EFFECTIVENESS OF ERGONOMIC EXERCISE TOWARD URIC ACID LEVEL AMONG ADULT PATIENTS WITH HYPERURICEMIA

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Abstract

Background: Hyperuricemia is the most prevalent complained in an adult’s age as manifested by joint swelling and joint pain. Exercise is one of the intervention to reduce the uric acid level, namely ergonomic exercise. However, the effect of ergonomic exercise remains unclear on the uric acid level among adult patients with hyperuricemia. Objectives: The study aimed to test the effect of ergonomic exercise on uric acid level among adult patients with hyperuricemia. Methods: This study was conducted using a quasi-experimental design with one group pre-post-test. The total sample included in this study was 20 subjects that selected using purposive sampling techniques. The inclusion criteria were adults aged 36 to 65 years old, had abnormal uric acid level, not under medication of hyperuricemia, and able to do exercise. The ergonomic exercise intervention was done three times a week for a total of four weeks. Data were analyzed using the Wilcoxon test. Results: Of total 20 subjects joined in this study, the means level of uric acid before the intervention was 10.78 (SD=3.81). After four weeks of intervention, the means of the uric acid level was 5.72 (SD=1.40). The results of the Wilcoxon test found a significant difference of the uric acid level before and after intervention (p<0.001). Conclusion: Ergonomic exercise is useful to reduce uric acid level among patients with hyperuricemia. A promotion such of intervention to all people in the community is essential.

Keyword: Ergonomic exercise, hyperuricemia, uric acid, intervention.
INTRODUCTION

Hyperuricemia is an increased level of uric acid in the blood, also known as gout or arthritis (one of the degenerative diseases). Uric acid is the final metabolic result of purine, a component of nucleic acids found in the nucleus of the body’s cells. Increased levels of uric acid can disrupt the human body such as feelings of pain in the joint and often accompanied by the emergence of very intense joint pain. In the world, the prevalence of gout has increased from 1990 to 2010. In the United States, gout affected 8.3 million, about 4% of Americans adults. Gout can also cause complications such as urolithiasis and acute gout nephropathy. However, the incidence of hyperuricemia is still unclear. It varies between age groups and increases at 30 years in men and 50 years in women (Liu et al., 2011). In the United States, the prevalence of hyperuricemia was increased and affected 43,300,000 (21% of adults) (Zhang et al., 2012). In Indonesia, the prevalence of hyperuricemia was 11.9% and 26.4% in East Java (Indonesian Ministry of Health, 2013).

Gout can be treated by pharmacological and non-pharmacological methods. However, pharmacological therapy must be minimized because the administration of drugs can cause dependence and contraindications. Therefore non-pharmacological treatment seems to be promising to prevent gout (Anis K., 2015). Non-pharmacological therapy can be done by relaxation, increasing fluid intake, warm compresses, low-purine diets by reducing foods containing high purines such as nuts and offal, maintaining ideal body weight, and exercise (Krisnatuti, 2006). Exercise is an effective way to reduce uric acid levels in the blood (Mujianto, 2013). The recommended level of exercise was 3-4 times a week with a duration of 15-45 minutes regularly. An example of exercise is walking, reactive training and exercise or gymnastics.

Ergonomic exercise is a fundamental exercise focus on the movements body’s composition and physiology. The body itself is maintained by its homeostasis (order and balance) so that it remains in a fit state (Sagiran, 2013). Movement in ergonomic exercise consists of five basic movements and one closing motion. The basic movement of ergonomic exercise consists of chest movements, submissive gratitude, strong sitting, sitting burning and lying resigned. Cover movements are micro energy or often called core energy rotation movements. Each movement contains tremendous benefits in disease prevention and health care (Wratsongko, 2014). The purpose of this ergonomic exercise is to reduce pain in the wrist joints and soft tissue. Research conducted by Anis Komariah in 2015 found that ergonomic exercise has an effect on decreasing blood uric acid levels in the elderly with gout. Other studies have suggested that ergonomic exercise therapy can improve muscle strength in the elderly (Yuliana M., et al. 2014).

