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Original Article

A correlation study of quality of sleep with blood glucose levels in the elderly at Budi Agung Elderly Social Welfare Unit, Kupang City, Indonesia

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ABSTRACT

The increase in the number of elderly people will cause an increase in health problems in the elderly. The functional decline in the elderly will cause a decrease in the capacity to respond to stimuli thus it becomes difficult for the elderly to maintain body homeostasis. One of the disturbed homeostases is the blood glucose level regulation system. The elderly may also experience decreased quality of sleep. Lack of sleep can cause several disturbances in immune response, endocrine metabolism, and cardiovascular function. Endocrine system changes that occur during the nighttime sleep period are associated with the secretion of several hormones. The research objective was to analyze the correlation between sleep quality and the blood glucose levels in the elderly at Budi Agung Elderly Social Welfare Unit, Kupang City. The design of this research was observational analytic using a cross-sectional study method. The result of this study indicated that 17 elderly (30.4%) had adequate quality and 39 elderly (69.6%) had poor sleep quality. The average blood glucose level in the elderly at Budi Agung's Social Welfare was 109.18 ± 33.00. The mean of blood glucose level with adequate sleep quality was 100.47 ± 33.63, while those with poor sleep quality were 112.97 ± 32.42 ($P = 0.06$). Therefore, it can be concluded that there is no significant correlation between sleep quality and fasting blood glucose levels in the elderly at Budi Agung Elderly Social Welfare Unit.

Keywords: Elderly, Sleep, Quality, Glucose

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INTRODUCTION

The elderly (seniors) are healthy adults who undergo a process of change into a weak and vulnerable person due to a reduction in a large part of the physiological system reserves thus they become more susceptible to various diseases and death.[1] The increase in the number of elderly people in the world in 2010 has reached 524 million or around 8% of the world's population, while in 2050, it is estimated that it will triple, namely, around 1.5 billion or equivalent to 16% of the world's population.[2] Meanwhile, in East Nusa Tenggara, Indonesia, the estimated percentage of elderly population in 2015 is 7.5%.[3] The increase in the number of the elderly will also cause an increase in health problems in the elderly.[4]

Health problems occur because the aging process will cause psychological, social changes, and a decrease in body function of the elderly. The functional decline in the elderly will cause a decrease in the capacity to respond to stimuli, therefore, the elderly finds it difficult to maintain body homeostasis.[5] This disruption to homeostasis causes dysfunction of various organ systems and the elderly are susceptible to various diseases. One of the disturbed homeostases is the blood glucose level regulation system.[6]

Disorders of blood glucose regulation in the elderly include insulin resistance, loss of first-phase insulin release, and an increase in postprandial blood glucose levels. Among the three disorders, the most significant is insulin resistance. Insulin resistance can be caused due to the changes in the

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body fat composition of the elderly in the form of an increase in fat composition from 14% to 30% (less muscle mass, more fat tissue), decreased physical activity resulting in a decrease in insulin receptors, changes in eating patterns of eating more carbohydrates, and neurohormonal changes. The disruption of the blood glucose regulation system results in an increase in blood glucose level. Blood glucose increases with age.[7]

Sleep quality is a person's satisfaction with sleep so that a person does not feel tired, easily aroused and restless, lethargic and apathetic, blackness around the eyes, swollen eyelids, red conjunctiva, sore eyes, divided attention, headaches, and frequent yawning or sleepy. Sleep quality includes both quantitative and qualitative aspects such as length of sleep, time needed to sleep, frequency of awakening, and subjective aspects of depth and sleep satisfaction. Factors that can affect sleep include physical, psychological, social, and environmental factors. Lack of sleep can cause several disturbances in immune response, endocrine metabolism, and cardiovascular function.[8] The result of reduced sleep time can affect the function of the endocrine system, especially associated with impaired glucose tolerance, insulin resistance, and reduced insulin response. Endocrine system changes that occur during the nighttime sleep period are associated with the secretion of several hormones.[9] Several studies in Indonesia have shown a correlation between blood sugar levels and sleep disorders. Research conducted by Tentero *et al*. who showed that there was a significant correlation between fasting blood sugar levels and sleep disorders.[10] Other studies have shown a significant correlation between insomnia scores and blood sugar levels, 2 h postprandial.

METHODS

The design of this study was observational analytic using cross-sectional analytic study method to analyze the correlation between sleep quality and blood glucose levels in the elderly. The measured sleep quality will be divided based on two criteria, namely, poor and adequate. The criteria for blood glucose levels used were the fasting blood sugar tests. Each subject is only taken one measurement at the time during this study.

The subjects in this study were all the elderly who lived at Budi Agung's Elderly Social Welfare Unit with purposive sampling technique that met the inclusion criteria. Subsequently, the subjects had to sign the informed consent form. Subjects are required to fast for 8–10 h before drawing blood samples for the blood glucose test. The blood was taken in the morning using peripheral blood. Furthermore, the subjects filled out the PSQI questionnaire. Data were collected and processed using predetermined data analysis techniques.

Ethical clearance was obtained from the Ethical Commission of the Faculty of Medicine, UNDANA, Kupang.

RESULTS

The total subjects in study were 56. Table 1 shows that the mean age of the subjects was 74.55 ± 8.19, where the percentage of the female subjects was more than men, namely, 60.7%. The mean body mass index (BMI) of the subjects was 20.54 ± 3.67. The study subjects who had adequate sleep quality were 17 elderly (30.4%) and 39 elderly (69.6%) had poor sleep quality.

Moreover, as shown in Table 2, there is no significant relationship between sleep quality and fasting blood glucose levels in the elderly (P = 0.06). Table 2 also indicated that there is no significant relationship between age, sex, and BMI with sleep quality.

