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Association between Intelligence Level and Handicap Degree in Epilepsy Patients

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Abstract

Background: Epilepsy correlates with high limitation value, disability and function loss which can give negative impact to patient's quality of life. This negative impact correlates with either epileptic seizures (motoric, sensory and behavior) or effects of anti-epileptic drugs that can cause cognitive impairment, which in this case is intelligence aspect with handicap in epilepsy patients. We determined correlation between intelligence level and handicap degree in epilepsy patients.

Methods: The research was conducted in patients of Neurological Department of Dr. Soetomo General Hospital, Surabaya, Indonesia, who met inclusion and exclusion criteria, consecutively from July 2013-December 2013. Intelligence test was conducted using Standard Progressive Matrices (SPM) test, while test on handicap degree was conducted using Subjective Handicap Epilepsy (SHE) test.

Results: There were 40 research subjects (19 females and 21 males) with average age of 30.9±9.6. The average score of SHE was 70.08±16/69, while the average score of SPM was 88.53±10.34. There was a weak positive correlation and statistically significant correlation between SPM and SHE scores ($r = 0.345$ and $p = 0.029$).

Conclusion: There was a correlation between intelligence level and handicap degree in epilepsy patients.

Keywords: Epilepsy, Handicap, Intelligence

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Introduction

Epilepsy is a chronic neurological disease marked by unprovoked epileptic seizures that occurs more than once a year. According to PERDOSSI (2012) there is a high prevalence of epilepsy in developing countries, with number reaching 114 per 100.000 population per year compared to that in development countries. An estimated 250.000 people per year in Indonesia suffer from epilepsy¹.

Epilepsy is caused by curse, magic, possession, mental disorders, and it is often regarded as a disease transmitted through saliva (Harsono, 2012). Limited medical personnel, service facilities, funding and society's ability decrease epilepsy prevention. The disease can be controlled with medication and surgery².

Epilepsy can also deal with intelligence impairment, with prevalence of its occurrence being estimated to be 14% until 44% that has been reported by various studies

conducted in United Kingdom. Furthermore, epilepsy patient with intelligence impairment usually has health problems, including fractures, trauma and side effects of anti-epileptic drugs³. Epilepsy also strongly correlates with intelligence level, which has important roles in handicap. The previous research has explained the correlation between intelligence level and handicap degree, thus this study aims to improve intelligence quality among disabled.

Method

The research is using cross sectional design. The study used sample of all epilepsy patients who visited Outpatient Neurological Clinic of Dr. Soetomo General Hospital, Surabaya, Indonesia from July to December of 2014. The research was conducted at the Outpatient Neurological Clinic of Mental Health Science, Dr. Soetomo General Hospital, Surabaya, Indonesia, for four months⁴.

The following are inclusion criteria that must be fulfilled in the research is epilepsy patients aged 13 – 55 years old, having minimum education of elementary school and can read and write. Being diagnosed with epilepsy at least for 1 year, patients are willing to participate in the research (informed consent) ⁵. The research employed consecutive sampling method. The research variables were intelligence level as independent variable, handicap degree as dependent variable, and sickness duration, types of epileptic seizure, as well as types of therapy as confounding variables. The study protocol was approved by the ethics committees of Dr. Soetomo Teaching Hospital (Surabaya, Indonesia) ⁶.

The research began with patients declaring their willingness to become the subjects of the study by signing informed consent. The sampling process continued by conducting anamnesis, physical and neurological examination based on inclusion and exclusion criteria. Afterwards, the researchers conducted handicap measurement based on SHE score issued by PPDS in Epilepsy unit. Intelligent test was then performed by a psychologist at Psychology Unit of Outpatient Clinic of Mental Health Science, before the researchers recorded all eligible samples and necessary clinical data ⁷. The records were collected to make data tabulation and statistical analysis. The study employed Spearman test to analyze the data since the data were not normally distributed; the results have strong positive correlation and statistically significant ($r=0.697$ and $p=0.025$). Statistic calculation was conducted using SPSS software (SPSS, Inc., Chicago, IL) ⁸.

Results

The results of data processing on distribution of clinical data that includes types of seizure, seizure frequency and types of therapy are shown in Table 1, while frequency distribution of sickness duration, SHE and SPM scores are presented in Table 2. Based on the results of analysis on frequency distribution of seizure types, Table 1 showed 15 subjects with focal seizure (37.5%) and 25 subjects with general seizure (62.5%). On the other hand, frequency distribution of seizure frequency showed 14 subjects (35%) with frequency $<1x/year$ and 26 subjects (65%) with frequency $\geq 1x/year$. Frequency distribution of types of therapy showed 21 subjects were treated with monotherapy (52.5%) and 19 subjects with polytherapy (47.5%). The average SHE score was 70.08 ± 16.69 , while the average SPM score was 88.53 ± 10.34 .

