

## Intelligence level in children with cerebral palsy (CP) at YPAC Medan

Abdul Mutholib Rambe, Amir Syarifuddin, Bistok Saing

### Abstrak

Telah dilakukan penelitian mengenai tingkat kecerdasan pasien anak penyandang kelumpuhan otak (CP) di Yayasan pembinaan anak cacat (YPAC) Medan, dengan menghubungkan antara jenis CP, derajat retardasi mental, serta jenis kelamin. Penelitian dilaksanakan secara potong lintang, meliputi semua pasien dengan CP yang terdaftar dalam buku registrasi poliklinik YPAC Medan antara Juli 1987-Juni 1998. Semua di antara 74 pasien yang diikutsertakan dalam penelitian ini mempunyai IQ di bawah rata-rata dan 62% di antaranya berjenis perempuan. Jenis yang paling banyak ialah tipe spastik (65%), kemudian campuran (16%), diskinetik (11%) dan hipotonik (8%). Secara keseluruhan, golongan CP campuran mempunyai derajat retardasi mental paling berat. Secara statistik terdapat hubungan bermakna antara jenis CP dengan tingkat retardasi mental ( $P < 0.001$ ), dan tak terdapat hubungan bermakna antara jenis CP dengan jenis kelamin. (*Med J Indones 2002; 11: 242-5*)

### Abstract

Children with cerebral palsy has been investigated at YPAC (Yayasan Pembinaan Anak Cacat / Institute for Crippled Children) Medan to obtain the detailed description of patient's intelligence level referring to cerebral palsy types and to determine the relationship between palsy types and mental retardation level as well as to relate cerebral palsy types and sex. The study is cross-sectionally conducted involving all cerebral palsy patients listed in registration book of YPAC Polyclinic Medan from July 1987 to June 1998. Of 74 patients participated in the study, all had IQ under average and 62% them were female. The most common type is spastic (65%), followed by mixed (16%), dyskinetic (11%) and hypotonic (8%), respectively. Overall, the mixed type had severe mental retardation. Statistically, there is a significant relationship between cerebral palsy types and mental retardation level ( $p < 0.001$ ). There is no significant relationship between cerebral palsy types and sex. (*Med J Indones 2002; 11: 242-5*)

*Keywords: cerebral palsy, intelligence level, children with CP*

It is interesting to monitor the motor development because the change can be clearly seen. It is a gradual process beginning from the newborn to the adult following a regular pattern with predetermined sequence. Before more complex skills could be learned, the simple ones must be passed through. General and undirected movements became specific and directed. The motor development is a genetically programmed process. Environmental, racial, sexual and socio-cultural factors play little role in motor development.<sup>1,2</sup>

Cerebral palsy is a static encephalopathy that may be defined as a non progressive disorder of posture and movement resulting from a defect or lesion of the developing brain from mild to severe.<sup>1,3,4-7</sup> The severity of motor development disabilities depend much on type, size and distribution of the cerebral

lesion as well as on the patient's intelligence.<sup>1,3</sup> The exact time when the growing brain reaches the adult size is still a controversy. Some authors suggested the age of 2 years; other investigators reported the brain can still increase in weight until the age of 5 to 8 years.<sup>3</sup>

Cerebral palsy is also commonly associated with a spectrum of developmental disabilities, including mental retardation, epilepsy, visual, hearing, speech, cognitive and behavioral abnormalities.<sup>1,3,5</sup> Intellectual problem in the form of mental retardation often occurred in cerebral palsy.<sup>5,8</sup> According to Brett,<sup>9</sup> there is no significant relationship between cerebral palsy types and intelligence level. But most children with spastic-type cerebral palsy had mental abilities under average, and their performance showed the subnormal mental symptoms.<sup>8</sup> This study is aimed to obtain a detailed description of intelligence level for children with cerebral palsy based on the type, to

determine the relationship between cerebral palsy types and mental retardation level as well as to relate cerebral palsy types and sex for children with cerebral palsy at YPAC Medan.

