

## Association between type of cerebral palsy and the cognitive levels

Ratna Dewi Kusumaningrum, Elizabeth Siti Herini, Djauhar Ismail

### Abstract

**Background** Cerebral palsy is the main cause of physical disability during childhood. Assessment is necessary to acknowledge the level of intelligence of the patients and to prevent impairments in order to plan the prompt intervention.

**Objectives** To evaluate the cognitive levels of cerebral palsy and association between cognitive levels and its types.

**Methods** We conducted a cross-sectional study on subjects from Sekolah Luar Biasa Negeri 3 Yogyakarta. Intelligence was measured using the Stanford-Binet intelligence scales, whereas diagnosis of cerebral palsy was based on criteria of the American Academy for Cerebral Palsy (AAPC). Data were analyzed using chi-square test.

**Results** There were 35 subjects, comprising of 21 boys and 14 girls aged 5–18 years. The results show that in general, children with cerebral palsy had mental retardation in several cognitive levels. Children with hemiplegia type (1 subject) had IQ level that equals to mental retardation. Children with spastic diplegia type (6 subjects) showed borderline IQ (1) and mental retardation (5). Children with quadriplegia type (15 subjects) had superior IQ (1), borderline (7) and mental retardation (7). Out of 13 subjects with athetoid type 2, had borderline IQ (2), and mental retardation (11). The statistical analysis with chi-square test resulted in  $P = 0.114$  ( $P < 0.05$ ).

**Conclusion** Our data showed that most patients with cerebral palsy had mental retardation of several cognitive level but there was no significant association between each type of cerebral palsy with cognitive levels. [Paediatr Indones. 2009;49:186-8].

**Keywords:** cerebral palsy, children, cognitive level

Over the last twenty years, the problems of human development, behavior, and psycho-social have been highlighted and put forward as a new morbidity.<sup>1</sup> One of the human development problems that come to interest is cerebral palsy, because it is one of the main cause of impairments during the childhood.<sup>2</sup> The prevalence of cerebral palsy is 1.5–2.5 per 1000 live-births;<sup>2–5</sup> cerebral palsy most frequently found in very low birth weight infants.<sup>5</sup> Patients with cerebral palsy suffer from all limitations caused by the disabilities of which will affect their either micro- or macroconditions. Nonetheless, cerebral palsy patients with mental retardation will burden their families in microenvironment, societies, and nation in economical, psychological, or social terms. Therefore, evaluation should be conducted to figure out the intelligence and prevents further impairments in cerebral palsy children to plan the prompt intervention.<sup>7</sup>

Studies on the association between types of cerebral palsy and cognitive levels have resulted in

---

From the Department of Child Health, Medical School, Gadjah Mada University, Sardjito Hospital, Yogyakarta, Indonesia.

**Reprint request to:** Ratna Dewi Kusumaningrum, MD, Departement of Child Health, Medical School, Gadjah Mada University, Dr. Sardjito Hospital, Jln.Kesehatan no.1 ,Sekip Utara, Yogyakarta 55281, Indonesia. Tel 62-274-587333 ext.232. Fax.62-274-583745.

controversial figures. On the other hand, Rambe *et al*<sup>8</sup> showed a definite association between types of cerebral palsy and cognitive level, but on the other hand other investigators found that such association does not exist.<sup>9-10</sup> We aimed to determine the association in our population.

## Methods

We conducted a cross-sectional study in 2007 involving children of the school for children with special condition in Yogyakarta, where children with cerebral palsy were mostly found. We recruited 35 subjects based on the sample size estimation:<sup>11</sup> We included children with cerebral palsy aged 5 to 18 years old<sup>12</sup> and agreed to participate, and excluded children with epilepsy either active or already cured.

The diagnosis of cerebral palsy was based on the anatomical and clinical diagnosis according to the classification of the American Academy for Cerebral Palsy (AAPC); results were expressed as nominal scale (hemiplegia, spastic diplegia, spastic tetraplegia, athetoid).<sup>13</sup> The psychologist determined the cognitive aspect of the subjects using the Stanford-Binet Intelligence Scales.<sup>14</sup>

The variable scale was nominal scale (types of cerebral palsy) and ordinal scale (cognitive levels). Data were analyzed using chi-square test to calculate the relationship between the type of cerebral palsy and the cognitive levels.

## Results

There were 35 subjects in this study, comprising 21 boys and 14 girls with range of age from 5–18 years. The most common type of cerebral palsy in this study was the spastic quadriplegia (15), and then athetoid type (13). There were no subject with ataxic.

**Table 1.** Type of cerebral palsy

Type of cerebral palsy	Subject N = 35
Hemiplegia	1
Spastic Diplegia	6
Spastic Quadriplegia	15
Athetoid	13

We classified the cognitive levels into two categories: mental retardation and non-mental retardation that consisted borderline, normal, and superior. The association between type of cerebral palsy and cognitive levels could be seen in **Table 2**.

