at improving the condition, including reducing limitations. In contrast, the social model views disability as a societal issue resulting from the interaction between the individual and the rest of society. Therefore, supporting a person with a disability involves actions aimed at eliminat-

Table 2. The type of education in the studied group considering the division into types of cerebral palsy (CP)

Education	Diplegia		Tetraplegia		Hemiplegia		Extrapyramidal		Total		χ^2 test
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	
Inclusive education	27	34.6	1	1.4	14	36.8	2	10.5	44	21.5	$\chi^2 = 65.33$ $p < 0.001$
Mainstream school – integrative classes	17	21.8	2	2.9	7	18.4	1	5.3	27	13.2	
Special education	22	28.2	37	52.9	10	26.3	9	47.4	78	38.0	
Home-schooling	6	7.7	14	20.0	4	10.5	7	36.8	31	15.1	
No education	6	7.7	16	22.9	3	7.9	0	0.0	25	12.2	

Table 3. The type of education depending on the degree of intellectual disability

Education	Normal cognitive function (IQ > 70)		Mild cognitive impairment (IQ 69–55)		Moderate cognitive impairment (IQ 54–35)		Severe cognitive impairment (IQ 34–20)		Profound cognitive impairment (IQ < 20)		χ^2 test
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	
Inclusive education	32	55.2	12	40.0	0	0.0	0	0.0	0	0.0	$\chi^2 = 145.18$ $p < 0.001$
Mainstream school – integrative classes	15	25.9	10	33.3	0	0.0	0	0.0	0	0.0	
Special education	0	0.0	2	6.7	32	76.2	27	81.8	19	65.5	
Home-schooling	6	10.3	5	16.7	9	21.4	4	12.1	7	24.1	
No education	5	8.6	1	3.3	1	2.4	2	6.1	3	10.3	

**The numerical values do not add up to 205 because participants who had not undergone intellectual development assessments due to their age were excluded from the analysis.*

Table 4. The type of education depending on locomotion abilities as defined by GMFCS

Education	GMFCS I		GMFCS II		GMFCS III		GMFCS IV		GMFCS V		χ^2 test
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	
Inclusive education	14	42.4	13	31.7	13	40.6	4	7.8	0	0.0	$\chi^2 = 66.87$ $p < 0.001$
Mainstream school – integrative classes	6	18.2	6	14.6	8	25.0	7	13.7	0	0.0	
Special education	10	30.3	14	34.1	4	12.5	24	47.1	26	54.2	
Home-schooling	3	9.1	5	12.2	2	6.2	11	21.6	10	20.8	
No education	0	0.0	3	7.3	5	15.6	5	9.8	12	25.0	

Table 5. The type of education depending on object manipulation abilities as defined by MACS

Education	MACS I		MACS II		MACS III		MACS IV		MACS V		χ^2 test
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	
Inclusive education	6	31.6	30	34.9	7	24.1	1	2.7	0	0.0	$\chi^2 = 56.73$ $p < 0.001$
Mainstream school – integrative classes	3	15.8	19	22.1	4	13.8	0	0.0	1	2.9	
Special education	6	31.6	21	24.4	10	34.5	23	62.2	18	52.9	
Home-schooling	3	15.8	7	8.1	6	20.7	6	16.2	9	26.5	
No education	1	5.3	9	10.5	2	6.9	7	18.9	6	17.6	

Table 6. The type of education depending on communication abilities as defined by CFCS

Education	CFCS I		CFCS II		CFCS III		CFCS IV		CFCS V		χ^2 test
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	
Inclusive education	32	57.1	10	22.2	2	8.0	0	0.0	0	0.0	$\chi^2 = 106.71$ $p < 0.001$
Mainstream education – integrative classes	13	23.2	11	24.4	2	8.0	0	0.0	1	2.0	
Special education	4	7.1	15	33.3	13	52.0	20	66.7	26	53.1	
Home-schooling	4	7.1	5	11.1	4	16.0	6	20.0	12	24.5	
No education	3	5.4	4	8.9	4	16.0	4	13.3	10	20.4	

ing barriers that hinder their interaction with the environment. In the context of education, this includes modifying the school environment, education methods, adjusting requirements, or assessment practices so that students with disabilities can be successful learners.

The social model of disability serves as the foundation for the concept of inclusive education. Inclusion is a process that helps overcome barriers to participation and achievement for students, while also countering the processes of marginalization and exclusion. It allows for the creation of social connections, networks, and relationships. Inclusive education stands in opposition to segregational education, which is carried out in institutions exclusively designated for people with disabilities [4–7].

