

Sleep Quality and Cognitive Dysfunction among Acute Stroke Patients from Coastal Areas of North Sulawesi, Indonesia

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ABSTRACT

Introduction: Poor sleep quality is one of the non conventional risk factors for stroke. Cognitive dysfunction is prevalent among stroke survivors. There is limited data on the association between sleep quality and cognitive dysfunction among stroke patients from coastal areas of Indonesia.

Aim: The objective of this study was to analyse the association between sleep quality and cognitive dysfunction among acute stroke patients from coastal areas in North Sulawesi province.

Materials and Methods: This was a hospital-based cross-sectional study. Samples of 78 acute stroke patients from coastal areas were consecutively selected. The dependent variable was cognitive dysfunction measured by Mini Mental Status Examination (MMSE). The independent variable was pre stroke sleep quality measured by the Pittsburgh Sleep Quality Index (PSQI). Stroke was diagnosed from history taking, physical examination, and/or neuroimaging study. The data were analysed by Chi-square test and Odds Ratio.

Results: More than half of 78 (52.6%) patients were female, with the mean age 59.71 (SD=13.78), and majority in 51-60 years age group (30.8%). Patients mostly graduated from high school (48.7%), lived in urban area (60.3%) and suffered ischemic stroke (62.8%). Poor sleep quality was found in 79.5% patients and cognitive dysfunction was detected in 53.9% patients. Stroke patients with poor sleep quality were almost two times more likely to experience cognitive dysfunction than counterparts with good quality of sleep (OR=1.89; 95%CI=0.54 to 6.55; p=0.467). The association between sleep quality and cognitive dysfunction among acute stroke patient from coastal areas of North Sulawesi province of Indonesia was not statistically significant.

Conclusion: Although poor sleep quality had a likely higher risk to develop cognitive disorders among acute stroke, but we could not establish significant association between sleep quality prior to stroke attack with impairment of cognitive function.

Keywords: Ischemic stroke, Public health, Quality of life

INTRODUCTION

Stroke is one of the most serious problems for public health. It is the leading cause of death globally, both in high and low income countries. Also, it hampers quality of life in term of disability and productivity [1,2].

Conventionally, risk factors for stroke are divided commonly in two main categories namely modifiable and non modifiable risk factors. Major modifiable risk factors are hypertension, diabetes mellitus, high lipid profile, heart diseases, physical inactivity, smoking or stress. Non modifiable risk factors are age, gender, ethnicity/race and heredity [3,4]. The occurrence of non conventional or non-traditional risk factors, including poor sleep quality is needed to be evaluated among stroke patients [5].

Sleep quality is considered as one of the non conventional risk factors for cardiovascular diseases, including stroke. Lack of sleep was associated with increasing level of cortisol which play an important role in the pathogenesis of vascular sympathetic control and development of stroke [5]. The interplay between sleep quality and other risk factors increase the possibility to develop stroke [5,6]. It is not clear to what extent poor sleep quality before the onset of stroke influence the cognitive function after stroke.

Among stroke survivors, cognitive dysfunction is prevalent and has important role in post stroke period [7]. Cognitive dysfunction negatively correlates to quality of life among the survivor of stroke. In addition, according to Aljunid SM et al., the life expectancy of vascular dementia among stroke patients is only five years [8]. Poor sleep quality negatively affect cognitive performance [9]. Based on basic health research in 2018, the prevalence of stroke in Indonesia is 10.9%; North Sulawesi is at the third rank in the country [10].

However there is limited data on the association between sleep quality and cognitive dysfunction among acute stroke patients, especially from coastal area of Indonesia.

The objective of the study was to analyse the association between sleep quality and cognitive dysfunction among acute stroke patients from coastal areas in North Sulawesi province.

MATERIALS AND METHODS

This was a hospital-based cross-sectional study carried out at Prof. Dr. RD Kandou General Hospital of Manado from May to August 2018. Ethical consideration was proposed to the Ethical committee of Faculty of Public Health, Sam Ratulangi University. The registration number obtained from the committee was 592/UN12.11.1/LL/2018. Informed consent was taken from patients. All stroke patients from coastal areas treated at neurological wards during the period of data collection were the target population of research. A sample of 78 acute stroke patients was consecutively selected for this study with some inclusion and exclusion criteria below. With 78 cases, type I error was 5%, reported proportion of cognitive disorder and sleep disturbance among stroke patients were around 60% and 80%, the power of study was 0.8431. Therefore, 78 cases were included.

The samples were obtained from neurology inpatient ward at the time of admission. Inclusion criteria were patients with acute period of stroke (<five days), did not have barrier in communication, agreed to participate and lived in coastal areas (based on their civilian ID card and/or other supported legal documents). The coastal area was chosen due to lack of information whether residency would affect the outcome. Patients with history of mental disorder, traumatic brain injury, chronic alcoholism, chronic diseases with regular medication, unstable condition were excluded from the study.

