

THE RELATION OF STROKE PATIENT'S CORTISOL LEVEL TO NATIONAL INSTITUTES OF HEALTH STROKE SCALE CORE ON SPONTANEOUS INTRACEREBRAL HEMORRHAGE: AN OBSERVATIONAL STUDY AT RUMAH SAKIT UMUM DAERAH (REGIONAL PUBLIC HOSPITAL) DR. SOETOMO IN SURABAYA

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Received: 10 July 2018, Revised and Accepted: 07 December 2018

ABSTRACT

Objective: The objective of the study was to find out differences in the cortisol level characteristics and National Institutes of Health Stroke Scale (NIHSS) score in the 1st and 7th days on patients treated at Dr. Soetomo Regional Hospital; thus, it can be the right education for stroke patients.

Methods: A prospective observational study was carried out against stroke patients treated in the neurosurgery department on September 2016–March 2017. Evaluation was done to all patients treated at the neurosurgery department. The evaluation process began with basal hormones within the first 24 h and taken at 6:00 and repeated on the 7th day to surviving patients. Of all the data obtained, the category scale data are presented by its frequency distribution, while numerical scale data are presented by its descriptive value (average and standard deviation).

Results: Of the 17 patients surviving until the 7th day, there is a decrease at the average cortisol level on the 1st day when compared to the average cortisol level on the 7th day with a mean value of 39.67–36.57 and so is the highest cortisol level; it decreases from the 1st day of 61.45 to the 7th day of 56.70. Meanwhile, in the NIHSS score value, the decrease in score only occurs in the average value on the 1st and 7th days from an average of 22.82 into 21.41, whereas minimum and maximum scores do not change. With the test result, the cortisol level characteristic gets a score of $p < 0.05$; thus, there is a significant difference.

Conclusion: Of the result of observation already carried out on stroke patients treated at Dr. Soetomo Regional Hospital, treatment and education levels for patients who have a risk of stroke factor are very important.

Keywords: Stroke, Hemorrhage, National Institutes of Health Stroke Scale, Cortisol

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INTRODUCTION

Increased stroke patient is one interesting topic that draws the attention of researchers [1]. One type of stroke commonly found is intracerebral hemorrhage (ICH). According to Fathima *et al.* [2] of 70% incidence of ischemic stroke, 20% of cases are ICH. Thus, this case gains much concern, although there are a lot of factors causing a stroke [3].

In the past 2 years, the number of hemorrhage stroke cases at Dr. Soetomo Regional Public Hospital (Rumah Sakit Umum Daerah, RSUD) had significantly increased, which made it a particular concern.

For the past 10 years, the knowledge development of spontaneous ICH (SICH) increasingly changed [4-6], for example, a radiology technique for diagnosing *in vivo* from ICH was found. The ICH occurs when the blood vessel in the brain parenchyma is ruptured. SICH can also happen as the result of a complication of previous lesions, such as vascular malformation or tumor, which is categorized as secondary SICH. When ICH occurred, blood vessels in the brain parenchyma ruptured. This causes an acute illness and gives effect to stroke patients where their cortisol levels are increased. Cortisol levels give an indication of the disease severity and its recovery phases. Cortisol may also be referred to as a short-term prognostic sign from the functional outcome and mortality. The same thing can be occurred in stroke patients who have an experience where cortisol levels increased in 7 days after the occurrence of stroke.

Referring to Barugh *et al.* [7] the increased cortisol after related with subordination, disability, and mortality. However, there is insufficient

evidence to draw conclusion that this relation does not depend on the severity of stroke.

One of the commonly used measuring tools to assess severity degree of a stroke is National Institutes of Health Stroke Scale (NIHSS). NIHSS and NIHSS modified have superiority in assessing the neurological deficit compared to other measuring tools [8,9]. By understanding the relationship between the increased level of cortisol and NIHSS scorer to acute stroke patients on the first 7 day, then, the pattern of handling stroke sufferers can be optimal. Also, a predict recovery of ambulation and upper limb function after 6-month stroke by age and NIHSS models as [10].

RELATED WORK

Until now, the topic of handling stroke patients has become very interesting. Hence, many researchers want to improve performance with a variety of methods [11-14]. SICH is a multi-factorial and etiological disease, and it is the second most occurring kind of stroke after ischemic stroke with the percentage of 10–20% of all kinds of stroke cases. According to Ikram *et al.* [15], hypertension is the dominant factor that affects the ICH occurrence. It corresponds to research in Japan, which has been issued by Aguilar and Freeman [16].

The understanding of axis hypothalamic-pituitary-adrenal activation during acute condition, which causes the increasing of cortisol serum concentration, is often connected to the severity level of diseases and prognosis. If a patient successfully passes the acute phase but experiences an elongation in a recovery process, a prolonged critical

period may occur [17]. The case of increasing cortisol level on the first 7 days after the stroke is very high.

Cortisol can be used as a prognostic factor of short-term functional ability and death to a patient in China who suffers from an acute ischemic stroke. Studies on the relationship between neuroendocrine change and SICH are not strong enough and still cause conflict [18]. Some studies state that there is a change of the cortisol level in a stroke patient but not specifically for ICH [19].

