BERKALA KEDOKTERAN
Doi: http://dx.doi.org/10.20527/jbk.v20i1.18763
RESEARCH ARTICLE
OPEN ACCES

Relationship of Gross Motor Function Classification System Level with The Incidence of Epilepsy

Observation on Cerebral Palsy Paediatric Case at RSUD Ulin Banjarmasin in 2021

Annisa Fujianti[1], Nurul Hidayah[2], Triawanti[3], Fakhrurrazy[4], Mohammad Bakhriansyah[5]

[1]Medical Study Program Undergraduate Program, Faculty of Medicine, Universitas Lambung Mangkurat, Banjarmasin, Indonesia
[2]Department of Paediatrics, Faculty of Medicine, Universitas Lambung Mangkurat, Banjarmasin, Indonesia
[3]Department of Biochemistry and Biomolecular, Faculty of Medicine, Universitas Lambung Mangkurat, Banjarmasin, Indonesia
[4]Department of Neuroscience, Faculty of Medicine, Universitas Lambung Mangkurat, Banjarmasin, Indonesia
[5]Department of Pharmacology, Faculty of Medicine, Universitas Lambung Mangkurat, Banjarmasin, Indonesia

Coresspondence Author: afujianti44@gmail.com

Abstract:

Epilepsy is one of the comorbidities or complications that can occur in cerebral palsy (CP) pediatric, the severity of CP can be measured using the gross motor function classification system (GMFCS) level. The aim of this study was to determine the relationship of GMFCS level with incidence of epilepsy in CP pediatric at RSUD Ulin Banjarmasin. This research used a cross – sectional method. Subjects were CP pediatric outpatients aged 2-18 years at pediatric polyclinic and medical rehabilitation installation RSUD Ulin Banjarmasin. Samples were obtained with total sampling technique during September-November 2021. Data were analyzed univariate and bivariate by Fisher's exact test with a significance level of p <0,005. There were 33 CP pediatric who fulfilled the inclusion and exclusion criteria. The result showed that most of the patients were aged 2-5 years (63,6%), male sex (57,6%), severe GMFCS levels (75,8%) and had epilepsy (66,7%). There was a significant correlation of GMFCS level with incidence epilepsy (p=0,008, PR=3,2). It can be concluded that GMFCS level is associated with incidence epilepsy in CP pediatric at RSUD Ulin Banjarmasin.

Keywords: Cerebral palsy; Epilepsy; Gross motor function classification system level.

Introduction

Cerebral palsy (CP) is a disorder that occurs in the cerebral tissues permanently, often at an early age and appears as a non-progressive central motor deficit, due to inhibition of normal brain development.[1] Based on an analysis of world data from the World Health Organization (WHO), in 2000-2016 there was an increase in the number of people with CP in the world by 0.6-0.7 out of 1000 live births worldwide. Based on data from people with disabilities from basic health research (Riskesdas) in 2010 in Indonesia, from children aged 24-59 months there are as many as 0.09% are children with CP.[2] In the data at Ulin Banjarmasin Hospital in January 2018-May 2021 there were 113 cases of children with CP who sought treatment in pediatric polyclinics and medical rehabilitation installations.[3]

Most children with CP have at least one complication or accompanying disease, one of which is epilepsy. Any cerebral damage can lead to epilepsy. The damage will cause abnormal activity of the nervous system that will trigger epilepsy.[4] Determining the severity of CP in the early days is usually difficult to determine, Palisiano et al. developed a classification scale to determine the severity of motor disorders with CP. This classification is called the Gross Motor Function Classification System (GMFCS), which consists of levels I-V, namely levels I, II, and III is a relatively mild-moderate level, while levels IV and V are levels that are quite severe or severe.[5]

Children with CP experience impaired motor function are often accompanied by other disorders such as impaired perception, sensation, cognition, communication, behavior, and epilepsy. By determining the severity of motor function in people with CP using GMFCS, it can be a reference to the possibility of additional disorders and for therapy planning.[6] Based on the background explanation above, from this study it is expected that with the determination of GMFCS levels, it can predict the incidence of epilepsy in the future. In addition, this study has never been done in South Kalimantan, especially in Ulin Banjarmasin Hospital so this research needs to be done.

