The Correlation of Sleep Quality and Physical Activity with Blood Pressure of Patients at Sei Langkai Community Health Center, Batam Island, Indonesia

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Abstract

Introduction: High blood pressure is a serious medical condition and can increase the risk of heart, brain, kidney and other diseases. Sleep disturbance is a factor that affects the development of cardiovascular disease. For instance, physical activity that is carried out regularly causes many changes; the heart will get stronger in the muscles so that the capacity becomes large and the heart rate becomes strong and regular, or measured. Moreover, the elasticity of blood vessels will increase due to relaxation and vasodilation, so that fat piles will decrease and increase contractions of the muscle walls of these veins.
Method: The research method was analytic observation with a cross-sectional. The sample in this research used a Finite-formula, and the total sample was 69 people. Data was collected by using a global physical activity and sleep quality questionnaire. The data obtained was analyzed by using the chi-square test.
Results: The research results showed there were 26 people (63,4%) who had good sleep quality with normal blood pressure and 8 people (28,6%) had bad sleep quality with high blood pressure on hypertension grade 1 and 11 people (39,3%) on hypertension grade 2. It obtained a p-value of 0.000. It means that there was a correlation between sleep quality and blood pressure. While the results of the analysis on the correlation of physical activity and blood pressure obtained that 1 patient (5%) did heavy physical activity and had hypertension grade 1 and hypertension grade 2. It obtained a p-value of 0.001. It means there was a correlation between physical activity and blood pressure.
Conclusion: There was a correlation between sleep quality and physical activity with the patients' blood pressure in the working area of Sei Langkai Community Health Center.

Keywords: Blood Pressure, Sleep Quality, Physical Activity

Introduction

High blood pressure, also known as hypertension, is a serious medical condition that can increase the risk of heart, brain, kidney, and other diseases. It is the main cause of premature death worldwide, with more than one in four men and one in five women - more than one billion people - having this condition (WHO, 2019). High blood pressure and coronary heart disease are global causes of death, disability, and decreasing life quality related to health. Sleep disturbances are also closely related to life quality-related to health, appear to be a factor that is influencing the development of cardiovascular disease, and are more common among people with these disorders than in the general population of middle-aged and older adults (Joris & Pandi, 2008).

Sleep serves to suppress blood pressure by reducing catecholamine secretion. There were significant differences in sleep quality in different groups based on age, blood pressure and smoking habits. The mean age for subjects with poor sleep quality was 56 years, which was significantly higher than the average age for subjects with good

sleep quality (Joris & Pandi, 2008). The literature shows that untreated sleep problems in patients with painful conditions can lead to a vicious cycle, and pain and poor sleep quality, which adversely affects an individual's quality of life, including social integration, physical activity, and emotional welfare. Therefore, sleep is very important because its disruption can cause serious consequences (Alsaadi et al, 2014).

Physical activity is a body movement produced by contraction of the skeletal muscles and which substantially increases energy expenditure (Bouchard, Blair & Haskel, 2012). Physical activity that is done regularly causes changes, such as the heart will become stronger in its smooth muscles so that the capacity is large and the construction or pulse is strong and regular. Besides that, the elasticity of blood vessels will increase due to relaxation and vasodilation, so that fat deposits will decrease and increase muscle contraction of blood vessel walls. Regular and measured exercise can absorb or eliminate cholesterol deposits in the arteries (Anies, 2007).

Based on data from the World Health Organization (WHO) in 2015, it showed that around 1.13 billion people in the world have hypertension. That means, 1 in 3 people in the world have been diagnosed with hypertension. The number of people with hypertension is increasing every year. It is estimated that in 2025 there will be 1.5 billion people affected by hypertension, and it is estimated that every year 9.4 million people will die because of hypertension and its complications (Ministry of Health, 2019). Meanwhile, according to Indonesian Sample Registration System (SRS) data in 2014, hypertension with complications (5.3%) was the fifth cause of death at all ages (Ministry of Health, 2019).