As clinical diagnosis, stroke was established from history taking, physical examination and/or neuroimaging study. Stroke was defined as “a focal (or at times global) neurological impairment of sudden onset, and lasting more than 24 hours (or leading to death) and of presumed vascular origin” [11].

Dependent variable was cognitive dysfunction measured by Mini Mental Status Examination (MMSE). MMSE comprises of 6 domains of cognitive function: Orientation (10 questions), Attention and Calculation (5 questions), Registration (3 questions), Recall (3 questions), Language (8 questions) and Copying (1 question). The maximum score is 30, a score of 23 or lower is indicative of cognitive dysfunction [12].

Independent variable was pre stroke sleep quality, measured by the Pittsburg Sleep Quality Index (PSQI). PSQI was assessed after the initial resuscitation, in a clinically stable condition and when the subjects were fully aware, to subjectively assess the sleep quality before the stroke attack. Retrospectively the history and pattern of sleep one month before stroke attack was asked. PSQI assess the following domains: 1) Subjective sleep quality; 2) Sleep latency; 3) Sleep duration; 4) Habitual sleep efficiency; 5) Sleep disturbance; 6) The use of sleep medications; 7) Daytime dysfunction. A global score was calculated by adding all the seven component scores. Except for the first four open questions, the rest was assessed on a 4-point scale. Each component score had a value of “0” (no difficulty) to “3” (severe difficulty). PSQI score less than five were considered as good sleep quality and the score of five and above were considered as poor sleep quality [13].

Primary data (sex, age, educational level, residency, MMSE and PSQI scores) were collected with structured questionnaire through interviewing the patients and/or closest caregivers.

STATISTICAL ANALYSIS

Categorical data were analysed by number and percentage and the numerical data were reported with mean and Standard Deviation (SD). For bivariate analysis Chi-square test and Odd Ratio (OR) as the measure of association were employed. The p-value <0.05 was considered significant. The analysis was conducted with SPSS software version 17.0.

RESULTS

This study showed that majority of samples were female (52.6%). Most of the sample graduated from high school level (48.7%) and were commonly living in urban coastal areas (60.3%). [Table/Fig-1] describes the demographic characteristics of stroke patients.

[Table/Fig-2] displays the percentage of some clinical characteristics. The more prevalent type of stroke was ischemic stroke (62.8%). Poor sleep quality a month prior to stroke was seen in 79.5% (mean PSQI score 7.95, SD 3.57). More than half patients experienced cognitive disorder after stroke (64.1%).

Bivariate analysis was conducted with Chi-square test to find the association between sleep quality and cognitive function. Almost half of sample (48.7%) experienced both poor sleep quality and cognitive dysfunction. However, significant finding were not found among the independent and dependent variables as depicted in [Table/Fig-3].

DISCUSSION

The main result of this study is that majority of stroke patients were in poor sleep quality until the stroke attack. Also, the high percentage of cognitive dysfunction among stroke patients was found. According to the findings, although poor sleep quality has almost twice as likely to develop cognitive dysfunction, but the association is not statistically significant. There are several major risk factors for stroke, including poor quality of sleep, which interact with each other [14].

Characteristics	n=78	%
Sex		
Female	41	52.6
Male	37	47.4
Group age (years)		
<21	1	1.3
21-30	1	1.3
31-40	2	2.6
41-50	15	19.2
51-60	24	30.8
61-70	18	23.1
>70	17	21.8
Educational level		
Basic school	16	20.5
Junior high school	10	12.8
High school	38	48.7
University	14	17.9
Coastal areas		
Urban	47	60.3
Sub-urban	2	2.6
Rural	29	37.2

[Table/Fig-1]: Demographic characteristics.

Characteristics	n=78	%
Type of stroke		
Ischemic	49	62.8
Haemorrhagic	29	37.2
Sleep quality		
Good	16	20.5
Poor	62	79.5
Cognitive dysfunction		
No	28	35.9
Yes	50	64.1

[Table/Fig-2]: Clinical characteristics.

Sleep quality	Cognitive dysfunction				Total		OR (95% CI)	p-value*
	Yes		No		n	%		
	n	%	n	%				
Poor	38	48.7	24	30.8	62	79.5	1.89 (0.54-6.55)	0.46
Good	12	15.4	4	5.1	16	20.5		
Total	50	64.1	28	35.9	78	100		

[Table/Fig-3]: Distribution of cognitive dysfunction based on sleep quality.
*chi-square test

