SLEEP MEDICINE BOOK

# Sleep Medicine: Multidiscipline in Harmony


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# Relationship between Sleep Quality and Clinical Outcomes of Acute Ischemic Stroke Patients

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## ABSTRACT

**Background:** Nowdays, ischemic stroke is still the most common long-term neurological disability in the adult patient population. New strategies and approches are needed to improve patient independence. Good sleep quality can be one of the neurological rehabilitation approach in ischemic stroke patients, as it thought to aid neuroplasticity by improving learning and memory function. On the other hand, sleep disturbances in ischemic stroke patients can worsen their clinical outcome.

**Methods:** This study is an analytical with a cross-sectional approach at Wahidin Sudirohusodo Hospital and network Hospital in July-August 2021, involving 28 samples of acute ischemic stroke patients. Pittsburgh Sleep Quality Index (PSQI) is used to measure patient's sleep quality and the NIHSS (National Institute of Health Stroke Scale) score at the initial attack and on the fifth day onset is used to determine the patient's clinical outcome. Data were processed using SPSS 25.0 with Wilcoxon test and Spearman correlation.

**Results:** Mean of initial NIHSS is 7.75±3.85 and fifth day onset is 5.93±4.31. P value from difference from initial NIHSS to fifth day onset is 0.000. Meanwhile, PSQI score is

3,71±2,40. In addition, there is a strong negative correlation (-0.579), with p value = 0,001, between the PSQI value and delta NIHSS.

**Discussion:** We found significant different between initial NIHSS and fifth day onset which shows significant improvement clinical outcome of acute ischemic stroke patients. Patients's PSQI mean score in this study come under good quality sleep category. Then, there is a significant strong negative colleration between significant delta NIHSS and good quality sleep category.

**Conclusion:** Good sleep quality is correlated with improvement in acute ischemic stroke's clinical outcome.

**Keywords: Acute Ischemic Stroke, PSQI, NIHSS, Sleep Quality, Clinical Outcome.**

## BACKGROUND

Stroke is an acute neurological defisit that lasts more than 24 hours. This is due to disturbance of cerebral blood flow. The clinical manifestations include sensory-motor dysfunction, tone impairement, postural control and equilibrium impairement, cognitive impairement, and others. (1) Stroke is an acute neurological emergency and one of the highest cause of disability and death in several countries in the world. In 2013, there were approximately 25,7 millions stroke cases, with almost half of the cases (10,3 millions cases) being the first stroke attack. Six poin five millions patients died and 11,3 millions patient become disability. (2)

There are two risk factor categories ischemic stroke, namely modifiable risk factor and non-modifiable risk factor. The modifiable risk factors are age, gender, and etnicity. Beside that, the non-modifiable risk factor is hypertension, diabetes mellitus, smoking, obesity, hyperuricemia, and hypercholesterolemia. (2)

In general, stroke is a disease of aging. The incidence of stroke increases with age, with the incidence doubling for each decade after 55 years of age. The higher stroke risk among women at younger ages likely reflects risks related to pregnancy and the postpartum state, as well as other hormonal factors, such as use of hormonal contraceptives. Overall, more strokes occur in women than men, because of the longer life span of women compared with men. Blacks are at twice the risk of incident stroke when compared with their white counterparts and have higher mortality associated with stroke. Hypertension is the most common ischemic stroke risk factor, 60% of people with hypertension will have a stroke. As many as 10-30% of people with diabetes mellitus can have a stroke. Research shows the role of hyperglycemia in the process of atherosclerosis, namely metabolic disorders in the form of accumulation of sorbitol in the walls of arteries. This causes osmotic disturbances and increases the water content in the cells which can result in a lack of oxygenation. Prospectively, smoking can increase the severity of stroke by 3.5 times and is associated with more cigarette consumption. Hyperuricemia is thought to be one of the factors that can increase platelet aggregation. Although not as severe as reported as heart disease, one observational study demonstrated an association between elevated plasma lipid levels and the incidence of ischemic stroke. The components of dyslipidemia that are thought to play a role are low levels of HDL (high density lipoprotein) and high levels of LDL (low density lipoprotein) that can accelerate atherosclerosis of coronary and cerebral blood vessels. (3)

Sleep is a physiological and repetitive form of reversible decline in consciousness that there is global decline in cognitive function so that the brain does not respon fully to surrounding stimulies. Sleep is a diverse and complex event. The sleep-wake cycle includes complex internal neural circuits. In normal adults, the sleep cycle is divided into 5 phases, namely phases 1 to 4 which are called NREM (Non Rapid Eye

Movement) and the fifth phase is called REM (Rapid Eye Movement). These five cycles can be repeated several times in a period of sleep. Phases 1 and 2 are called light NREM, while phases 3 and 4 are called deep NREM which are seen as delta or slow wave sleep (SWS). (4)