The Riau Islands Health Profile in 2017 confirmed that the most common hypertension found based on the results of blood pressure measurements in the health care facilities and Integrated Coaching Post (PTM Posbindu) in Riau Island Province was in Lingga Regency, with 30.9%, and the lowest was in Batam City, with 13.1% (Ministry of Health, 2017).

The Health Office of Batam City informed us that there were 70,122 cases of hypertension throughout 2019, with 39,750 women and 30,372 cases of men. Based on the data, it was stated that the highest hypertension data in Batam was obtained by the Sei Langkai Community Health Center, which had 13,682 cases, with 8,012 cases in women and 5,670 cases in men.

Subject and Research Method

This research used an analytical observational method with a cross-sectional approach. The sample used the Finite formula and the total sample was 69 people. Data was collected by using the Sleep Quality Questionnaire and the Global Physical Activity Questionnaire (GPAQ). The data obtained was analyzed by using the chi-square test.

Research Results

The results showed good sleep quality was mostly found in patients with normal blood pressure, 26 patients (63.4%). Poor sleep quality was found in patients with high blood pressure, as many as 8 patients (28.6%) with grade 1 hypertension, and 11 patients (39.3%) with grade 2 hypertension, with a p-value of 0.000. While the results of the analysis on the relationship between physical activity and blood pressure obtained data that carried out heavy physical activity as much as 1 patient (5%) for patients with hypertension scale-1 and hypertension scale-2, the p-value was 0.001.

1.Frequency Distribution of Sleep Quality
Based on the results of the univariate analysis on the total frequency distribution of sleep quality in the working area of Sei Langkai Community Health Center in 2020, it was obtained as follows:

Table 1: Frequency Distribution of Sleep Quality

Sleep Quality	Frequency (*f*)	Percentage (%)
Good	41	59,4
Poor	28	40,6
Total	69	100,0

Based on Table 1, it can be seen that 41 patients (59.4%) had good sleep quality and 28 patients (40.6%) had poor sleep quality.

2. Frequency Distribution of Physical Activity

Based on the results of the univariate analysis on the total frequency distribution of physical activity in the working area of Sei Langkai Community Health Center in 2020, it was obtained as follows:

Table 2: Frequency Distribution of Physical Activity

Physical Activity	Frequency (*f*)	Percentage (%)
Low	30	43,5
Moderate	20	29
Heavy	19	27,5
Total	69	100

Based on Table 2, there were 30 patients (43.5%) who did low physical activity, 20 patients (29%) who did moderate physical activity and 19 patients (27.5%) who did heavy physical activity.

3. Frequency Distribution of Blood Pressure

Based on the results of the univariate analysis on the total frequency distribution of blood pressure in the Working Area of Sei Langkai Community Health Center in 2020, it was obtained as follows:

Table 3: Frequency Distribution of Blood Pressure

Blood Pressure	Frequency (*f*)	Percentage (%)
Normal	33	47,82
Pre-Hypertension	13	18,84
Hypertension Scale 1	10	14,5
Hypertension Scale 2	13	18,84
Total	69	100

Based on the table above, there were 33 patients (47.82%) who had normal blood pressure, 13 pre-hypertension patients (18.84%), which were 10 patients (14.5%) on scale 1 and 13 patients (18.84%) on scale 2.

