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The Effect of Blood Pressure On The Quality of Daily Sleep In The Elderly In PSTW Pandaan

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ABSTRACT

The blood pressure normally increases in the elderly, making them subject to greater risk of hypertension. As a person advances in age, the arterial wall thickens leading to a buildup of collagen in the muscle layer leading to a narrowing and stiffness of the blood vessels. This is compounded by poor quality of sleep which leads to a further increase in the blood pressure. The objective of this study therefore was to determine the relationship between blood pressure and daily sleep quality in the elderly. The method was analytic correlation using cross sectional design. The population included adults above 45 years old in Tresna Wedha Nursing Home (PSTW) in Pandaan while the sample size of 64 people was determined by Purposive Simple sampling technique. The data analysis was conducted using chi square test. The results showed that 18 (28.1%) respondents had blood pressure in the Optimal category and 7 respondents (10.9%) had grade 2 hypertension. Majority of the respondents (36/56.3%) had good sleep quality while the rest (28/43.8%) had poor sleep quality. The results of the data analysis using chi square test was statistically significant with p value = 0.003 (p<0.005) which showed a relationship between blood pressure and sleep quality. Irregular sleeping pattern leads to physiological changes and imbalance of homeostasis. The active sympathetic nervous system tends to increase peripheral resistance and cardiac output which results unraised blood pressure

Keywords: Blood pressure, Sleeping quality, Elderly

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BACKGROUND

The population of the elderly is decreasing in some developed countries, but increasing in developing countries (1). World Health Organization (WHO) estimates that there will be an increasing proportion of the elderly in the world from 7% in 2020 to 23% in 2025. In Indonesia, it is reported that the population of the elderly will increase from 9.77% in 2010 to 11.34% or 28.8 million people in 2020 (2, 3).

Physiological changes in the Elderly include changes in the cardiovascular system, namely atherosclerosis which is hardening of the arteries caused by blockages in blood vessels, leading to rise in blood pressure and decrease in the activity of the nervous system, therefore lowering the functions of the nervous system, especially those related with stress (4). Loss of the hearing system also takes place because the tympanic membrane becomes atrophic and the hearing bones become stiff. The Elderly are at a higher risk of developing degenerative diseases, and hypertension occupies the largest proportion of all degenerative diseases (5).

Beside the physiological changes, there are also psychological setbacks that often occur such as decreased sleep quality or sleep disorders. In people of more than 65 years old, 13% of men and 36% of women need more than 30 minutes to fall asleep. Old age is a natural stage of human life that tends to decline. Physiological changes and psychological setbacks for elderly can lead decreasing sleep quality or sleep disorders (6, 7).

Sleep disorders occur in the elderly due to psychological stress, health status, diet and/nutrition factors. The individual's resting needs are different from each other based on sleep quality, health status, activity patterns, lifestyle and age. The resting needs of chronically ill people is different from that of healthy people even though in the same age range, as a result of the illness or pain that is felt (8).

Sleeping is a basic natural necessity for humans. It functions as the body's recovery process. The process to restore the body to a relaxed one takes place during sleep (9). Sleep is one of the human's physiological need that naturally occurs due to changes in the status of consciousness, characterized by a decrease in awareness and response to stimuli.

Some of the effects of disruption and change in sleeping quality are decreased quality of life, disturbance of daily activities, and lowering of the body's immune system (10). Good sleeping quality provides energy to be used for the recovery process of the body's cells. Conversely, poor quality of sleep makes the regeneration of body cells to be below the normal so that the body is more susceptible to disease (11, 12).

WHO Community Study of the Elderly in Central Java revealed that high blood pressure (hypertension) and cardiovascular disease are the second most common diseases suffered by the elderly after arthritis, which is equal to 15.2% of 1203 samples. The prevalence of hypertension is predicted to increase to 60% in 2025, which is about 1.56 million sufferers. Hypertension is a risk factor for diseases of the cardiovascular system and it is the most common cause of death in the elderly in the world. Hypertension is a common and important risk factor for cardiovascular disease that increases with age (2, 13).

Generally the risk of hypertension which is defined as Systolic Blood Pressure (SBP) ≥ 140 mm Hg and/or Diastolic Blood Pressure (DBP) ≥ 90 mm Hg increases with increasing age. In fact, the prevalence of hypertension for human in 60 years twice than those who are 49-59 years old. Blood pressure in the Elderly tends to be high, therefore they are positioned at a greater risk of hypertension (high blood pressure) (14). The arterial wall thickens and gradually builds up collagen in the muscle layer, therefore the blood vessels will gradually narrow and become stiff (15-17).

Based on the described above, this research is interested in following up research about the effect of blood pressure on the quality of daily sleep in the elderly in PSTW Pandaan.

METHODS

The method was analytical using cross sectional design. The population were adults who above 45 years old in PSTW Pandaan. The total number of respondents were 107 people and the sampling technique was Purposive Simple with a total of 64 samples. The data analysis was conducted using chi square test.

RESULTS

Table 1 showed that majority of respondents are Elderly as many as 29 (45.3%). Table 2 showed that majority of respondents are female as many as 39 (60.9%). Table 3 showed that majority of respondents (43.8%) stayed in a nursing home for a duration of 4-6 years. Table 4 showed that majority of respondents representing 28.1% has blood pressure on optimal level. Table 5 showed that majority of respondents (56.3%) have good sleeping quality as many as 36 (56.3%) while 28 (43.8%) respondents had poor sleeping quality. Table 6 showed that majority of respondents have blood pressure at the optimal level and good sleeping quality.

