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Role of Epidemiological and Clinical Indicators as Predictors Outcome in Acute Haemorrhagic Stroke Patients

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Abstract

Stroke is world's third leading cause of death after heart disease and cancer. Haemorrhagic strokes are more destructive and have a poor prognosis. A prognostic outcome measure of stroke patients can be used to help clinician to educate family and to considerate therapy that provides maximum benefits for the patients. There are 32 research subjects. The data were collected from medical records of haemorrhagic stroke patients who admitted from 2015-2017. Epidemiologic data, risk factors, GCS, NIHSS and GOS were obtained from the patient's medical records. The ICH location, volume and presence of IVH were obtained from the patient's brain CT scan or MRI data. ICH score is calculated based on 5 items: GCS score, ICH volume, IVH, Infratentorial origin of ICH and Age. Statistical test reveals that none of the independent variables measured significantly correlated with LOS (p value <0.05 CI 98%). Number of stroke attacks were significantly associated with 1 month (p value 0,004) and 3 months (p value 0,000) GOS. Both GCS at the time of admitted and discharged from the hospital were significantly associated with 1 month (p value 0,000 and 0,000) and 3 months GOS (p value 0.004 and 0,000). Also both discharged from the hospital were significantly associated with 1 month (p value 0,000 and 0,000) and 3 months GOS (p value 0,001 and 0,000). ICH score has significantly corellation with 1 month (p value 0,000) and 3 months GOS (p value 0,001).

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The results of this study indicate that clinical indicators (number of stroke attacks, GCS, NIHSS) and ICH Score can be predictors of outcomes of haemorrhagic stroke patients. In this study, there is no variable that can be used to estimate how long patients will be hospitalized.

Key words: Hemorrhagic Stroke; GCS; NIHSS; ICH Score; Length of stay (LOS); Outcome.

1. Introduction

Stroke is world's third leading cause of death after heart disease and cancer. According to the American Hearth Association (AHA) and the National Stroke Association, there are an estimated 700,000 new stroke cases per year and about one third causing death [1]. In Indonesia according to the Household Health Survey (Household Health Survey - National Household Health Survey) 1995, stroke is the leading cause of death, with 3 per 1,000 population suffering from stroke and ischemic heart disease. In general, 85% of stroke events are ischemic and 15% are haemorrhagic strokes. Based on prevalence data, hypertension as a major risk factor in Indonesia (about 95%), epidemiologists predict that about 12 million Indonesians people aged over 35 years have the potential to suffer a stroke now and in the future [2]. Stroke is a cause of mortality and disability in Indonesia. There is no clinical pattern data of stroke patients admitted to hospital in Indonesia. Ischemic stroke is the most common type of stroke and the majority of patients are discharged in living conditions with clinical improvement. In the other hand, haemorrhagic strokes are more destructive and have a poor prognosis [3]. A comprehensive effort to control stroke risk factors in the community needs to be encouraged in Indonesia, in addition to a prognostic outcome measure of stroke patients so that the therapy offered can provides maximum benefits.

2. Materials and Methods

The data were collected from medical records of haemorrhagic stroke patients who admitted from 2015-2017 which fulfilled inclusion and exclusion criteria. Epidemiologic data such as gender, age, stroke attack, risk factors, GCS, NIHSS and GOS were obtained from the patient's medical records. The ICH location, volume and presence of IVH were obtained from the CT scan or MRI data of the patient's brain when they came to the hospital. ICH score is calculated based on 5 items: GCS score, ICH volume, IVH, Infratentorial origin of ICH and Age.

Sex, age, location of bleeding, ICH volume, presence of IVH, surgery or not, risk factors, number of stroke attacks, ICH score, GCS and NIHSS score on arrival and when discharged from the hospital are independent variables. While 1 and 3 months Glasgow Outcome Scale (GOS) that reflects the outcome of patients and length of stay (LOS) in the hospital are dependent variables.

3. Result

There are 32 research subjects. Table 1 shows the data and how the data of the research subjects are categorized in this study.