Due to their multiple disabilities, individuals with CP require support in the areas of health, education, and participation. Since 2000, the term "children with special educational needs" (SEN) has been introduced in Europe. It is used to refer to children who require additional support or adjustments in their education. Individuals with CP can also be included in this group. The European Agency Statistics on Inclusive Education (EASIE) is an independent organization that serves as a platform for collaboration among the ministries of education in its member countries (31 countries, including Poland). According to EASIE, there are various practices in Europe for children with SEN. The one-track approach involves nearly all children receiving mainstream education, while the 2-track approach maintains 2 distinct systems, with pupils with SEN typically placed in special schools or special classes. Most European countries, including Poland, currently adopt a multi-track approach [6–8]. In the Polish education system, a 3-track approach is utilized, where individuals with disabilities can access general education, inclusive education, and special (segregated) education, and exceptionally they can receive individual home-schooling. The choice of appropriate educational and upbringing form lies with the child's parents or guardians, considering their individual developmental needs. Parents may, but are not obligated to, consider the recommendations stated in the special education needs assessment. These recommendations are merely suggestions expressed by a team of specialists.

According to education law, children with disabilities aged 3 to 6 years have the right to attend preschool. Students with mild, moderate, or severe intellectual disabilities have the opportunity to receive education in all types of schools, including mainstream schools. However, students with moderate and severe intellectual disabilities follow a different curriculum. Separate rehabilitation and educational centres are provided for individuals with profound disabilities, where activities offered contribute to fulfilling their educational requirements [5].

According to Sentenac *et al.* [12], in various European regions, nearly half of all children with CP are educated in special settings. In Wales, approximately 30% of CP children are educated in special schools [13], while a similar percentage (33%) is observed in Australia [14]. In Brazilian studies, this percentage reaches 51% [15]. In our own study, 31% of participants attend special schools, including individuals with mild, moderate, and severe cognitive impairment, while 9% attend special centres for those with profound intellectual disability.

The study group was categorized using 2 approaches to disability: the medical approach and the social approach. In the medical approach, the analysis focused on the type of CP, intellectual disability, and associated impairments. In the social approach, the analysis cantered on the level of functioning in locomotion, object manipulation, and communication, because every child with CP has individual abilities regardless of their diagnosis. The analysis revealed statistically significant differences in schooling categories concerning the type of CP, intellectual disability, and the level of functioning assessed using the GMFCS, MACS, and CFCS classification systems.

In the case of CP, motor and non-motor symptoms are clearly related and dependent on the location and extent of brain damage. Patterns of brain damage are well understood, but predicting the cognitive functioning of an individual patient is still challenging [16]. It is reported that intellectual disability occurs in up to 50% of CP cases and is correlated with the degree of motor impairment and epilepsy. In the studied group, it was

observed in 65% of the participants. It is more prevalent in children classified at lower levels of the classification systems (IV and V). Multiple disabilities, including motor impairment and intellectual disability, limit the participation of children with CP, often leading to their exclusion from mainstream schools [16, 17].

According to Hidecker *et al*. [18], individuals with a functional profile at GMFCS, MACS, and CFCS levels are likely to function quite well in school and the community. Similarly, children whose performances were classified at GMFCS levels I or II, MACS levels I or II, combined with CFCS I belong to the high-functioning group. In contrast, children whose performances were classified at GMFCS levels IV or V, MACS levels IV or V, combined with CFCS IV or V belong to the low-functioning group, being fully dependent on caregivers. Results from our study indicate that nearly half of the students classified at the first levels of the classification systems were enrolled in mainstream schools (inclusive education or integrative classes). The percentages were as follows: 60.6% for GMFCS I, 47.4% for MACS I, and 80.3% for CFCS I. On the other hand, participants classified at levels IV and V were attending special schools or specialized centres (in the case of profound intellectual disability). Similar results were obtained in European studies, where 75.6% of participants with GMFCS I and 72.5% with normal communication attended mainstream schools [12], compared to 13% with GMFCS I and 15% with normal communication in Brazilian studies [15].

Conclusions

Every child has a fundamental right to be schooled in a mainstream setting. The choice of schooling type made by parents should take into account the needs of the child. In the studied group, the schooling option was determined by the existence and severity of motor and non-motor disabilities. The inclusion of children with CP in mainstream schools was mainly restricted to students with normal cognitive function (IQ > 70) and mild cognitive impairment (IQ 69–55), with GMFCS, MACS, and CFCS levels I, II, and III. All types of impairments were found to be associated with the type of schooling.