4. Correlation of Sleep Quality and Blood Pressure

Based on the results of the bivariate analysis on the correlation between sleep quality and blood pressure in the Working Area of Sei Langkai Community Health Center in 2020, it was obtained as follows:

Table 4: Correlation of Sleep Quality and Blood Pressure

Sleep Quality	Blood Pressure								Total		P *Value*
	Normal		Prehypertension		Hypertension Scale 1		Hypertension Scale 1		*F*	%	
	F	%	*F*	%	*F*	%	*F*	%			
Good	26	63,4	11	26,8	2	4, 9	2	4, 9	41	100	0,000
Poor	7	25	2	7,1	8	28,6	11	39,3	28	100	

Table 4 showed the results of the analysis on the correlation between sleep quality and blood pressure. There were 26 patients (63.4%) who had good sleep quality with normal blood pressure, 11 pre hypertension patients (26.8%), 2 hypertension patients (4.9%) on scale 1 and 2 hypertension patients (4.9%) on scale 2. Meanwhile, there were 7 patients (25%) who had poor sleep quality with normal blood pressure, and 2 pre hypertension patients (7.1%), which were 8 patients (28.6%) on scale 1 and 11 patients (39, 3%) on scale 2. It obtained a p value of 0.000.

5. Correlation of Physical Activity and Blood Pressure

Based on the results of bivariate analysis on physical activity and blood pressure at the working area of Sei Langkai Community Health Center in 2020, it showed that:

Table 5: An Analysis of Physical Activity and Blood Pressure

Physical Activity	Blood Pressure								Total		P *Value*
	Normal		Pre-hypertension		Hypertension scale-1		Hypertension scale-2				
	F	%	*F*	%	*F*	%	*F*	%	*F*	%	
Light	7	23,3	4	13,3	8	26,7	11	36,7	30	100	0,001
Moderate	14	70	4	20	1	5	1	5	20	100	0,001
Heavy	12	63,2	5	26,3	1	5,3	1	5,3	19	100	0,001

On the table 5, the results of the analysis of the correlation between physical activity and blood pressure. Light physical activity with normal blood pressure was 7 patients (23.3%), pre-hypertension was 4 patients (13.3%), scale 1 of hypertension was 8 patients (26.7%) and scale 2 of hypertension was as many as 11 patients (36.7%). Meanwhile, moderate physical activity with normal blood pressure was 14 patients (70%), pre-hypertension was 4 patients (20%), scale 1 of hypertension was 1 patient (5%), and scale 2 of hypertension was 1 patient (5%). Then heavy physical activity with normal blood pressure for as many as 12 patients (63.2%), pre hypertension for as many as 5 patients (26.3%), scale 1 hypertension for as many as 1 patient (5.3%), and scale 2 hypertension for about 1 patient (5.3%). Based on the analysis, a p-value of 0.001 was obtained.

Discussion

1.Frequency Distribution of Sleep Quality

Based on Table 1, 41 patients (59.4%) had good sleep quality and 28 patients (40.6%) had poor sleep quality. Thus, it can be concluded that good sleep quality dominates in this study. Good sleep quality is influenced by several factors, including consuming cow's milk because it contains melatonin. Melatonin can directly search for free radicals and stimulate antioxidant enzymes. Taking B vitamins, such as niacin, has been shown to improve sleep. Besides that, tart cherries and kiwis have been shown to improve sleep quality and reduce symptoms of insomnia (Grandner, 2019). Increasing vitamin D intake, consuming green tea and reducing caffeine consumption can improve sleep quality. Poor sleep quality includes: insufficient sleep duration, disturbed sleep waves, snoring, and other things that interfere with sleep so that it also disturbs the balance of the systems in our body (Gangswich, 2006).

2. Distribution of Physical Activity Frequency

Based on Table 2, there were 30 patients with a low physical activity category (43.5%), moderate physical activity for about 20 patients (29.0%), and heavy physical activity for as many as 19 patients (27.5%). The type of activity performed in individual discretionary time that increases total daily energy expenditure. Activities are selected based on personal needs and interests (Bouuchard, Blair & Haskel, 2012). The term "physical activity" should not be confused with "exercise", which is a subcategory of planned, structured, repetitive physical activity aimed at improving or maintaining one or more components of physical fitness. Furthermore, moderate and heavy intensity physical activity improves health (WHO, 2018).