Table 1: Research Subjects

Category	Amount	Percentage
Sex		
• Man	22	68,8
• Woman	10	31,2
Age		
• < 60 year	25	78,1
• ≥ 60 year	7	21,9
Location of the ICH		
• Supratentorial	26	81,3
• Infratentorial	4	12,5
• Both	2	6,3
Intraventricular Hemorrhage	5	15,6
• (+)	27	84,4
• (-)		
Volume of the ICH		
• ≤ 30 mL	28	87,5
• > 30 mL	4	12,5
Surgery		
• (+)	29	90,6
• (-)	3	9,4
Risk Factors		
• (+)	31	96,9
• (-)	1	3,1
Number of stroke attacks		
• 1	24	75
• >1	8	25
GCS at admission		
• 3-4	1	3,1
• 5-12	8	25
• 13-15	23	71,9
GCS at discharge		
• 3-4	1	3,1
• 5-12	5	15,6
• 13-15	26	81,3
NIHSS at admission		
• ≤ 5	10	31,3
• 6-13	15	46,9
• ≥ 14	7	21,9
NIHSS at discharge		
• ≤ 5	19	59,4
• 6-13	6	18,8
• ≥ 14	7	21,9
ICH Score		
• 0	15	46,9
• 1	12	37,5
• 2	3	9,4
• 3	1	3,1
• 4	1	3,1
• 5	0	0
• 6	0	0
LOS		
• ≤ 10 hari	17	53,1
• > 10 hari	15	46,9

GOS 1 month		
• < 4	8	25
• ≥ 4	24	75
GOS 3 months		
• < 4	4	12,5
• ≥ 4	28	87,5

Statistical test reveals that none of the independent variables measured significantly correlated with LOS (p value <0.05 CI 98%). Number of stroke attacks were significantly associated with 1 month GOS (p value 0,004) and 3 months (p value 0,000). Both GCS at the time of admitted and discharged from the hospital were significantly associated with 1 month (p value 0,000 and 0,000) and 3 months GOS (p value 0.004 and 0,000). Also both discharged from the hospital were significantly associated with 1 month (p value 0,000 and 0,000) and 3 months GOS (p value 0,001 and 0,000). ICH score has significantly corellation with 1 month (p value 0,000) and 3 months GOS (p value 0,001).

4. Discussion

This study aims to determine the various epidemiological and clinical variables that can affect and estimate how long the stroke patients will be treated at the Hospital and predict the outcome of the patient. It can be used to educate haemorrhagic stroke patients and families and help clinician to choose the appropriate therapy.

The subjects distribution based on sex was 22 men (68,8%) and 10 women (31,2%). This is consistent with previous studies suggesting that the stroke incidence is higher in men [4] [5],but the prevalence of stroke is higher in women because there are more women in the population, especially over the age of 70 years [4].

Epidemiological indicators (sex and age), radiological indicators (location and volume of ICH and presence of IVH) and clinical indicators (risk factors, number of stroke attacks, GCS, NIHSS and ICH score) were not significantly associated with the length of stay of haemorrhagic stroke patients in the hospital (LOS). This is possible because the length of treatment depends on many factors, not only the clinical condition of the patients but also the doctor's consideration and social factors.

Haematoma volume is one of the relevant predictors of patients' outcomes. Haematoma expansion and delayed intraventricular haemorrhage independently predict poor outcome in ICH while intraventricular spread of haemorrhage was independent predictors of outcome at 6 months [6]. 62.5% of patients with larger haemorrhage volume has poor outcome compared with 18% in patients with lesser haemorrhage volume after 30 days [7]. Research by Börü and his colleagues in 2009 proved a correlation between haematoma volume and mortality rates (30-day and one-year), poor prognosis can be predicted by volume of hematoma [8]. Similar with study by Sang Joon An and his colleagues which states that poor prognostic factors of ICH include large hematoma volume, hematoma expansion, intraventricular hemorrhage, infratentorial location and old age [9]. In the other hand, a study conducted at the National University of Malaysia found that the volume of hematoma showed no significance in predicting the outcome of the patients with intra cerebral haemorrhage [6]. In our study, volume

of hematoma, presence of IVH, location of hematoma and age have no significant association with outcome (GOS) of hemorrhagic stroke patients. This result was similar to the study conducted by Gyeong O Go and his colleagues in 2013 which states that the ICH location, as well as the presence or absence of intraventricular hemorrhage (IVH), had no significant effect on outcomes. This can be due to the small number of samples and the unbalanced case distribution between the various variable criteria.