Sleep disturbances can occur due to reduced quality, quantity of sleep or disruption of circadian rhythms. Sleep disturbances can cause cognitive deficits, reducing certain abilities such as attention, spatial, temporal orientation, and memory efficiency. This disorder also can causes impaired social and psychological functioning. Thus, sleep disturbances associated with stroke patients apper to be an important component of therapeutic, diagnostic, and clinical approaches. (4)

Nowadays, ischemic stroke is still the most common long-term neurological disability in the adult patient population. New strategies and approaches are needed to improve patients dependence. Good sleep quality can be one of the neurological rehabilitation approach in ischemic stroke patients, as it thought to aid neuroplasticity by improving learning and memory function. On the other hand, sleep disturbances in ischemic stroke patients can worsen the clinical outcome of stroke patients. (5) Studies show that in acute ischemic stroke, sleep disturbance triggers brain damage and increased expression of genes that inhibit axonal growth. So that, prevention of sleep disturbances and improvement of sleep quality can be a new therapeutic window to improve the clinical outcome of stroke patients. (6)

NIHSS (National Institute of Health Stroke Scale) is used to determine the severity of stroke. The NIHSS on attack is used as the baseline score, while the NIHSS on fifth day attack is used for short-term clinical outcome assessment. Sleep quality is a variable that is difficult to define and measure objectively. The Pittsburgh Sleep Quality Index (PSQI) is a questionnaire that has been widely used to measure sleep quality and components related to sleep problems. The lower the PSQI score, the better the patient's sleep quality. (1)

## METHOD

This study is an analytic observational study with a cross-sectional method that assesses the relationship between sleep quality and clinical outcomes in acute ischemic stroke patients. The study is conducted in July-August 2021 until the number of samples are fulled. The research is conducted at Dr. RSUP. Wahidin Sudirohusodo Makassar and other network hospitals. The population of this study were all acute ischemic stroke patients who underwent hospitalization at the Inpatient Installation of Dr. RSUP. Wahidin Sudirohusodo Makassar and other network hospitals.

The sample of this study is acute ischemic stroke patients who meet the inclusion and exclusion criteria. The inclusion criteria in this study included the age of 18-65 years (both male and female), meet the diagnostic criteria for acute ischemic stroke/TIA (transient ischemic acute), symptoms and signs of clear neurological deficits, and are willing to be included in the study by signing the informed consent and filling out the research questionnaire. While the exclusion criteria in this study are subjects with decreased consciousness, thrombolysis, impaired muscle strength due to other diseases, taking drugs that affect sleep quality, consuming caffeine, alcohol, and/or NAPZA in the last 1 month, and suffering psychiatric disorders (from interview with patient, family, and medical record).

Sleep quality in this study is measured by PSQI score. PSQI is an effective instrument used to measure sleep quality and patterns in adults. The PSQI can differentiate between "bad" and "good" sleep quality by measuring seven components of subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleeping pills, and daytime dysfunction during the past month. This score is categorized into good category (score 1-5), mild (score 6-7), moderate (score 8-14), and poor category (score 15-21). On the other hand, acute ischemic stroke patients's clinical outcomes is measured by the NIHSS. NIHSS is one of the instruments used to measure the level of functional impairment or neurological deficit due to acute ischemic stroke and has been widely used in clinical and research. Delta NIHSS is the difference between early NIHSS and fifth day onset NIHSS so that it can measure improvement in clinical symptoms of acute ischemic stroke patient. NIHSS is categorized into mild (score <5), moderate (score 5-14), severe (score 14-25), and very severe (score >25).

The difference between the initial NIHSS and fifth day onset is analyzed with Wilcoxon, while the correlation between sleep quality and clinical outcome in acute ischemic stroke patients is assessed by the Spearman correlation. Statistical analysis using SPSS version 25.0.

## RESULT

This study was conducted on acute ischemic stroke patients who were treated at dr. Wahidin Sudirohusodo Makassar and network hospitals. There were 28 samples with the characteristics mentioned in Table 1. There were 13 patients (46.4%) aged more than 60 years and 15 patients (53.6%) aged less than 60 years. The mean age in this study was 60.93±7.75 years. The sexes of men and women are comparable, namely 14 people (50%).

Table 1 also shows the initial NIHSS and fifth day onset. Initial NIHSS patients (first day of attack) were categorized into mild (score <5), moderate (score 5-14), severe (score 14-25), and very severe (score >25). The number of each category is as follows: 5 people (17.9%), 18 people (64.3%), 5 people (17.9%), and 0 people (0%). The initial NIHSS mean was 7.75±3.85. Then the fifth day onset NIHSS was assessed with the following numbers: mild category 16 people (57.1%), moderate category 10 people (35.7%), severe category 2 people (7.1%), very severe category none (0%). The fifth day onset NIHSS mean was 5.93±4.32. There was an improvement between fifth day onset NIHSS compared to the initial NIHSS. The PSQI score in this study was used to assess the patient's sleep quality. This score is also categorized into good category (score 1-5), mild (score 6-7), moderate (score 8-14), and poor category (score 15-21). Twenty-two patients (78.6%) were in the good category, 3 patients (10.7%) were in the mild category, 3 patients (10.7%) were in the moderate category, and no patient was in the very heavy category. The mean PSQI score was 3.71±2.40. The average PSQI in this sample is in the good category.