Research Method

The study used an analytical observational design with a cross-sectional study design. The population in this study were all pediatric patients at Ulin Banjarmasin Hospital with a diagnosis of CP. The study sample was a CP pediatric patient in the pediatric polyclinic and at the medical rehabilitation facility of Ulin Banjarmasin Hospital, which met the criteria for inclusion and exclusion. The sample inclusion criteria are children aged 2-18 years who are diagnosed with CP and complete medical record data. The sample exclusion criteria are that parents/guardians are not willing for patients to participate in the study. The sampling of this study was conducted using total sampling techniques, during the period September-November 2021.

The independent variable in the study was gmfcs levels, while the dependent variables were epileptic events and without epilepsy in CP pediatric patients.

The research was conducted with nurse intermediaries in pediatric polyclinics and medical rehabilitation installations of Ulin Banjarmasin Hospital. Nurses record data on patients with a diagnosis of CP. If it meets the inclusion criteria and exclusion criteria, then the nurse will explain the procedure, purpose, and benefits of the study, then ask for approval to the parent / guardian of the child patient to be included in the study by signing a consent form following the research (informed consent). Research data is taken from the diagnosis by a pediatrician or medical rehabilitation specialist in the form of epilepsy and GMFCS levels, the data is taken and recorded into a research data fill sheet by a nurse. Epilepsy data and GMFCS levels that have been collected from the research data filled sheet recorded by nurses, then reconfirmed by researchers with data from medical records. Then the data was collected, calculated, summed, and described into

percentage and frequency, to analyze the association of GMFCS levels studied with the incidence of epilepsy in CP pediatric patients using fisher's exact test and calculated the prevalence ratio with a confidence level of 95%.

Results

There were 33 pediatric CP patients at the pediatric polyclinic and medical rehabilitation installation at Ulin Hospital Banjarmasin who met the inclusion and exclusion criteria of this study. The distribution of the sample in the study of the relationship between GMFCS levels and the incidence of epilepsy in CP children at Ulin Hospital Banjarmasin is shown in table 1.

Table 1. Characteristics of CP pediatric patients at Ulin Banjarmasin Hospital September-November 2021

Characteristic	Frequency	Proportion (%)
Age:		
2-5 years	21	63,6
>5 years	12	36,4
Sex:		
Male	19	57,6
Female	14	42,4
GMFCS level:		
Mild-moderate level	8	24,2
Severe level	25	75,8
Epilepsy :		
Without epilepsy	11	33,3
With epilepsy	22	66,7
Mild-moderate GMFCS level:		
2-5 years	4	50%
>5 years	4	50%
Mild-moderate GMFCS level:		
Female	2	25%
Male	6	75%
Severe GMFCVS level:		
2-5 years	17	68%
>5 years	8	32%
Severe GMFCVS level:		
Female	14	56%
Male	11	44%

In this study, the age of CP child patients is mostly in the age group 2-5 years (63.6%) than the age group >5 years (36.4%). The sex of most pediatric CP patients in this study were male patients (57.6%) compared to female patients (42.4%). CP pediatric patients with severe GMFCS levels (75.8%) in this study, had a greater number of patients with mild-moderate GMFCS levels (24.2%). Patients with CP in this study had more epilepsy (66.7%) and fewer patients with CP without epilepsy (33.3%). In this study, children with CP with mild-moderate GMFCS levels aged 2-5 years (50%) were the same as those aged >5 years (50%), while those with severe GMFCS levels aged 2-5 years (68%)

more than those aged > 5 years (32%). Then, at the mild-moderate GMFCS level there were more male patients (75%) than female (25%), and at the severe GMFCS level there were more female patients (56%) than male (44%). Bivariate analysis of the relationship between GMFCS levels and the incidence of epilepsy using Fisher's exact test is shown in table 2. In this study, 80% of CP patients with severe GMFCS level have epilepsy, while 20% of CP patients with mild-moderate GMFCS have epilepsy.

