



The Influence of Low Purine Diet and Physical Activity on Changing of Uric Acid Levels in Hyperuricemia



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Abstract



Keywords

*Blood;
Hyperuricemia;
Low Purine Diet;
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Uric Acid Levels;*

Hyperuricemia is caused by elevated levels of uric acid in the blood due to excessive production or reduced disposal. Factors that contribute to increased uric acid production are the consumption of foods that contain lots of purine and uric acid, obesity, drug use, physical activity and certain diseases in the blood. The purpose of this study was to determine the effect of low purine diet and physical activity on changes in uric acid levels in hyperuricemia in tourism areas. The research was conducted in Sanur Urban Village of Denpasar, with the sample is woman age 30-60 years old as much 38 people. The research is an experimental research with pretest-posttest control design. Subjects were divided into two groups, group 1 applied a low purine diet and physical activity and group 2 as a control only applied a low purine diet. A low purine diet is consumed daily for 6 weeks. Physical activity is yoga exercises performed for 60 minutes with a frequency of 3 times a week for 6 weeks. To know the change of blood uric acid level before and after intervention using Paired t-test. The mean uric acid levels before the intervention in the low purine diet intervention group and the physical activity of Gymnastics Yoga was 7.6 mg/dl and after the intervention decreased to 5.2 mg/dl. In the control group that only applied a low purine diet without Gymnastics Yoga before the intervention was 7.2 mg/dl and after intervention also decreased to 5.44 mg/dl. Levels of uric acid after low purine intervention and physical activity were lower than before treatment ($p < 0.05$). The lower purine intervention and greater physical activity decreased uric acid levels compared with controls ($p < 0.05$). For women with hyperuricemia to reduce uric acid levels by applying a low purine diet and yoga exercises three times a week, with a duration of about 60 minutes.

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1. Introduction

The uric acid disorders are widely known, but some people are still not aware of its symptoms and causes. It is a normal consist of the blood and urine as the residual result of purine metabolism, both purines derived from food consumed and purine derived from the breakdown of the body proteins or nucleic acids in the body. Hyperuricemia is a condition characterized by increased levels of uric acid in the blood than normal as a result of impaired purine metabolism (Karyadi, 2002). The incidence data for this disease in Indonesia as a whole is yet certain known. Based on the research in Central Java, the hyperuricemia prevalence was 24.3% for males and 11.7% for females. The field research conducted in Denpasar city population was obtained hyperuricemia prevalence 18.2% (Indrawan, 2005). The research in the hospital also showed an increased incidence of hyperuricemia. The research in RSCM showed that hyperuricemia and gout disease increased at a younger age (30-50 years). This condition is quite worrying due to the age is classified as productive so that hyperuricemia can decrease overall working productivity (Karyadi, 2002). Whereas, the data of medical record in Sanglah Hospital Denpasar, shows the outpatient number of Hyperuricemia in 2007 was 244 people, most of them are 25-60 years old.

The factors that contribute to increased production of uric acid is the foods consumption consists a lot of purine and uric acid, obesity, drug use, physical activity and certain diseases in the blood. The foods consumption on high purine content (> 1000 mg/day) as in the viscera, meat broth, alcohol, and poultry are very risky to increasing the uric acid in the blood. The tourism development in Bali area also affects the availability of places or restaurants that provide fast food. This situation can lead to changes in the dietary habit of the surrounding society, from a traditional dietary high in fiber to a diet high in protein and fat are generally as well as high purine.