## METHODS

This investigation is a cross sectional study carried out from October to November 1998 involving all children with cerebral palsy listed in the registration book of YPAC Polyclinic Medan since July 1987 to June 1998. The participants were 2-14 years old. The children's age was determined as follows: 30 days equal to a month; 12 months is a year. The children's aged less than 15 days was neglected, more than 15 days were counted as one month. The patients' data were collected from medical records including name, age, sex and cerebral palsy types. Clinically cerebral palsy was classified as follows: (1) spastic; (2) dyskinetic; (3) hypotonic; (4) ataxic and (5) mixed types.<sup>10</sup> Written informed consent were obtained from the parent or guardian and the patient's intelligence level was measured by a psychologist using the Stanford-Binet method. The quantitative value was converted into qualitative results by classifying IQ level into: severe (IQ < 35), intermediate (IQ = 36-51), mild (IQ = 52-67) and borderline (IQ = 68-83) mental retardation.<sup>11</sup>

The statistical analysis was done using a computer with SPSS for windows program. Kolmogorov-Smirnov goodness of fit test was used to examine whether or not the data is distributed normally. The relationship between two qualitative variables was analyzed using chi-square test (confidence level 95%;  $p < 0.05$ ).

## RESULTS

There were 86 children with cerebral palsy recorded in the patient registration book of YPAC Polyclinic Medan from July 1987 to June 1998 with the age between 2-14 years (mean 7.9; SD 2.29). Only 74 cases of them (80%) could be included in the study, consisting of 46 cases (62%) girls and 28 cases (38%) boys. Twelve children not included from the study consisted of : 5 uncontrolled and unclear cases; 2 had moved to other areas and 4 whose IQ could not be tested. All IQ were below average. The distribution of

intelligence level examination showed : severe 20 cases (27%), intermediate 24 cases (33%), mild 20 cases (27%) and borderline 10 cases (13%) of mental retardations.

Based on the cerebral palsy classification, spastic, dyskinetic, hypotonic and the remaining mixed types were 48 (65%), 8 (11%), 6 (8%) and 12 (16%) cases, respectively. The characteristics of cerebral palsy patients with mental retardation can be seen in table 1.

Table 1. Characteristics of study subjects

Characteristics	Subjects	IQ	(%)
Age (yr), mean (SD)	7.9 (2.99)		-
<b>Sex:</b>			
- Male	28		38
- Female	46		62
<b>Cerebral palsy types:</b>			
1. Spastic	48		65
2. Dyskinetic	8		11
3. Hypotonic	6		8
4. Mixed	12		16
<b>Mental retardation level :</b>			
1. Borderline	10	68-83	13
2. Mild mental retardation	20	52-67	27
3. Intermediate mental retardation	24	36-51	33
4. Severe mental retardation	20	< 35	27

SD = Standard deviation; IQ = Intelligence quotient

In the 48 cases of spastic type cerebral palsy, severe mental retardation was found in 4 cases (8%) only. Mild mental retardation was found in 20 cases (42%); the remaining were intermediate and borderline mental retardation, 14 (29%) and 10 (21%) cases, respectively. From 6 cases of hypotonic type, severe and intermediate mental retardation were 2 (33%) and 4 (67%) cases, respectively. In the 8 dyskinetic group, there were cases of mild and borderline mental retardation; severe mental retardation in this dyskinetic type was seen in 2 cases (25%); the remaining 6 (75%) were intermediate cases. All of 12 mixed type generally showed severe mental retardation. Statistical analysis, discovered significant relationship between cerebral palsy types and mental retardation level (Table 2;  $p < 0.001$ ).

The majority of patients were female with spastic type 63%, hypotonic 67%, dyskinetic 63% and mixed 58%. Statistically, there was no significant relationship between cerebral palsy types and sex (Table 3;  $p > 0.05$ ).