Table 2. Bivariate Test Results between GMFCS Level and Epilepsy Incidence

			Epilepsy		Total	P *value*	PR
			Yes	No			
GMFCS level	Severe level	N	20	5	25	0,008	3,2
		%	80	20	100		
	Mild-moderate level	N	2	6	8		
		%	25	75	100		
Total		N	22	11	31		
		%	66,7	33,3	100		

Discussion

Table 1 shows that the age of cp child patients is mostly in the age group 2-5 years (63.6%) than the age group >5 years (36.4%). This is similar to the study of Putri et al. which mentioned the most age in pediatric CP patients is the age group of 3-5 years (54.7%).[7] The diagnosis of CP patients relies on a combination of neurological assessments, neuroimaging findings, and recognition of the findings of CP risk factors. Such diagnoses tend to be complicated and may be delayed, at the age of 12-24 months historically considered

As a silent period that causes CP cannot be accurately identified. This is in accordance with the results of the study in table 1, namely cp children who are most widely found in Ulin Banjarmasin Hospital are CP children at the age of 2-5 years (63.3%), according to the age of detection of CP to be diagnosed, which starts at the age of 2 years.[8,9] The sex of the most pediatric CP patients in the study was male patients (57.6%) than female patients (42.4%). This suggests that CP is more common in males. This is in accordance with research Chounti et al. which mentioned that the incidence of CP is more common in the male sex than women with a ratio of 1.4:1.[10] The results of this study strengthen the results of the study Putri et al. which mentioned the most sex in pediatric CP patients, namely male patients (57.1%).[7] In male there is a greater biological vulnerability than women when there is an injury to the immature brain.[11] The male brain is more susceptible to injury to white matter and intravenous bleeding, as well as in male babies born very prematurely, so the incidence of CP is more susceptible to occur in men than women.[10]

Pediatric CP patients with severe GMFCS levels (75.8%) in the study had greater numbers than patients with mild-moderate GMFCS levels (24.2%). These results are in line with the Ekici et al. study, which is that CP pediatric patients with severe GMFCS levels (52%) have greater amounts than mild-moderate GMFCS levels (48%).[6] Similar results were found in the Ibrahim et al. study, which mentioned severe GMFCS levels (56.2%) in CP pediatric patients, had more than mild levels (9.4%) and moderate levels (34.4%).[12] Researchers suspect that the level of heavy GMFCS that occurs more in Ulin Banjarmasin Hospital can be due to the status of Ulin Banjarmasin Hospital is a class A hospital that is a reference from other health facilities. So, patients who seek treatment at Ulin

Banjarmasin Hospital are mostly patients whose disease is quite severe.

Pediatric CP patients in the study had more incidence of epilepsy (66.7%) and fewer had CP without epilepsy (33.3%). This is similar to the Ekici et al. study which found cp pediatric patients had more epilepsy (61%) than those without epilepsy (39%).[6] Epilepsy is common in CP children and has been used as a marker of severity in CP related to underlying brain lesions.[13] In the study Cooper et al. stated that all CP children who had epilepsy in the future, showed lesions in white matter and grey matter.[14]

In this study, cp child patients with mild-moderate GMFCS levels aged 2-5 years (50%) amounted to the same as those aged >5 years (50 years), while at the level of heavy GMFCS aged 2-5 years (68%) more than those aged >5 years (32%). Then, at mild-moderate GMFCS levels, there were more male patients (75%) than women (25%), and at severe GMFCS levels, there were more female patients (56%) than men (44%). In the Romeo et al. study, male-moderate mild-grade CP cp patients (77) numbered more than women (54). While at the level of heavy GMFCS, there are also more male sexes (21) than women (19). In the study Romeo et al. cp patients children with mild-moderate GMFCS levels aged >4 years (66) more than the aged <4 years (65) and at the GMFCS level the weight is also more aged >4 years (21) of the aged <4 years (19).[15]

Conclusions

Based on the results of this study it can be concluded that there is a relationship between GMFCS levels and the incidence of epilepsy in pediatric CP patients at Ulin Banjarmasin Hospital. Researchers suggest further studies with a larger number of samples than the study are needed, to get samples that could better represent the CP patient population. It is expected that with this study parents should always monitor and pay attention to the growth and development of their children, starting from newborns so that the incidence of CP can be detected early and also so that it is not too late to be handled so that it does not get worse.

Acknowledgements

The authors are grateful to Ely Purnama, S.Kep., Ns. and Ilmi Darmawan S.Kep., Ns., who assisted with data collection for this study.