Some research results show the relationship between various factors, especially high purine consumption on the occurrence of hyperuricemia. According to Hensen and Putra (2007) research for rural tourism areas in Bali shows there is a significant relationship between a high-purine diet with hyperuricemia. According to Dewi Kusumayanti, et al (2014) results, showed that high levels of purine intake (> 150 mg/day) were more common in the hyperuricemia group than in the control group. The consumption of high purine foods poses 2.14 times greater risk for hyperuricemia than those not. An obesity is as well as more common in hyperuricemia than

those who do not. It poses 2.32 times greater risk for hyperuricemia than those who do not. Due to the various issues caused, hyperuricemia needs to be overcome by observing diet and physical activity. Based on the above description then conducted a study to determine the effect of low-purine diet and physical activity on changes in uric acid levels for hyperuricemia at tourism areas. Based on the above background of the problems can be formulated the research problems as follows: What is low-purine diet and physical activity is able to be lower blood uric acid levels for patients with hyperuricemia in Denpasar city? The purpose of the present study is to determine the effect of low purine diet and physical activity on changes in uric acid levels for hyperuricemia in Denpasar city.

2. Research Method

The present research is an experimental research with *pretest-posttest group control design*. The study was conducted in Sanur Sub-district, South Denpasar, Denpasar City from June to October 2017. The population is adult women in Sanur Sub-district, South Denpasar, Denpasar, whereas, the sample was part of the population with inclusion criteria: 30-60 years old, normal blood pressure and willing as a sample on the research until completion. The sample size was calculated using Pocock (2008) formula and obtained a minimum sample size for each group 18 people. The sampling was conducted by *purposive random sampling*. The data collection was processed by computer *software* program with statistical analysis *Paired t-test* to determine the blood changing on the uric acid level in each group and *independent t-test* to know the mean difference of uric acid level before and after treatment both groups. The treatment is given to the intervention group is administered a low purine diet for 6 weeks, yoga exercises with frequency 3 times a week, and duration is 60 minutes. Due to the ethical considerations in the group are given a low purine diet alone but without yoga exercises.

3. Results and Analysis

The research was conducted in Sanur Village, South Denpasar, Denpasar City. Sanur Village is a famous tourist area for its beautiful beaches including inn/hotel facilities and popping up restaurants/food stall offering various types of dishes. Sanur Village has nine environments: Banjar Singgi, Panti, Gulingan, Taman, Sindu Kaja, Sindu Kelod, Batu Jimbar, Semawang and Pase Kuta. The Sanur boundaries municipality is as follows: in the east bordering at the Bali Sea; on the south by Badung strait/ Indonesia ocean; in the west by the village is Sanur Kauh and in the north bordering of the village is Sanur Kaja. The sports facilities available in Sanur Village is a field that located in Banjar Taman Sari.

Characteristics of Research Subjects

The mean age of the research subjects in group 1 (intervention group) was 48.2 ± 7.8 with the youngest age 33 years old and the oldest 60 years old. In group 2 (control), the mean age was 46.7 ± 7.3 , with the youngest age 32 years old and the oldest 60 years old. In the intervention group, almost part of the sample has been college education level (47.7%) while in the control group their background level education is Senior High School (63.2%). More than half of the samples in both groups were housewives. The sample distribution based on the complete characteristics illustrated in Table 1.

Table 1
Characteristic of research subject

Variable	Group			
	Intervention		Control	
	f	%	f	%
Age (mean±SD)	48.2±7.8		46.7±7.3	
Education level				
Elementary School	2	10.5	1	5.3
Junior high school	0	0.0	2	10.5
Senior high school	8	42.1	12	63.2
College	9	47.4	4	21.1
Occupation				
Housewives	11	57.9	10	52.6
Entrepreneur	6	31.6	8	42.1
Civil servant	2	10.5	1	5.3
Total	19	100.0	19	100.0

Diet and physical activity implementation

The diet implementation both groups in details unlike Table 2.

Table 2
Diet implementation in group 1 and 2

Nutritional Consumption Level	Group			
	Intervention		Control	
	Intake	Reference value	Intake	Reference value
Energy (%)	80.8	80-105	79.7	80-105
Protein (%)	14.9	10-15	14.1	10-15
Cholesterol (%)	31.4	20-30	30.2	20-30
Carbohydrates (%)	55.3	55-70	55.2	55-70
Purine (mg)	94.3	≤ 150	85.8	≤ 150

In the intervention group, the referenced rate of energy consumption is 80-105%, whereas, 80.8% is consumed (as recommended). The mean protein intake rate is about 14.9% total energy, as referenced (10-15% total energy); cholesterol intake 31.4% total energy, approximating the referenced (20-30% total energy and carbohydrate intake 55.3% according to the referenced 55-70% total energy) purine intake 94.3 mg as referenced (<150 mg).