The results of correlation analysis were divided into six data correlation analyses using Spearman test that are shown in Table 3. The results of data processing on correlation between intelligence level (SPM score) and handicap degree (SHE score) based on educational level showed a moderate positive correlation, but it was not statistically significant, between SHE and SPM scores in the sample group of elementary-junior high school graduates, with correlation coefficient (r) of 0.478 and $p=0.137$. Meanwhile for the sample group of senior high school-university graduates, there was a weak positive correlation between SHE and SPM scores ($r=0.128$ and $p=0.508$).

The results of data processing on correlation between intelligence level (SPM score) and handicap score (SHE score) based on the subjects' occupation showed a powerful positive correlation between SPM and SHE scores in the sample group of students-college students, with correlation coefficient of (r)= 0.886 and $p=0.019$, and the correlation was statistically significant. In the sample group of employed subjects, there was no correlation between SPM and SHE scores with correlation coefficient (r)= 0.165 and it was not statistically significant with $p=0.449$. Meanwhile in the sample group of unemployed subjects, there was a moderate positive correlation, but it was not statistically significant, between SPM and SHE scores with $r=0.425$ and $p=0.221$.

The results of data processing on correlation between intelligence level (SPM score) and handicap degree (SHE score) based on seizure types showed a weak positive correlation between SPM and SHE scores in the subjects with focal seizures, with correlation coefficient value (r)= 0.216 , and it was not statistically significant with $p=0.440$. Meanwhile in the sample group of general seizure, there was a moderate positive correlation between SPM and SHE scores with $r=0.419$, and it was statistically significant with $p=0.037$.

The results of data processing on correlation between intelligence level (SPM score) and handicap degree (SHE score) based on seizure frequency showed a weak positive correlation between SPM and SHE scores in the sample group with frequency $<1x/year$, with $r=0.347$, and it was not statistically significant with $p=0.224$. Meanwhile, there was a moderate positive correlation between SPM and SHE scores in the sample group with frequency $\geq 1x/year$, with $r=0.505$, and it was statistically significant with $p = 0.008$.

The results of data processing on correlation between intelligence level (SPM score) and handicap degree (SHE score) based on types of therapy showed no correlation between SPM and SHE scores in the sample group with monotherapy, with $r=0.098$ and $p=0.673$. Meanwhile, there was a moderate positive correlation between SPM and SHE scores in the sample group with polytherapy, with $r=0.574$, and it was statistically significant with $p=0.010$. From the results of overall analysis, there was a weak correlation between SPM and SHE scores with $r=0.345$, and it was statistically significant with $p=0.029$.

Tabel 1. Clinical data by types of seizure, seizure frequency, types of therapy

| Clinical Data Distribution | Value | Percentage |
|----------------------------|-------|------------|
| Types of seizure | | |
| Focal seizure | 15 | 37.5 % |
| General seizure | 25 | 62.5 % |
| Seizure frequency | | |
| <1x/year | 14 | 35% |
| ≥1x/year | 26 | 65% |
| Types of therapy | | |
| Monotherapy | 21 | 52.5% |
| Polytherapy | 19 | 47.5% |

Tabel 2. Clinical data by sickness duration, SHE score and SPM score

| Clinical Data Distribution | Mean ± SB | Range |
|---------------------------------|---------------|----------|
| Sickness duration | | |
| Sickness duration (year) | 11.78± 8.74 | 1-41 |
| Handicap degree (SHE score) | 70.08 ± 16.69 | 30-99 |
| Interlligence level (SPM score) | 88,53 ± 10,34 | 70 - 112 |

Tabel 3. Results of correlation assessment

| Variable(s) | Correlation coefficient (r) | p |
|--|-----------------------------|-------|
| Correlation between intelligence level (SPM score) and handicap degree (SHE score) based on education level | | |
| SPM score vs SHE score (Elementary-Junior High School) | 0.478 | 0.137 |
| SPM score vs SHE score (Senior High School-University) | 0.128 | 0.508 |

| | | |
|---|-------|-------|
| Correlation between SPM and SHE scores based on occupation | | |
| SPM score vs SHE score (student-college student) | 0.886 | 0.019 |
| SPM score vs SHE score (employed) | 0.165 | 0.440 |
| SPM score vs SHE score (unemployed) | 0.425 | 0.221 |
| Correlation between SPM and SHE scores based on types of seizure | | |
| SPM score vs SHE score (focal seizure) | 0.216 | 0.440 |
| SPM score vs SHE score (general seizure) | | |
| Correlation between intelligence level (SPM score) and handicap degree (SHE score) based on seizure frequency | | |
| SPM score vs SHE score (< 1x/year) | 0.347 | 0.224 |
| SPM score vs SHE score (≥ 1x/year) | 0.505 | 0.008 |
| Correlation between SPM and SHE scores based on types of therapy | | |
| SPM score vs SHE score (monotherapy) | 0.098 | 0.673 |
| SPM score vs SHE score (polytherapy) | 0.574 | 0.010 |
| Correlation between intelligence level (SPM score) and handicap degree (SHE score) among total of research subjects | | |
| SPM score vs SHE score | 0.345 | 0.029 |

Discussion

Based on the results of data processing on epilepsy patients' education level, there were 11 subjects (27.5%) graduated from elementary-junior high school, while there were 29 subjects (72.5%) graduated from senior high school-university. The results of data processing on the patients' occupation showed 6 students and college students (6%), 24 subjects were employed (60%) and 10 subjects were unemployed (25%). Thomas SV (2005) explained that most subjects could complete their secondary education and have a job.