Provide information undoubtedly and applicatively is a significant effort to prevent the occurrence of gout especially in adults to the elderly age group. However, changing people’s behavior is not easy. Therefore, the role of nurses is needed to carry out various preventive, such as teaching ergonomic exercise correctly. Cipageran Urban Village, located in Cimahi City has the highest number of population growth about 5.17% in one year, from 2013 to 2014 (Cimahi City Health Profile, 2014). The number of people in the productive age reached 4,359 people out of a total of 5,910 people (Cimahi Population Service, 2011). Despite a higher number of population in that village, a risk of gout disease that has not detected and preventive against hyperuricemia have not conducted yet. This study aimed to test the effectiveness of ergonomic exercise towards uric acid levels in adults with hyperuricemia.
METHODS

Instruments
The instruments used in the patient surveys are described below, using the observation sheet to see changes in uric acid levels in the blood, instruments of ergonomic exercise procedures according to Wratsongko (2014), and blood uric acid levels using Easy Touch equipment.

Study design and intervention
This study conducted using a queasy experimental design in one group with pretest and posttest. The intervention of ergonomic exercise was provided to adults people three times a week, with a duration of 15-45 minutes regularly for four weeks. The intervention consists of basic and closing movement, namely chest movements, submissive gratitude, strong sitting, sitting burning and lying resigned. The uric acid level was measured before and after intervention for each participant. Assessment of changes in blood uric acid levels was carried out using a uric acid measuring device, namely easy touch. This tool is very effective and efficient in measuring uric acid.

The target population of this study was people with hyperuricemia lived in Cimahi district, West Java. The inclusion criteria were adults aged 36 to 65 years old, had an abnormal uric acid level, not under medication of hyperuricemia, and able to do physical activity, namely ergonomic exercise. The sample was selected using a purposive sampling technique. The total sample included in this study was 20 respondents.

Data Analysis
Data were analyzed using univariate analysis to describe variable interest. The normality of data was evaluated using Shapiro Wilk because of the number of respondents less than 50. The result of the normality test showed that the data not normally distributed. To test the effect of ergonomic exercise on the uric acid level was used a Wilcoxon test.

RESULTS

The results of the study influence the exercise ergonomics in the adult age to the elderly on changes in uric acid levels in the RW 19 area of Cipageran Urban Village, Cimahi City which lasted from March to April 2018 with a total sample of 20 people will be discussed in the data below. The results of processing the data obtained are then analyzed by univariate and bivariate analysis. For univariate analysis using numerical data with a mean value of uric acid levels before and after exercise ergonomic treatment.

The uric acid before intervention

Table 1. The means of uric acid before ergonomic exercise (n=20)

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Min-Max</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uric acid</td>
<td>20</td>
<td>10.78</td>
<td>7.3 – 18.9</td>
<td>3.81</td>
</tr>
</tbody>
</table>

Of total 20 subjects joined the intervention from March to April 2018, the average of uric acid before the intervention was 10.78 (SD=3.81) (Table 1).
The uric acid after intervention

Tabel 2. The means of uric acid before ergonomic exercise (n=20)

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Min-Max</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uric acid</td>
<td>20</td>
<td>5.72</td>
<td>3.3 – 8.1</td>
<td>1.40</td>
</tr>
</tbody>
</table>

Summarizes the means of uric acid after the intervention. On average, the uric acid after the intervention was 5.72 (Table 2).

The effect of ergonomic exercise on uric acid level

Tabel 3. Normality test using Shapiro Wilk

<table>
<thead>
<tr>
<th>Statistic</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td>0.800</td>
<td>20</td>
</tr>
<tr>
<td>Post-test</td>
<td>0.955</td>
<td>20</td>
</tr>
</tbody>
</table>

According to the normality test using Shapiro-Wilk, found significant results in the pre-test (p<0.001), means the data were not normally distributed (Table 3).