In the control group, the average daily energy consumption level is 79.7% approach the referenced 80-105%). The mean percentage of protein intake is about 14.1% total energy, as referenced (10-15% of total energy); carbohydrate intake 55.2% as referenced (55-70% total energy) and cholesterol intake 30.2% total energy as well as referenced (20-30% total energy). The mean purine intake is 85.8 mg as referenced (<150 mg).

The physical activity performed in the intervention group is Yoga Gymnastic with frequency three times a week and 60 minutes duration including 10 minutes for warming up, 40 minutes for core gym and 10 minutes cooling down (including balance and meditation). Whereas, the control group did not do Yoga Gymnastics.

Influence of intervention

In order to know the difference between the mean of the uric acid level before and after the intervention is used the *t-paired test* at $\alpha = 0,05$, the test result unlike in Table 3.

Table 3
The mean different test of uric acid level before and after intervention

Group	Uric acid value (mg/dl)			t	p
	Before	After	Mean different		
Intervention	7.568±0.745	5.237±0.939	2.331±0.819	12.416	0,000
Control	7.174±0.845	5.44±.936	1.737±.896	8.451	0,000

The statistical test results in Table 3. show the p -value in the intervention and control group is 0,000 ($p < 0.05$). It defines there is a significant difference in uric acid levels before and after intervention in the intervention group. Similarly, for the control group, there is a significant difference in uric acid levels before and after the intervention. Thus, the low-purine diet interventions with physical activity unlike Yoga Gymnastics performed for six weeks can decrease uric acid levels, with mean decreased uric acid levels $2,331 \pm 0.819$ mg/dl. In the control group who applied a low purine diet without doing Yoga Gymnastics also decreased levels its uric acid, with mean decreased uric acid levels $1.737 \pm .896$ mg/dl.

The influence difference of low purine diet intervention along with physical activity on Yoga Gymnastic compared to low purine diet without Gymnastic Yoga on the decrease of the uric acid level is tested with *independent t-test* at $\alpha = 0,05$, the test result is described in Table 4.

Table 4.
Different test of intervention influence on decreasing of uric acid level between groups

Uric Acid Level	Group		t	p
	Intervention (n=19)	Control (n=19)		
Mean (mg/dl)	2,331	1,737	2.136	0.040
SD	0,819	0,896		

The *independent t-test* results show that p -value is 0.040 ($p < 0.05$), defines a different meaning. Thus, there is a significant difference in decreasing of uric acid levels in the intervention group versus the control group. The mean decrease of uric acid level in the intervention group is greater than the control group. Thus, the low purine diet interventions with greater Yoga is lower uric acid levels compared to the treatment of a low purine diet without Yoga exercises.

Discussion

Hyperuricemia is caused by elevated uric acid levels in the blood due to excessive production or reduced disposal. Uric acid is the metabolism result in the body, which levels should not be excessive. Everyone has uric acid in their body, due to every normal metabolism producing uric acid. Whereas, the trigger is food and other compounds that consist of a lot of purines. Actually, the body provides 85% (percent) of purine compounds for daily needs. It defines that the food purine requirement is only about 15%. The factors that contribute to increased uric acid production is the foods consumption that consists of a lot of purine and uric acid, obesity, drug use, physical activity and certain diseases in the blood. The foods consumption with high purine content unlike the innards, meat broth, alcohol, and poultry are a very high-risk increase of uric acid in the blood. In order to be lower uric acid levels given a low purine diet with the condition: the amount of energy provided tailored to the needs, 10-15% protein total energy requirements and limiting animal protein, 20-30% cholesterol, and carbohydrates 55-70%.