Types of anti-epileptic drugs (AEDs) administered to the research subjects were old AEDs, including carbamazepine, valproic acid, phenytoin and clobazam. The average dose used in the research, either monotherapy or combination of polytherapy, was still in the therapeutic range². The research found that monotherapy was more

frequently used than polytherapy. Thus, this finding was consistent with the previous studies which stated that monotherapy was more frequently used than polytherapy for epilepsy patients, including the studies conducted by Cantey (5:1 ratio, n = 145) and Sejvar (3:1 ratio, n = 112).

The results of data correlation processing showed a powerful positive correlation and statistically significant correlation between SPM and SHE scores in the sample group of students and college students. However, this finding cannot be compared with findings from other studies since there is no journal with similar discussion. The present study divided occupational characteristics into two groups, namely students-college students and employed-unemployed. Thus, there was a possibility that students and college students have a more homogenous activity compared to employed subjects (the activity

of employed subjects is more heterogenous because of varied types of occupation)⁹.

There was a moderate positive correlation between SPM and SHE scores found in the group of subjects with seizure frequency of ≥ 1 /year ($r=0.505$ and $p=0.008$). This finding was consistent with studies conducted by Hawari I et al. ($p=0.009$) and Piperidou et al. ($p=0.001$). The finding of the present study is supported by a statement found in literatures that stated that the greater the physical and chronic health problems, the seizure will be more frequently occurred that can worsen epilepsy patients' handicap.. Research conducted by Dodril et al. also indicated that adult patients who suffer from episodes of general tonic clonic seizure more than 100 times tended to have worse intellectual, neuropsychological, psychosocial and emotional functioning than patients with fewer episodes of seizure¹⁰.

Well-controlled seizure will maintain epilepsy patients' cognitive function. Anti-epileptic drugs can control the work and also provide protection function that exceeds its side effects, they are: 1) by reducing seizure activity, where recurrent seizures can trigger neuronal damage and disrupt brain formation and circuits, 2) modulate neurotransmitters effects, reducing excitociticy by decreasing glutamate release, 3) inhibiting Ca^{2+} -mediated cellular function and Ca^{2+} -depended depolarization, 4) as a free radical scavenger, and 5) pleiotropic effects. The results of data correlation processing showed a moderate positive correlation ($r=0.574$ and $p=0.010$) between SPM and SHE scores in the subjects with polytherapy. This finding was consistent with studies conducted by Hawari I et al. ($p=0.006$) and Piperidou et al. ($p<0.001$)

Polytherapy have a relatively bigger effect on cognitive function compared to monotherapy, regardless the types of anti-epileptic drugs used in its combination. Combination of anti-epileptic drugs will worsen its cognitive side effects that can induce the occurrence of more serious cognitive impairments if the drugs are administered in the same time¹¹.

³ The research found a weak positive correlation between SPM and SHE scores ($r=0.345$), and it was statistically significant ($p=0.029$). This finding was consistent with a research conducted by Sabaz with $p=0.000$, as the finding stated that child epilepsy patients with intellectual impairment had a larger handicap (worse quality of life) compared to those with normal IQ.

Gulhoto et al. in Brazil also stated that adolescents with focal seizures had a lower cognitive ability compared to normal adolescents. Epilepsy patients with intellectual impairment have higher emotional, behavioral and cognitive problems, with difficulty in socializing and having achievements, particularly in schoolchildren. The direction of a positive relation indicates that if SPM score increases, the SHE score also increases (smaller handicap)¹².

Although academic problems are the result of multifactorial, there is still a need for a more specific educational approach in order to improve the performance of these adolescents, in addition to helping them eliminate the stigma associated with epileptic seizures in society¹³. Therefore, statistical analysis is true if the research hypothesis states that there is a correlation between intelligence level (SPM score) and handicap degree (SHE score) in epilepsy patients¹⁴. The correlation can also occur due to effects of polytherapy, more seizure frequency towards handicap and worsening intelligence. Therefore, the results of this study are expected to be more clinically focused and precise in giving therapy for epilepsy patients by optimizing the monotherapy use of anti-epileptic drugs and more selective combination therapy.

Conclusion

There was a correlation between intelligence level and handicap degree in epilepsy patients.

¹ **Ethical Clearance:** This research process involves participants in the survey using a questionnaire that was accordant with the ethical research principle based on the regulation of research ethic committee. The present study was carried out in accordance with the research principles. This study implemented the basic principle ethics of respect, beneficence, nonmaleficence, and justice.

Conflict of Interest: The author reports no conflict of interest of this work.

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