Since the data sample was not normally distributed, it was continued with the Wilcoxon test to assess the change in the initial and fifth day onset NIHSS. The median, minimum, and maximum values of the NIHSS are presented in Table 2. The initial NIHSS median value is 6.50, the minimum value is 3.00, and the maximum value is 16.00. While in the fifth day onset NIHSS, the median value is 4.00, the minimum value is 2.00, and the maximum value is 16.00. It also describes changes in the NIHSS (delta NIHSS) value with a median of 2.00, a minimum of -9.00, and a maximum value of 6.00. From this it is shown that there is a change in the NIHSS to a smaller number with a positive median number, indicating that there is an improvement in the clinical outcome of acute ischemic stroke patients. The improvement is considered significant as evidenced by the value of p = 0.000.

After that, the Spearman Correlation Test was carried out to see the correlation between the PSQI value and delta NIHSS which is shown in Table 3. Before analyze the NIHSS delta correlation, the initial and fifth day onset NIHSS correlations to the PSQI were first described. These two correlations show a weak (-0.028) and moderate (0.323) correlation with an insignificant p-value of 0.887 and 0.093, respectively. From this explanation, it can be concluded that there is no correlation between the initial and fifth day onset NIHSS on the PSQI value. Then, in the Spearman Correlation Test of the PSQI value with the delta NIHSS, a r value of -0.579 was obtained, meaning that there was a strong correlation between the PSQI value and the delta NIHSS in the form of a negative correlation, meaning that the smaller the PSQI value (better sleep quality) was correlated with a greater NIHSS change (more clinical improvement). This data analysis also showed a significant correlation (p value = 0.001).

## DISCUSSION

Good sleep quality can be one of the neurological rehabilitation in acute ischemic stroke patients by helping neuroplasticity by improving learning and memory functions. Conversely, sleep disturbances can trigger brain damage and increased expression of genes that inhibit axonal growth in stroke patients. This can worsen the clinical outcome of acute ischemic stroke patients. Therefore, education to maintain the quality of sleep in patients with stroke is important to improve the clinical outcome of acute ischemic stroke patients.

This study describes the risk factors for acute ischemic stroke, between age and gender. These two risk factors are non-modifiable risk factors. The number of samples that are almost the same between age and gender in this study.

Most of the patients (18 patients, 64.3%) were admitted with moderate initial NIHSS with a mean value of 7.75±3.85 and fifth day onset NIHSS in mild category (16 patients, 57.1%) with a mean value of 5.93±4 ,32. From the Wilcoxon test, there was a significant change in NIHSS (p = 0.000) with a mean of 1.82±2.60. This shows that there is a significant difference in the clinical outcome of ischemic stroke patients when the patient is admitted compared to the fifth day onset.

From this study, it can also be seen that most of the patients (22 patients, 78.6%) had a mean PSQI value in the good category, indicating that most of the patients had good sleep quality. This was assessed to be correlated with clinical improvement in acute ischemic stroke patients as shown in the Spearman analysis. It is said that the PSQI value in the good category has a strong negative correlation (-0.579) with a significant change in the NIHSS, with a p value of 0.001 (significant).

## CONCLUSION

Sleep quality is significantly correlated with the clinical outcome of acute ischemic stroke. Good sleep quality will affect the clinical improvement of acute ischemic stroke patients.

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## REFERENCE


1. Campos TF, Barroso MTM, Silveria ABG, Melo LP, Dantas AATSG, Araujo JF. Sleep disturbances complaints in stroke: implications for sleep medicine. Sleep Sci. 2013;6(3):98-102.
2. Aninditha T dan Wiratman W. Buku Ajar Neurologi Buku 2. Departemen Neurologi Fakulas Kedokteran Universitas Indonesia. Jakarta; 2017.
3. Boehme AK, Esenwa C, Elkind MSV. Stroke Risk Factors, Genetics, and Prevention. American Heart Association, Inc. 2017.
4. Islamiyah WR, editor. Pedoman Tatalaksana Gangguan Tidur. Surabaya; 2018.
5. Duss SB, Seiler A, Schmidt MH, Pace M, Adamantidis A, Muri RM, et al. The Role of Sleep in Recovery Following Ischemic Stroke : A Review of Human and Animal Data. Elsevier. 2016.
6. B.Gao,E.Cam,H.Jaeger,C.Zunzunegui,J. Sarnthein,andC.L. Bassetti, "Sleep disruption aggravates focal cerebral ischemia in the rat," Sleep,vol.33,no.7, pp.879–887,2010.