DISCUSSION

The government has planned various policies to improve the health status of the elderly, including facilitating the nursing home, one of which is PSTW in Pandan East Java. This study further showed that the majority of respondents (45.3%) were Elderly, and a small proportion (1.6%) are in the Middle Age category. It is well known that the elderly period is the last phase of human life, during which physical changes occur in the cardiovascular system that affects the blood pressure.

This study showed that the majority of respondents (28.1%) had blood pressure in the optimal category with systolic pressure less than 120 mmHg and diastolic pressure less than 80 mmHg, while a small proportion of respondents (10.9%) had hypertension level 2 with systolic pressure of 160-179 mmHg and diastolic pressure of 100-109 mmHg. It indicates that the elderly have to monitor their health regularly, as well as strengthen the management of hypertension or engage in preventive measures such as physical activity, diet, maintenance of the body mass index, and compliance with good drugs. These contribute to long-term improvement in control of hypertension (18).

Blood pressure is the power produced by blood flow to the walls of the stationary blood vessels. Blood pressure in the elderly is greatly influenced by the total peripheral resistance and cardiac output. Total peripheral resistance is the friction between blood flow in the walls of the blood vessels which is influenced by blood viscosity, cross-sectional area of blood vessel walls, and blood vessel elasticity. Meanwhile, cardiac output is the amount of blood pumped throughout the body which is affected by the stroke volume. This study showed that the majority of elderly female respondents were 39 (60.9%). Elderly female presented with higher blood pressure values than elderly male, whereas hypertension is one of the most common chronic diseases in elderly and a major risk factor for cardiovascular diseases that can be a serious threat toward human health (19, 20).

This research showed that the majority of respondents (56.3%) had good sleeping quality, while those who had poor sleeping quality were (43.8%). When someone faced sleep disturbance, then the hypothalamus activates two axes namely medulla adrenal sympathetic system and hypothalamic pituitary adrenal-axis (HPA-axis). When a stressor comes due to

a sleep disorder, the norepinephrine and epinephrine hormones are secreted by the adrenal medulla gland. The effect of the stimulation directly affects specific organs such as the blood vessels and the heart. Both norepinephrine and epinephrine hormones directly make the blood vessels of each tissue to constrict, thereby increasing peripheral resistance which can ultimately increase blood pressure (21). Music-assisted relaxation can be used at a minimal cost to overcome sleep disorders (22).

The results indicate that the majority of respondents (16 elderly) had blood pressure in the optimal category and they experienced good sleeping quality, while a small proportion of respondents (2 elderly) had blood pressure in high normal category with poor sleeping quality. Based on the results of the data analysis using chi square test with P value = 0.003 ($p < 0.005$) there is a statistically significant relationship between blood pressure and sleeping quality of the elderly in PSTW Pandaan East Java, 2019. A regular sleep disturbance will affect physiological changes in the form of body imbalance homeostasis. The active sympathetic nervous system is going to increase peripheral resistance and cardiac output, leading to increased blood pressure. So, it can be concluded that someone who has poor sleeping quality is going to experience increasing blood pressure.

Sleep disorder is a major problem for elderly. Sleep disorders that occur in the elderly will cause the pituitary to release Corticotrophin Releasing Hormone (CRH) and Arginine Vasopressin (AVP). When CRH is secreted by the hypothalamus, it will be transported to the anterior pituitary which will stimulate corticotropin secretion which finally increases the cortisol hormone (23). The main effect of cortisol in the metabolism of glucose for the human body is to increase glucose levels in the body by helping to mobilize glucagon from the pancreas, and to increase metabolism of glucose formation from non-carbohydrate ingredients (24).

When there are sleep disorders, the body tends to have a high metabolic rate, therefore it takes so much glucose as an energy-forming fuel. Cortisol helps to supply increased glucose needs. Cortisol will also stimulate muscle cells as a trigger of muscle protein overhaul. The results of the overhaul are brought to the liver and kidneys to form glucose by glucagon and then released into the blood. Cortisol can use up sugar reserves from muscle cells including converting non-carbohydrate compounds to glucose, however blood glucose levels are increased. Vasopressin is another hormone secreted by the hypothalamus. Vasopressin's main function is to increase the reabsorption of water in the distal tubule and cause the renal tubular collection to return to the blood which will help regulate the body's fluid volume. If vasopressin increases due to stimulation by the hypothalamus, there will be an increase of water reabsorption which will increase the volume of plasma, and eventually increase blood pressure.

Desaulniers et al stated that the sleep environment for the elderly needs to be optimized according to their need. The effect of short sleep duration is a risk for hypertension (25). A result of meta-analysis that covered 225,858 subjects and using the categories of "short" and "long" sleep duration showed that short sleep duration was associated with a higher risk of hypertension when compared with long sleep duration (26). The main determinant of poor night sleep in the elderly is the dyspnea and long sleep latency. Nurses can play an important role in recognizing the negative effects of sleep disorders on the health of the elderly. In other words, there's a need to evaluate the elderly's sleeping characteristics, sleep duration, sleep time, sleep patterns and medical diseases etc (27, 28).

CONCLUSION

Majority of the elderly in PSTW Pandaan East Java have blood pressure in the optimal level
Majority of the elderly in PSTW Pandaan East Java have good sleeping quality
There is a relationship between blood pressure and sleeping quality of the Elderly in PSTW Pandaan East Java

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