Table 4. The differences of uric acid before and after intervention (n=40)

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
<th>Min.</th>
<th>Max.</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before intervention</td>
<td>20</td>
<td>10.78</td>
<td>3.81</td>
<td>7.3</td>
<td>18.9</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>After intervention</td>
<td>20</td>
<td>5.72</td>
<td>1.40</td>
<td>3.3</td>
<td>8.1</td>
<td></td>
</tr>
</tbody>
</table>

According to the Wilcoxon test, found a significant difference on the uric acid before and after intervention (P<0.001), with the means difference was 4.91 (Table 4).

DISCUSSION

Before the intervention, the uric acid levels of all respondents were above the normal value (> 7 mg / dL) with a mean value of 10.78 with a minimum value of 7.3 mg / dL and a maximum value of 18.9 mg / dL. Under the normal conditions, uric acid can accumulate excessively if the production of uric acid is also excessive. The average human uric acid production per day is around 600-800 mg. High levels of uric acid in the blood can cause the buildup of monosodium urate crystals, which will settle in the joints and cause an inflammatory response called hyperuricemia. Several factors can affect the occurrence of hyperuricemia, namely genetic, consumption of foods with levels high of purines, drinks containing high fructose, diseases associated with blood and vascular system, alcohol
intake, cancer drugs, Vitamin B12, obesity, and hormonal therapy. A person who has hyperuricemia can be asymptomatic and symptomatic. Most people do not realize that they have increased levels of uric acid in the blood because the initial increased of uric acid in the blood is more asymptomatic with no significant clinical manifestation. A new person will feel a complaint if there is inflammation in the form of swelling of the joints of the toes or hands, but occasionally feel joint pain or renal colic. Increased levels of uric acid in the blood is rarely detected early, and there is rarely a routine examination of uric acid levels.

Uncontrol the level of uric acid in the blood can cause various complications, such as kidney disease. Based on research conducted by Giordano et al. (2015) that high uric acid in the blood is strongly associated with the development of chronic kidney disease and can be a poor prognostic of acute kidney failure. This excess of uric acid produced by purines can occur because the kidneys cannot release it through urine, which eventually will form uric acid crystals that accumulate in the joints. This crystal is hard, so it will erode the soft tissue or lining of the joint cartilage and cause painful arthritis symptoms. Another unmodifiable factor of hyperuricemia is age. Based on research conducted by Rini Setyoningsih (2009) in Outpatient Hospital Dr. Kariadi Semarang Hospital, age above 40 years old were experienced hyperuricemia showed statistically significant in the bivariate analysis. At the age of over 40 years, an increase in uric acid levels that occur due to decreased kidney function in the process of excretion as reported in high levels of urea and creatinine. Whereas in this study respondents in the adult to the elderly age range 33-76 years who experienced an increase in uric acid levels in the blood. In conclusion, the increase in blood uric acid levels is accompanied by increasing age, especially in the age range above 30 years of hyperuricemia. This occurs due to an increase in uric acid metabolism (overproduction), a decrease in uric acid expenditure (underexcretion) or a combination of both which also affects the decline in kidney function.

The means of uric acid after ergonomic exercise was 5.72 with a standard deviation of 1.40 and the minimum value of uric acid is 3.3 mg/dL, and the maximum value of uric acid is 8.1 mg/dL. Ergonomic exercise is a type of mild exercise that has an effective way to reduce uric acid levels. This Ergonomic exercise can facilitate blood circulation that can maximize oxygen supply throughout the organ and also increase the body’s metabolism, for example, the metabolism of gout. Ergonomic exercise is a fundamental exercise which the movement considered the body's composition and physiology. The body itself is maintained by its homeostasis (order and balance) so that it remains in a fit state (Sagiran, 2013). In this study, ergonomic exercise 3 times a week for four weeks is expected to reduce uric acid levels in the blood.