3. Distribution of Hypertension Frequency

Based on Table 3 above, patients with normal blood pressure categories were 33 patients (47.82%), pre-hypertension as many as 13 patients (18.84%), 10 hypertension patients (14.5%) on scale 1 and 13 hypertension patients (18.84%) on scale 2. Blood pressure is regulated by the medullary cardiovascular control center and several hormones. These hormones include the adrenal medulla hormones epinephrine and norepinephrine. The main area of the brain that adjusts sympathetic output to the arterioles is the cardiovascular control center in the medulla of the brainstem. It is an integrated center for blood pressure regulation. Several other parts of the brain also affect blood distribution, especially the hypothalamus, which part of its function is to regulate temperature, controlling blood flow to the skin to adjust heat to the environment (Sherwood, 2014).

4. Correlation of Sleep Quality and Blood Pressure

From Table 4, it can be seen that good sleep quality is mostly found in patients with normal blood pressure, 26 patients (63.4%) and poor sleep quality is mostly experienced by patients who have high blood pressure, as

many as 8 patients (28.6%) for scale 1 hypertension. and as many as 11 patients (39.3%) for Scale 2 of hypertension. The results of the analysis showed that the relationship between sleep quality and blood pressure obtained a p value of 0.000. The p value is smaller than the significant value or Sig. (2-tailed) about 0.05. These results indicate that there is a relationship between sleep quality and blood pressure. In the last decade, it has been published on the relationship between insomnia and hypertension. Population-based studies using self-reported data have shown a significant association between insomnia, either defined as a symptom or as a disorder of hypertension (Watson & Preedy, 2020). Hypertension and coronary artery disease are confirmed to be associated with sleep duration in the adult population (Bouchard, Blair & Haskel, 2012). Higher prevalence of prehypertension and hypertension has been reported in primary and secondary schools of men and women with poor sleep (8-hour sleep duration). Each unit increased sleep duration (hours) has been shown to predict a decrease in prehypertension and risk of hypertension by 0.89 and 0.88 in boys and girls. Hypertension and coronary artery disease are confirmed to be associated with sleep duration in the adult population (Watson & Preedy, 2020).

5. Correlation of Physical activity and Blood Pressure

In Table 5, the results of the analysis in this study showed that the relationship between physical activity and blood pressure obtained a p value of 0.001. The p value is smaller than the significant value or Sig. (2-tailed) is 0.05. The results showed that there was a relationship between physical activity and blood pressure. From this data, it can be concluded that the more often a person does moderate or heavy physical activity, the less a person experiences hypertension. This is because regular and measured exercise can absorb or eliminate cholesterol deposits in the arteries (Anies, 2007). Good and regular physical activity will train the heart muscles and peripheral resistance, which can prevent an increase in blood pressure. Regular exercise can stimulate the release of endorphins, which cause a euphoric effect and muscle relaxation so that blood pressure does not increase (Kokkinos et al, 2009). Significant cardiovascular changes accompanying exercise, including a substantial increase in skeletal muscle blood flow, a significant increase in cardiac output, a decrease in total peripheral resistance (due to extensive vasodilation in skeletal muscle despite generalized arteriolar vasoconstriction in most organs), and a moderate increase in mean arterial pressure blood drops to normal (Sherwood, 2014).

Conclusion

Based on the results of research that has been carried out in the working area of Sei Langkai Community Health Center, Batam City, it can be concluded that:

1. Good sleep quality for as many as 41 patients (59.4%) and poor sleep quality for as many as 28 patients (40.6%).
2. Low physical activity as many as 30 patients (43.5%), moderate physical activity as many as 20 patients (29.0%), and heavy physical activity as many as 19 patients (27.5%).
3. Normal blood pressure was 33 patients (47.82%), pre hypertension was 13 patients (18.84%), scale 1 of hypertension was 10 patients (14.5%) and scale 2 of hypertension was 13 patients (18.84%).
4. The results of the analysis of good sleep quality were mostly found in normal blood pressure in 26 patients (63.4%) and poor sleep quality in high blood pressure in as many as 8 patients (28.6%) on scale 1 of hypertension and as many as 11 patients (39.3%) on scale 2.
5. The results of the analysis showed that the relationship between sleep quality and blood pressure obtained a p value of 0.000. That is, it shows that there is a relationship between sleep quality and blood pressure.
6. The analysis results of the relationship between physical activity and blood pressure showed that moderate physical activity had as many as 1 patient (5%) with Scale 1 hypertension and as many as 1 patient (5%) with Scale 2 hypertension. While the data for heavy physical activity had as many as 1 patient (5.3%) for Scale 1 hypertension and as many as 1 patient (5.3%) for Scale 2 hypertension.
7. The results of the analysis showed that the relationship between physical activity and blood pressure obtained a p value of 0.001. This means that there is a relationship between physical activity and blood pressure.

Suggestions

1. For Health Institutions

It is hoped that Sei Langkai Health Center of Batam City can improve health programs, especially health promotion about the importance of physical activity and improving sleep quality, so that people's blood pressure in the working area of Sei Langkai Pubic Health Center can be controlled.

2. For Educational Institutions
As a reference source which is expected to provide useful information and input for students of the Medicine Faculty, University of Batam regarding the relationship between sleep quality and physical activity with the patient's blood pressure.

3. For the Researchers
It can increase understanding and experience in the application of knowledge gained in conducting research on the relationship between sleep quality and physical activity with the patient's blood pressure.

4. For Further Researchers
It is hoped that they can conduct research using other methods, and are expected to be able to explain in more detail to patients or the public the relationship between sleep quality and physical activity with blood pressure.

References

Alsaadi, S. M., et al. (2014). Poor Sleep Quality Is Strongly Associated With Subsequent Pain Intensity in Patients With Acute Low Back Pain. ONLINE. (https://pubmed.ncbi.nlm.nih.gov/24782195/). Diakses pada 2 juni 2020.

Anies.(2007). Waspada Ancaman Penyakit Tidak Menular. Jakarta: PT. Media

Bouchard, C., Blair, S., & Haskell, W. (2012). Physical activity and health. 2nd edition. Leeds: Human Kinetics.

Grandner, M. (2019). Sleep and health. New york: Academic press

Joris C.Verster, S.R.Pandi-Perumal DLS. (2008). Sleep and Quality of Life in Medical Illness. 1st ed. Inc HP, editor. Columbia University, New York, United States: Humana Press

Kemkes. (2017). Profil Kesehatan Provinsi Kepulauan Riau 2017. ONLINE. (https://www.kemkes.go.id/resources/download/profil/PROFIL_KES_PROVINSI_2017/10_Kepri_2017.pdf). Diakses tanggal 2 juni 2020.

Kemkes. (2019). Hipertensi Penyakit Paling Banyak Diidap Masyarakat. ONLINE. (https://www.kemkes.go.id/article/view/19051700002/hipertensi-penyakit-paling-banyak-diidap-masyarakat.html). Diakses tanggal 2 juni 2020

Kokkinos PF, et al, 2009, Physical Activity in The Prevention and Management of High Blood Pressure. Hellenic J Cardiologym, vol: 50.

Sherwood, LZ. (2014). Fisiologi Manusia dari Sel ke Sistem. Edisi 8. Jakarta: EGC.

Watson, R., & Preedy, V. (2020). Neurological Modulation of Sleep. San Diego: Elsevier Science & Technology.

WHO (2018). Physical activity. ONLINE. (https://www.who.int/news-room/fact-sheets/detail/physical-activity). Diakses tanggal 4 juni 2020.

WHO (2019). Hypertension. ONLINE. (https://www.who.int/health-topics/hypertension/#tab=tab_1). Diakses tanggal 2 juni 2020.