The increase of the cortisol level is related to symptoms of confusion and poor output of a post-stroke patient. Hypercortisolism is also related to an initial cognitive dysfunction after the occurrence of ischemic stroke. The fluctuative change of the cortisol level affects the increase of death rate after the ischemic stroke [20]. During the acute ischemic stroke, a stress response may occur, and catecholamines increase is proven to be related to the stroke severity level and final output [21]. Death on an acute stroke patient is related to the increase of cortisol serum level while S-Cortisol is related to the stroke severity level [22].

RESEARCH METHOD

This research is conducted using an analytic observation method while the samples used are all ICH patients of RSUD Dr. Soetomo that have fulfilled inclusion criteria.

17 patients (9 females and 8 males, Table 1) who were treated by a team of neurosurgeons at RSUD Dr. Soetomo from August 2016 to June 2017 had fulfilled an inclusion and exclusion criteria to form a study group in this research. The sample size is taken using a correlation formula:

$$n = \{ (Z\alpha + Z\beta) / (0,5 \ln [(1+r)/(1-r)]) \}^2 + 3 \tag{1}$$

Then,

$$\alpha = 0.05 \rightarrow Z_\alpha = 1.96 \tag{2}$$

$$\beta = 0.20 \rightarrow Z_\beta = 0.84 \tag{3}$$

The exclusion criteria are of age <17 years old and no >60 years old, having an endocrine disorder, sustaining an extracranial injury, experiencing hemorrhage caused by aneurysm/avm, and having a metabolic disorder. An initial computed tomography scan examination is applied to the patients to diagnose the ICH. The volume measurement is made based on the ABC/2 technique, and it is possible that the intraventricular hemorrhage is scored using the Graeb scheme. Following flowchart is shown in Fig. 1.

Hypothesis:

The levels of cortisol on day 1 and 7 are different

- Sig. >0.05 = H₀ accepted,
- Sig. <0.05 = H₀ is rejected

The NIHSS score of days 1 and 7 is different

- Sig. >0.05 = H₀ accepted,
- Sig. <0.05 = H₀ is rejected

Relationship between cortisol levels day 1 with mortality.

Evaluation of basal hormone is applied to all patients within the first 24 h of being hospitalized. A blood sample is taken at 6.00 a.m. on the following day and is repeated on the 7th day only for the patients who survive. The normal level of cortisol hormone is 5–25 mgm dl/1.

The clinical condition of the patients is measured using NIHSS. The measurement is conducted when the patients come and on the 7th day. The NIHSS score has been directly evaluated by researchers. All data have been tabulated and analyzed.

RESULTS

This research is conducted for 6 months by collecting the medical record data of the patients from the period of September 2016 to March 2017

at RSUD Dr. Soetomo. The collected data are the data of the acute ICH stroke patients. The population collected is 17 patients. The data are divided into the inclusion and exclusion data, as many as 17 patients and 9 patients with characteristics as presented the Table 1.

Table 1 shows the total and percentage of research samples based on age and gender between female and male from the period of September 2016 to March 2017 at RSUD Dr. Soetomo.

The cortisol level of each patient is examined on the 1st and the 7th days. Table 2 shows the cortisol examination result on the 1st and the 7th days.

From the data above, it can be seen that the average value of cortisol on the 1st day is quite high, which is 39.67 from 17 samples. On the other hand, on the 7th day, it can be seen that the cortisol level decreases to the average of 36.57 and the maximum level acquired by the patients also decreases. The maximum value on the 1st day is 61.45 with p<0.05. It means that there is a significant difference on the cortisol level of day 1 and the cortisol level of day 7.

After acquiring the cortisol level of each patient from day 1 to day 7, the next thing to do is to test the different NIHSS score from each patient from day 1 to day 7. The examination result can be seen from Table 3.

The NIHSS score of the 17 patients has total value of 22.82 with the p (paired t-test) level of 0.165. The value has slightly decreased on the 7th day to 21.41. However, there is no change in the maximum value of NIHSS, which is 36. There is also no change in the minimum value, which is 5 in the NIHSS score.

On the other hand, the result of different characteristic examination between the NIHSS score on the 1st day and the 7th day is p>0.05, which means the characteristic of NIHSS score on the 1st day with the cortisol level on the 7th day is the same. Table 4 shows the change in NIHSS score from the observed patient.

Regarding the data above, most patients did not experience changes NIHSS score day-1 and day-7. There was one patient who

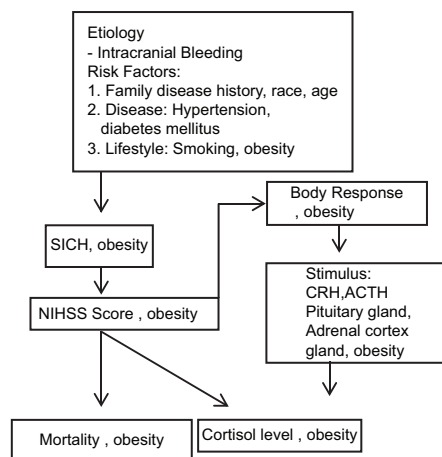


Fig. 1: Flowchart

Table 1: Characteristics of patients

Character	Characteristics	Percentage
Age (n=17)	Mean±SD	51.64±6.56
	Minimum	43
	Maximum	60
Gender (n=17)	Male	47.05
	Female	52.95