When analysing the situation of children with severe disabilities (GMFCS IV, V, severe ID), one should ask whether mainstream schools have the ability to adapt conditions and teaching methods to the extent of their impairments. This includes considerations from an economic perspective (adjusting buildings, classrooms, instructional aids), organizational perspective (obligation to provide transportation, employing assistants), pedagogical perspective (qualifications of staff), as well as the well-being of the student. In such cases, specialized schools may be more suitable.

Conflict of interest

The authors declare no conflict of interest.

References

1. Rosenbaum P, Paneth N, Leviton A, Goldstein M, Bax M, Damiano D, Dan B, Jacobsson B. The definition and classification of cerebral palsy. Dev Med Child Neurol 2007; 109: 8-14.
2. Stadskleiv K. Cognitive functioning in children with cerebral palsy. Dev Med Child Neurol 2020; 62: 283-289.
3. Stadskleiv K, Jahnsen R, Andersen GL, von Tetzchner S. Neuropsychological profiles of children with cerebral palsy. Dev Neurorehabil 2018; 21: 108-120.
4. Kowalski MH. Uczniowie niepełnosprawni w polskim szkolnictwie powszechnym. Kwartalnik Kolegium Ekonomiczno-Społecznego Studia i Prace 2014; 3: 92-107.
5. Konarska P. Kształcenie osób niepełnosprawnych w świetle aktualnych regulacji prawnych. Forum Prawnicze 2014; 5: 42-57.
6. Lebeer J. It is a long road to inclusive education for children with cerebral palsy. Dev Med Child Neurol 2018; 60: 336-337.
7. Twardowski A. Controversies around the social model of disability. Culture – Society – Education 2019; 2: 7-21.
8. Ramberg J, Watkins A. Exploring inclusive education across Europe: some insights from the European agency statistics on inclusive Education. Forum for International Research in Education 2020: 6: 85-101.
9. Palisano RJ, Rosenbaum P, Bartlett D, Livingston MH. Content validity of the expanded and revised Gross Motor Function Classification System. Dev Med Child Neurol 2008; 50: 744-750.
10. Eliasson AC, Krumlinde-Sundholm L, Rösblad B, Beckung E, Arner M, Ohrvall AM, Rosenbaum P. The Manual Ability Classification System (MACS) for children with cerebral palsy: scale development and evidence of validity and reliability. Dev Med Child Neurol 2006; 48: 49-54.
11. Hidecker MJ, Paneth N, Rosenbaum PL, Kent RD, Lillie J, Eulenberg JB, Chester K Jr, Johnson B, Michalsen L, Evatt M, Taylor K. Developing and validating the Communication Function Classification System for individuals with cerebral palsy. Dev Med Child Neurol 2011; 53: 704-710.
12. Sentenac M, Ehlinger V, Michelsen SI, Marcelli M, Dickinson HO, Arnaud C. Determinants of inclusive education of 8-12 year-old children with cerebral palsy in 9 European regions. Res Dev Disabil 2013; 34: 588-595.
13. Jones H, Carter B, Bethan J, Collins H, Wang T, Rees S, Kemp A, Paranjothy S. Educational outcomes of children with cerebral palsy. Int J Popul Data Sci 2019; 4: 092.
14. Gillies MB, Bowen JR, Patterson JA, Roberts CL, Torvaldsen S. Educational outcomes for children with cerebral palsy: a linked data cohort study. Dev Med Child Neurol 2018; 60: 397-401.
15. Santos LHC, Grisotto KP, Rodrigues DCB. Bruck I School inclusion of children and adolescents with cerebral palsy: is this possible for all of them in our days? Rev Paul Pediatr 2011; 29: 314-319.
16. Moll I, Voorman JM, Ketelaar M, van Schie PE, Gorter JW, Lequin MH, de Vries LS, Vermeulen RJ. Prognostic value of brain abnormalities for cognitive functioning in cere-

bral palsy: a prospective cohort study. Eur J Paediatr Neurol 2021; 32: 56-65.
17. Fluss J, Lidzba K. Cognitive and academic profiles in children with cerebral palsy: a narrative review. Ann Phys Rehabil Med 2020; 63: 447-456.
18. Hidecker MJ, Ho NT, Dodge N, Hurvitz EA, Slaughter J, Workinger MS, Kent RD, Rosenbaum P, Lenski M, Messaros BM, Vanderbeek SB, Deroos S, Paneth N. Inter-relationships of functional status in cerebral palsy: analyzing gross motor function, manual ability, and communication function classification systems in children. Dev Med Child Neurol 2012; 54: 737-742.

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