Metabolism of uric acid in kidney have four stages, namely uric acid from the capillary plasma enters the glomerulus and undergoes glomerular filtration, about 98-100% will be reabsorbed in the proximal tubule, then secreted into the lumen distal to the proximal tubule and reabsorbed into the distal tubule. Uric acid will be excreted in the urine about 6% - 12% of each filtration. After glomerular vein filtration, almost all are reabsorbed in the proximal tubule. Low urine pH in the urinary tract makes the veins excreted in the form of gout (Spieker et al., 2002). From this metabolism, there will be a decrease in renal filtration function if uric acid levels are high and cause hyperuricemia. To prevent decreasing kidney function, high uric acid levels can be reduced in several ways, one of them is light exercise such as
ergonomic exercise. Regular exercise can maximize oxygen supply to the brain and increase metabolic regulation, namely the combustion system (uric acid, cholesterol, blood sugar, lactic acid, oxalate crystals), improve the condition of strength and flexibility of joints and minimize the risk of joint damage due to arthritis. Exercising regularly has many benefits including to prevent and treat gout. Routine ergonomic exercise can facilitate collateral blood circulation in the lower limbs, burn fat and toxins in the body (uric acid, cholesterol, blood sugar, lactic acid, oxalate crystals) and reduce blockages in blood vessels. This condition will have a positive effect because the metabolic system will run smoothly and reduce increased uric acid in the body.

Our findings underscore that excessive levels of uric acid in the blood can trigger various pathological conditions. However, it can be prevented by doing a regular ergonomic exercise. The results of this study showed that uric acid levels were decreased. The minimum value of respondents' uric acid levels reached 3.3 mg/dl, and the maximum uric acid level reached 8.9 mg/dl, this decrease was a process of breaking up of accumulation of purine in the joints along with an increase in the metabolic system of uric acid. Although there are still more than normal values of respondents' uric acid levels, this value shows a decrease from before intervention.

There was a significant difference in the average uric acid levels before and after ergonomic exercise, the mean levels of uric acid before ergonomics exercise. Regular exercise ergonomics can reduce uric acid levels in the blood as shown in the changes of uric acid before and after ergonomics exercise. It was supported by several theories that explain the physiological response of muscle fibers to light intensity exercises such as ergonomic exercise. It was explained that through light intensity exercise (ergonomic exercise) physiologically will facilitate the blood circulation system and activate urinate, which functions to convert uric acid into a form of melatonin which will be secreted in the urine so that the condition of hyperuricemia is resolved (Figure 1).

**Figure 1. Synthesis and elimination of uric acid**

The type of activity given to the respondents in this study is ergonomic exercise. Ergonomic exercise is beneficial and efficient because it is based on the rules of the body's creation. Ergonomic exercises can restore the position and flexibility of the nervous system and facilitate blood flow to all systems of the human body, including the urinary system and blood flow. Ergonomic exercises are carried out routinely three times a week for four weeks can improve the blood circulation system with the activation of urokinase which can break down the excess uric acid in the blood to form calcitonin to be
excreted in the urine. Based on research conducted by Revansia (2014) showed that there were differences in the effect of low impact ergonomic and aerobic exercise on the level of systolic and diastolic blood pressure in elderly hypertension, and the most useful impact was an ergonomic exercise on systolic pressure and low impact aerobic exercise on diastole pressure. Research conducted by Anis K (2015) shows that ergonomic exercise can decrease blood uric acid levels in the elderly with gout. The limitations in this study were included data regarding the diet of purine which may be a confounding factor for reduced the level of uric acid in the blood.

CONCLUSION

The results of this study found that majority of respondent had a very high uric acid level in the blood. After four weeks regularly ergonomic exercise, there was a significantly decreased uric acid level. Health professional need to do health education by promoting this exercise to the community who are at high risk for hyperuricemia or gout is essential.

REFERENCES

Dinas kependudukan Cimahi. 2011