**Table 2.** Association between type of cerebral palsy and cognitive levels

Type of cerebral palsy	Cognitive level	
	Superior-borderline (70-140) N = 11	Mental retardation (<70) N = 24
Hemiplegia	0	1
Spastic diplegia	1	5
Spastic quadriplegia	8	7
Athetoid	2	11

X<sup>2</sup>=5.957; df = 3; P = 0.114

In general, there were 24 subjects with cognitive level of mental retardation. There were no subject with normal cognitive level. Only one subject had a superior cognitive level, and the rest were borderline. There was no association found between types of cerebral palsy and cognitive levels (P = 0.114).

## Discussion

According to the types of motor dysfunction, cerebral palsy is classified into: (1) spastic type (70-80%), (2) dyskinetic type (10-15%), and (3) ataxic type (<5%),<sup>15</sup> in which the spastic type is the most frequent. This was similar with this study; 22 subjects were cerebral palsy of spastic type, hemiplegia, spastic diplegia, and spastic quadriplegia and the other 13 suffered from dyskinetic (athetoid).

Male subjects were more than females (21 vs 14 = 2:3). From each type of cerebral palsy, male subjects were also more than females. However, it is generally believed that gender has no role on the development of cerebral palsy. Rambe *et al*<sup>8</sup> conducted a study on 74 children with cerebral palsy, 28 boys and 46 girls. This study resulted in 42% of spastic type of cerebral palsy implied in mild mental retardation, 67% of hypotonic type in moderate mental retardation, and 75% with dyskinetic in moderate mental retardation, and 100% of mixed type of cerebral palsy in severe mental

retardation. Our results were in line with Hutton and Pharaoh' study<sup>16</sup> which stated prevalence of cerebral palsy children who suffered from mental retardation was 50-70%. This might support relationship between damage location inside the brain and types of cerebral palsy which also determine the type.

Our study showed no relationship between type of cerebral palsy and the cognitive levels. This is different with the study done by Rambe et al who demonstrated a relationship between the type of cerebral palsy and the cognitive levels. In conclusion, with the limited number of patients, this study indicates that most of the patients with cerebral palsy have mental retardation of cognitive levels but there is no relationship between the type of cerebral palsy and the cognitive levels.

## References

1. American Academy of Pediatrics (AAP). Committee on Children With Disabilities. Developmental surveillance and screening of infants and young children. *Pediatrics*. 2001;108:192-5.
2. Krigger KW. Cerebral Palsy: An overview. *Am Fam Physician*. 2006;73:91-102.
3. Kuban KCK, Leviton A. Cerebral palsy. *N Engl J Med*. 1994;330:188-95.
4. Rosenbaum PL, Walter SD, Hanna SE, Palisano RJ, Russell DJ, Raina P, et al. Prognosis for gross motor function in cerebral palsy. *JAMA*. 2002; 288:1357-63.
5. Vincer MJ, Allen AC, Joseph KS, Stinson DA, Scott H, Wood E. Increasing prevalence of cerebral palsy among very preterm infants: lowercase. *Pediatrics*. 2006;118:e1621-6.
6. Rosenbaum P. Cerebral palsy: what parents and doctors want to know. *BMJ*. 2003;326:970-4.
7. Beckung E, Hagberg G. Neuroimpairments, activity limitations, and participation restriction in children with cerebral palsy. *Dev Med & Child Neur*. 2002;44: 309-16.
8. Rambe AM, Syarifuddin A, Saik B. Intelligence level in children with cerebral palsy (CP) at YPAC Medan. *Med J Indones*. 2002;11:242-5.
9. Brett EM. *Paediatric Neurology*. Churchill Livingstone: London; 1985.
10. Menkes JH. *Textbook of child neurology*. 5th ed. USA: Williams & Wilkins; 1995.
11. Sugiyono. *Metode penelitian administrasi*. Bandung: Alfabeta, 2004; p. 98
12. Tunggal HS. *Undang-Undang Perlindungan Anak (Undang-Undang Nomor 23 Tahun 2002)*. Jakarta: Harvarindo; 2005.
13. Titien I. Penyimpangan dentokraniofasial anak palsi serebral usia 8-16 tahun dan faktor risikonya [Dissertation]. Jakarta: University of Indonesia; 2007.
14. Fournier PA. Stanford-Binet intelligence scales. American Psychological Association. 2006 . [cited 2006 August 19]. Available from: <http://www.apa.org>.
15. Bax M, Goldstein M, Rosenbaum P, Leviton A, Paneth N. Proposed definition and classification of cerebral palsy. *Dev Med & Child Neur*. 2005;47:571-6.
16. Hutton JL, Pharoah POD. Effects of cognitive, motor, and sensory disabilities on survival in cerebral palsy. *Arch Dis Child*. 2002;86:84-90.