This study also found that the number of stroke attacks were significantly associated with outcome of haemorrhagic stroke patients. As we know that stroke is the leading cause of disability. Moreover, after recurrent stroke, recovery of neurological deficits will be worse than that of the first attack, resulting in poor functional outcome [10].

The GCS has the advantage of being simpler to use, because it does not require analysis of brain imaging and measurement of hematoma volume followed by the calculation of an additional score [11]. GCS has been used extensively as a predictor of outcome in haemorrhagic stroke patients [9]. In this study both GCS at admitted and discharged from the hospital had a significant corellation with outcomes (GOS). The better the GCS is, the better the outcome. Various studies have similar results, in Asian studies, low initial GCS were independent predictors for poor outcome [9]. In a population-based study in Greater Cincinnati, the volume of ICH in combination with the GCS predicted overall 30-day mortality with 96% sensitivity and 98% specificity [5]. Study conducted by Gyeong O Go and his colleagues in 2013 also found that the initial GCS score significantly predicted results and outcomes. Patients with GCS ≤ 8 had a higher proportion of poor outcomes, compared to patients with GCS > 8 [12]. Study by Safatli DA et la 2016 reveals that GCS score on admission together with the baseline volume and localization of the hemorrhage are strong predictors for 30-day mortality in patients with spontaneous primary intra cerebral hemorrhage [13].

The National Institutes of Health Stroke Scale (NIHSS) is a valid, reproductive scale that measures neurological deficits and most often used as a value system in stroke intervention studies [14,15] NIHSS is associated with infarct size, clinical severity and long-term outcomes. Two or more NIHSS score changes are used in clinical trials to immediately recognize potential changes in patient status so the clinician can give prompt diagnostic and treatment. The predictive value of the NIHSS scale can also be made for planning the rehabilitation of the patient or the need for long-term care. More than 80% of patients with score 5 or less at the time of admission will be discharged, compared to those with score 6 and 13 usually require immediate rehabilitation while still hospitalized, and patients with score 14 or more require long-term care [16]. The study conducted by Adams and his colleagues shows that NIHSS score have strong predictive value regarding the recovery of patients after stroke. The ≥ 16 score is estimated to have a high probability of outcome with severe disability or death. While the scor of ≤ 6 indicates a good likelihood of recovery [17]. Study by Charles Bae and his colleagues found out that the admission NIHSS predicts 3-month survival in ICH patients better than the GCS [18]. As the literature, this study also found that NIHSS at admission and discharged from the hospital has a significant corellation with the outcome (GOS).

ICH Score, a simple clinical grading scale consisting of 5 items: age, GCS, ICH Volume, Location of the ICH, IVH, may help stratify the risk. Patient with high ICH score have a high mortality rate [9] [19]. The ICH score

accurately predict the 30-day mortality [13]. In this study, ICH scores had significant corellation statistically with outcomes (GOS) of haemorrhagic stroke patients. However, when each item is assessed separately, the results show no significant corellation with outcomes (GOS). This suggests that a scoring system consisting of multiple assessment items has a better predictor power than a single predictor variable.

5. Conclusion

The results of this study indicate that clinical indicators (number of stroke attacks, GCS, NIHSS) and scores that combine epidemiological, clinical and radiological data (ICH Score) can be predictors of outcomes of haemorrhagic stroke patients who can provide information to the patient's family and help clinicians predict possible outcome of treatment.

In this study, there is no variable that can be used to estimate how long patients will be hospitalized. This can be due to the many factors that affect it. Not only the patient's clinical condition, but also the consideration of the physician and social factors. Further research is needed with larger samples and more stringent inclusion and exclusion criteria.

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