DISCUSSION

The results showed that there was no significant correlation between sleep quality and fasting blood glucose levels in

Table 1: Characteristics of research subjects

Variable	F	%	Mean±SD	Median (min–max)
Age			74.55±8.19	73 (60–96)
Gender				
Male	22	39.3		
Female	34	60.7		
BMT			20.54±3.67	20.65 (12.16–27.34)
Fasting glucose			109.18±33.00	96 (78–220)
Sleep quality				
Adequate	17	30.4		
Poor	39	69.6		

Table 2: Relationship between sleep quality and fasting blood glucose

Variable	Sleep quality		*p*
	Adequate	Poor	
Age	74.41±8.71	74.62±8.06	0.933§
Gender			
Male	9 (52.9%)	13 (33.3%)	0.167¥
Female	8 (47.1%)	26 (66.7%)	
BMT	20.88±4.12	20.39±3.51	0.646§
Blood glucose level	100.47±33.63	112.97±32.42	0.060‡

*Significant (P<0.05); ¥ Chi-square; § independent t; ‡ Mann–Whitney

the elderly (P = 0.06). On the other hand, the results also indicated that the elderly with poor sleep quality had a higher mean fasting blood glucose (112.97 ± 32.42) compared to the elderly with good sleep quality (100.47 ± 33.63). This suggests that poor sleep quality can affect the increase in fasting blood glucose levels in the elderly.

Sleep quality is a person's satisfaction with sleep so that a person does not feel tired, easily aroused and restless, lethargic and apathetic, blackness around the eyes, swollen eyelids, red conjunctiva, sore eyes, divided attention, headaches, and frequent yawning or sleepy. Sleep quality covers both quantitative and qualitative aspects such as the length of sleep, time needed to sleep, frequency of awakening, and subjective aspects of depth and sleep satisfaction. Factors that can affect sleep include physical, psychological, social, and environmental factors. Lack of sleep can cause several disturbances in immune response, endocrine metabolism, and cardiovascular function. The result of reduced sleep time can affect the function of the endocrine system, especially associated with impaired glucose tolerance, insulin resistance, and reduced insulin response. Endocrine system changes that occur during the nighttime sleep period are associated with the secretion of several hormones.[9] Several studies in Indonesia have shown a relationship between blood sugar levels and sleep disorders. Research conducted by Tentero *et al*. who showed that there was a significant relationship between fasting blood sugar levels and sleep disorders.[10]

Other studies have shown a significant correlation between insomnia scores and blood sugar levels, 2 h postprandial. The theory is that sleep loss can affect the involvement of hormones in appetite regulation. After sleep restriction occurs, the level of leptin, which is a factor that makes a person full, decreases and the level of ghrelin, which stimulates appetite, increases. Less sleep time also increases a person's chance to eat thus, losing sleep will increase appetite and increase food intake which can lead to obesity and increased blood glucose levels.[11]

The absence of significant results in this study is probably due to factors that can affect fasting blood glucose levels in the elderly, including gender. Subjects in this study were more mostly women, as much as 60.7%. Women tend to have higher blood glucose levels than men. This is because the body fat in women is greater than the body fat in men. Body fat and obesity are directly related to insulin sensitivity, therefore, insulin resistance occurs causing hyperglycemia. Men usually have higher physical activity and thus have better insulin sensitivity.[12] Therefore, gender can be a confounding variable in the results of this study.

CONCLUSION

There is no significant correlation between sleep quality and fasting blood glucose levels in the elderly at Budi Agung Elderly Social Welfare Unit.

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ETHICS

This study has received ethical approval from the Health Research Ethics Commission of the Faculty of Medicine, University of Nusa Cendana.

REFERENCES

1. Setiati S, Harimurti K, Govinda A. Internal Medicine Textbook. 5th ed. Jakarta: Publisher Office of the University of Medicine Faculty; 2009.
2. World Health Organization. Global Health and Aging. Geneva: World Health Organization; 2011. Available from: http://www.who.int/ageing/publications/global_health.pdf.
3. Nugroho W, Center for Data and Information of the Ministry of Health RI. The situation of the elderly (elderly) in Indonesia. In: Komunikasi Dalam Keperawatan Gerontic. Jakarta: EGC; 2009.
4. Nugroho W. Communication in Gerontic Nursing. Jakarta: EGC; 2009.
5. Nugroho HA. Changes in physical function and family support with psychosocial responses to the elderly in Kembangarum Village, Semarang. Nurs J 2007;1:45-57.
6. Setiati S, Kuntjoro H, Arya GR. The aging process and its clinical implications. In: Sudoyo AW, Setiyohadi B, Alwi I, Simadibrata M, Setiadi S, editors. Internal Medicine Textbook. 5th ed. Jakarta: Interna Publishing; 2009.
7. Kurniawan K. Diabetes mellitus type 2 in old age. Indones Med Mag 2010;60:576-84.
8. Wicaksono DW. Analysis of the Dominant Factors Related to Sleep Quality in Nursing Students of Airlangga University. Jakarta: EGC; 2014.
9. Barakat S, Abujbara M, Banimustafa R, Batieha A, Ajlouni K. Sleep quality in patients with type 2 diabetes mellitus. J Clin Med Res 2019;11:261-6.
10. Tentero IN, Pangemanan DH, Polii H. The relationship between diabetes mellitus and sleep quality. eBiomedics 2016;4:1-6.
11. Knutson KL, Cauter EV. Associations between sleep loss and increased risk of obesity and diabetes. Ann N Y Acad Sci 2008;1129:287-304.
12. Ardiningsih ES, Sartika RA. Factors Associated with Hyperglycemia in Adults in Depok City and Central Lampung Regency in 2010 (Secondary Data Analysis). Depok, Indonesia: University of Indonesia; 2013. p. 1-20.