The prevalence of poor quality of sleep (79.5%) in the current study is relatively higher than several studies. In a study about sleep disturbance from eight countries in Asia and Africa, Stranges S et al., reported the prevalence of 16.6% [15]. A lower prevalence was in Purworejo, Indonesia (3.9%) and highest was in Matlab, Bangladesh (40.0%). In a population-based research in Ethiopia, Berhanu H et al., reported that prevalence of poor sleep quality among adult was 65.4% and was dominantly in males [16]. Among stroke patient, Dixon S conducted a systematic review of the prevalence of insomnia which was 37.6% [17]. A study by Huzmeli ED and Sarac ET in Turkey showed that 53.3% of the stroke patients in neurologic wards had poor sleep quality. Majority of sleep disorder among acute stroke is Sleep-Disorder Breathing (SDB), specifically Obstructive Sleep Apnea (OSA) and nocturnal oxygen desaturation. As a risk factors for stroke, OSA also increases the chance for the next stroke attack. The severity of sleep apnea among stroke survivors would increase the incidence of next stroke and mortality

[7]. Hermann DM and Bassetti CL reported SDB and Sleep-Wake Disturbance (SWD) as risk factors for stroke [18]. Both SDB and SWD could influence the severity and recovery of stroke.

Cognitive disorder was prevalent in stroke population. In the present study, the prevalence of cognitive dysfunction was relatively similar to several studies. Hasra IWPL et al., found the total prevalence of cognitive dysfunction in stroke patients treated at neurologic wards as 67.5% [19]. A study by Huzmeli ED and Sarac ET reported the prevalence of different levels of cognitive dysfunction among stroke patients as 60% [7]. In a setting of population-based study conducted in Jember, Febriana A reported that prevalence of probable dementia was 18% [20]. Cognitive dysfunction commonly occurred as long-term complication of stroke. In general, cognitive dysfunction after stroke was identified as Vascular Cognitive Impairment (VCI). Cognitive dysfunction may also lead to Alzheimer Diseases (AD) after stroke. Age and educational level were reported as risk factors for cognitive impairment after stroke. Advance age and low educational level were reported to be associated with cognitive dysfunction. Interestingly, the majority of respondents in this study were non-elderly and relatively in higher educational level. However, the majority of the respondents were in low occupational level. According to Sun JH et al., the higher the occupational level, the lower the cognitive performance [21].

Cognitive function is also associated with duration of sleep and, in general, quality of sleep. Ferrie JE et al., reported that poor quality of sleep is a risk factor for dementia [22]. The changes in sleep habit in younger age contribute to cognitive function and performance in older age [23]. According to Lo JC et al., it is essential to develop a good habit of sleep to reduce the consequences of cognitive deficit in relation to aging process [24]. In a research conducted by Nebes RD et al., it was concluded that the association between sleep quality and cognitive performance in adult is still significant, regardless the general clinical co-morbidities among participants in the study. Participants with sufficient and lack of sleep had different results in memory working performance, concentration and problem solving. Also, the symptoms of depression were more common in participants with poorer sleep quality. However, the processing velocity, inhibition and episodic memory were not different [25].

In the present study, the probability to develop cognitive dysfunction among stroke patient with poor sleep quality was 1.89 times higher than their counterpart. However, this association was not statistically significant. According to Huzmeli ED and Sarac ET there is an interaction between mood, cognitive and sleep quality among stroke survivors [7]. Sleep quality was also associated with specific pathologic type of stroke. Sleep quality is associated with sub type II pathology which was related to atherosclerosis [26]. It is not clear in the current study whether the insignificant association was due to different type of stroke pathology or age group of the patients. According to Rani SBB et al., there is significant association between sleep apnoea risk and cognitive dysfunction [27]. However this was a population-based design and only the elderly were included in the study.

Limitation(s)

There are several limitations of this study: First, selection bias is an important aspect that needs to be addressed because all strokes were not included in this study. Major strokes patients would have language defects and other neurological deficits which may obscure the cognitive testing. Also, the sleep history obtained from patients with cognitive defects to stroke may not be precise. Longitudinal study with larger sample size is suggested for further evaluation. Second, cognitive deficits may be related directly to the stroke per se. Even small infarcts in thalamus can lead to major cognitive issues. Also, cortical infarcts of parietal and temporal lobes may cause confusion and memory issues. The cognitive issues demonstrated may not

be related to the sleep disorder per se. The size of infarct/bleed/location/grade of cerebral atrophy/other ischemic chronic changes may be relevant in this situation. Therefore, neuroimaging results should also be analysed as a determinant for cognitive function in stroke patients. Third, Pittsburgh scoring scale is a screening tool of sleep disorders. The exact type is not known here. Most of the sleep disorders are not related to stroke or hypertension. Hence, sleep studies should be conducted in sleep laboratory under objective observation and measurement. Last, the current study did not evaluate other risk factors for cognitive decline in stroke patients. A comprehensive risk factors study for declining cognitive function among stroke patients is suggested.

CONCLUSION(S)

Significant finding of association between sleep quality and cognitive dysfunction was not detected among acute stroke patients from coastal areas treated at the hospital. However, due to its potency to affect cognitive function, sleep quality should be routinely assessed among stroke patients.

Declaration

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