References

1. Kenneth FS, Stephen A, Donna MF. Pediatric Neurology: Principles & Practice. 6th ed. Philadelphia: Elsevier Health Sciences; 2017.
2. Kementrian Kesehatan Republik Indonesia. Infodatin: penyandang disabilitas pada anak. Pusat Data dan Informasi Kementrian Kesehatan RI. 2014.
3. RSUD Ulin Banjarmasin. Buku register kasus cerebral palsy anak di RSUD Ulin Banjarmasin tahun 2018-2021. Banjarmasin: RSUD Ulin. 2021.
4. Wibowo AR, Saputra DR. Prevalens dan profil klinis pada anak palsi serebral spastik dengan epilepsi. Sari Pediatri. 2016;14(1):1-7
5. Karatoprak E, Sözen G, Saltık S. Risk factors associated with epilepsy development in children with cerebral palsy. Child's Nervous System. 2019;35(7):1181–7.
6. Ekici A, Carman KB, Yimenicioglu S, Kocak O, Yarar C, Yakut A, et al. The evaluation of epilepsy and other contributing disorders in patients with cerebral palsy using the Gross Motor Function Classification System. The European Research Journal. 2017;175–181.
7. Putri SMAP, Kurniawan CD, Silakarma D. Faktor prenatal, perinatal, dan postnatal kejadian cerebral palsy pada anak di Rumah Sakit Umum Pusat Sanglah Denpasar. Jurnal Medika Udayana. 2019;8(8):2–7.
8. Michael-Asalu A, Taylor G, Campbell H,

Lelea LL, Kirby RS. Cerebral Palsy: Diagnosis, Epidemiology, Genetics, and Clinical Update. Advances in Pediatrics. 2019;66:189–208.
9. Novak I, Morgan C, Adde L, Blackman J, Maled RN, Brunstrom-Hernandez J, et al. Early, accurate diagnosis and early intervention in cerebral palsy: Advances in diagnosis and treatment. JAMA Pediatrics. 2017;171(9):897–907.
10. Chounti A, Hägglund G, Wagner P, Westbom L. Sex differences in cerebral palsy incidence and functional ability: A total population study. Acta Paediatrica Internasional Journal of Paediatrics. 2013;102(7):712–7.
11. Te Velde A, Tantsis E, Novak I, Badawi N, Berry J, Golland P, et al. Age of diagnosis, fidelity and acceptability of an early diagnosis clinic for cerebral palsy: A single site implementation study. Brain Sciences. 2021;11(8):1–14.
12. Ibrahim ZZ, Amalia PR, Setiawati OR. Hubungan Fungsi Motorik Kasar terhadap Kualitas Hidup Anak Cerebral Palsy di Instalasi Rehabilitasi Medik RSUD Dr . H . Abdul Moeloek. Jurnal Medika Malahayati. 2016;3(2):79–82.
13. Pavone P, Gulizia C, Le Pira A, Greco F, Parisi P, Di Cara G, et al. Cerebral palsy and epilepsy in children: Clinical perspectives on a common comorbidity. Children. 2021;8(1):1–11.
14. Cooper MS, MacKay MT, Fahey M, Reddihough D, Reid SM, Williams K, et al. Seizures in children with cerebral palsy and white matter injury. Pediatrics. 2017;139(3).
15. Romeo DMM, Cioni M, Battaglia LR, Palermo F, Mazzone D. Spectrum of gross motor and cognitive functions in children with cerebral palsy: Gender differences. European Journal Paediatric Neurology. 2011;15(1):53–8.
16. Baehr M, Frotscher M. Diagnosis topic neurologi DUUS. 4th ed. Jakarta: EGC; 2010.
17. Shichuo L, Ding D, Jianzhong W. Definitions and Epidemiology of Epilepsy. In: Oxford Textbook of Epilepsy and Epileptic Seizures. 2013. p. 51.
18. Simon S. The Causes of Epilepsy. In: Oxford Textbook of Epilepsy and Epileptic Seizures. 2013. p. 61–2.
19. Vera R, Dewi M, Nursiah N. Sindrom Epilepsi Pada Anak. Majalah Kedokteran Sriwijaya. 2014;46(1):72–6.