Table 2. The relationship between cerebral palsy types and mental retardation level

Cerebral palsy types	Mental retardation level								Total
	Severe		Intermediate		Mild		Borderline		
	n	%	n	%	n	%	n	%	
Spastic	4	8	14	29	20	42	10	21	48
Hypotonic	2	33	4	67	0	0	0	0	6
Dyskinetic	2	25	6	75	0	0	0	0	8
Mixed	12	100	0	0	0	0	0	0	12
Total	20		24		20		10		74

$X^2 = 56.89$        $df = 9$        $p < 0.001$

Table 3. The relationship between cerebral palsy types and sex

Sex	Cerebral palsy types								Total	
	Spastic		Hypotonic		Dyskinetic		Mixed		n	%
	n	%	n	%	n	%	n	%		
Female	30	63	4	67	5	63	7	58	46	62
Male	18	37	2	33	3	37	5	42	28	38
Total	48		6		8		12		74	100

$X^2 = 0.13$        $df = 3$        $p < 0.05$

## DISCUSSION

In this study, severe mental retardation was 27% or equal to the previous other study;<sup>12</sup> mild and intermediate were 27% and 33% of our cases respectively. Moe and Seay<sup>12</sup> reported that mild to intermediate and severe mental retardation were found in 26% and 27%, of their sample respectively. The incidence of mental retardation related to the severity of cerebral palsy.

The number of cerebral palsy patients with mental retardation in female is larger than male patients, 46 cases (62%) vs 28 cases (28%) (Table 1), although statistically, the difference is not significant (Table 3,  $p > 0.05$ ). It differs from another study conducted by Franky (1994) (cited by Soetjningsih) that obtained the opposite results; 58,3% cerebral palsy patients were boys.

According to Monar (cited by Soetjningsih), the spastic-type was the most common type, followed by mixed, dyskinetic and hypotonic types, respectively.<sup>3</sup> The highest percentage of cerebral palsy in this study is spastic found in 48 cases (65%), followed by mixed

in 12 cases (16%), dyskinetic in 8 cases (11%), hypotonic in 6 cases (8%). The sequence of the frequency of the various types of CP is similar to Monar's report.

Statistically, mental retardation level is significantly related to cerebral palsy types. Severe mental retardation is more commonly found in mixed, less in spastic and rare in hypotonic, dyskinetic and ataxic types.

This study showed that all spastic-type patients have subnormal intelligence level which agrees with Mohsen's report.<sup>8</sup> Other studies reported that relationship was found between mental retardation level and the clinical severity<sup>13</sup> which is similar to our findings (Table 2;  $p < 0.001$ ). In spastic diplegia, severe mental retardation was rarely found compared with other types. Almost 25% spastic hemiplegic patients had cognitive abnormality including mental retardation.<sup>5</sup> Spastic quadriplegia was closely related with mental retardation, and almost 90% were severely retarded.<sup>13,14</sup> Ingram (cited by Weil and Levin)<sup>13</sup> reported that none of the children with spastic quadriplegia were educable. Unfortunately, in

this study, cerebral palsy types are not specified in more detail. Crothers and Paine (cited by Weil and Levin)<sup>13</sup> reported that 65% extra pyramidal-type had intelligence level over 70 and 45% of them had an IQ 90 or more. Mixed type cerebral palsy, caused by combined multiple and large cerebral lesion, is specifically related to the more complicated cases including sensory deficit, seizures and cognitive/perception abnormalities.<sup>15</sup> If cerebral palsy is accompanied by seizures, intelligence will be statistically lower.<sup>6</sup> Children with spastic quadriplegia type are often associated with athetosis and classified as mixed type.<sup>5</sup> In this study, mental retardation level is significantly related to cerebral palsy types. Different intelligence levels can be found in spastic type, but the most common were mild 42%, followed by intermediate 29%, borderline 21% and the remaining severe mental retardation 8%. In the dyskinetic type, three fourth of all cases were intermediate and the remaining were severe mental retardation. Two third of cases, in the hypotonic type, were intermediate, and one third severe mental retardation. Most mixed type CP patients had severe mental retardation. This study showed that the incidence of severe mental retardation in the spastic type was low (8%), whereas mild mental retardation was high (42%); intermediate mental retardation and borderline were 29% and 21%, respectively. Two third of the cases in the hypotonic type were intermediate, and the remaining, severe mental retardation. In the dyskinetic type, three fourth of the cases were classified as intermediate and other mild mental retardation. All mixed type cases had severe mental retardation. Statistically, significant relationship between cerebral palsy types and the level of mental retardation was encountered ( $p < 0.001$ ). No significant relationship between cerebral palsy types and sex was found.

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