The results showed the significant differences in uric acid levels before and after intervention in the intervention group, with mean decreasing of uric acid levels $2,331 \pm 0.819$ mg/dl. In the control group, there is also a difference of uric acid levels before and after the intervention, with mean decreasing of uric acid levels $1.737 \pm .896$ mg/dl. Decreasing of uric acid levels occurring both groups is due to the treatment of a low purine diet as recommended. In the intervention group, the referenced rate of energy consumption is 80-105%, but 80.8% is consumed (as Kusumayanti, G. D., & Dewantari, N. M. (2017). *The influence of low purine diet and physical activity on changing of uric acid levels in hyperuricemia. International Journal of Health Sciences*, 1(3), 1-9.

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recommended). The mean protein intake rate is about 14.9% total energy, as referenced (10-15% total energy); 31.4% total cholesterol intake, approximated the referenced (20-30% total energy) and carbohydrate intake 55.3% as referenced 55-70% total energy. The mean purine intake is 94.3 mg as referenced (<150 mg).

In the control group, the average daily energy consumption level is 79.7% close to the referenced 80-105%. The mean percentage of protein intake is about 14.1% total energy, as referenced (10-15% total energy); carbohydrate intake 55.2% as referenced (55-70% total energy) and cholesterol intake 30.2% total energy as well as referenced (20-30% total energy). The mean purine intake is 85.8 mg as referenced (<150 mg). The mean decreasing of uric acid levels is relatively greater in those with purine consumption <100 mg (1.8 mg/dl) than that purine consumption > 100 mg (1.6 mg/dl).

The purine is organic base compounds that make up nucleic acids and is included in the amino acid group of protein-forming agents. Nucleotides consist of nucleosides that bind phosphoric acid. Nucleotides and phosphates hydrolyze mononucleotides into nucleotides therefore, they can be absorbed or converted into purine and pyrimidine bases. The process of uric acid formation is mostly from endogenous purine nucleotide metabolism, guanosine monophosphate (GMP), inosine monophosphate (IMP) and adenosine monophosphate (AMP). The formation of uric acid from the purine nucleoside through the purine bases of hypoxanthine, xanthine, and guanine with end products of uric acid. Purine sources in humans originate from purine (exogenous) food sources and nucleic acid degradation into purine (endogenous) nucleotides (Rodwell VW, 2006). The foods with high purine content (> 100-1000 mg/100g foodstuff) included: brain, liver, heart, lung, kidney, viscera, duck meat extract/duck broth, goose, bird, corned beef, sardine, small shrimp, broth, alcohol, yeast. An offal consumption aggravates the enzyme hypoxanthine to process purines. As a result, a lot of residual uric acid in the blood, which is shaped granules and collect around the joint causing pain is very painful.

This study is in accordance with the research that was conducted by [Maria do Rosário Gondim Peixoto \(2001\)](#), stated that nutritional therapy, i.e. reducing intake of purine food sources, cholesterol, and increasing of fluid intake as efficiently in lowering serum uric acid levels. The researcher recommends one alternative as an early approach to patients with hyperuricemia for changing their lifestyle to achieve the expected results.

In the intervention group decreasing of uric acid levels other than due to the treatment of low-purine diet is also caused by physical activity, unlike Yoga Gymnastics. The *independent t-test* results showed that there is a significant difference in decreasing of uric acid level both intervention groups ($p < 0.05$). The mean decreasing of uric acid level in the intervention group is greater than the control group. Thus low-purine diet interventions with greater Yoga Gymnastics reducing of uric acid levels compared to controls that are given only low purine diet itself. According to [Rimjhim Chaturvedi \(2015\)](#), uric acid levels can be reduced by helping of proper diet and exercise included walking, swimming, and Yoga. Yoga can help reduce uric acid levels in three ways: 1) Assist in managing weight, weight loss is gradually recommended as if you lose weight too fast, purines can attack the joints. Yoga helps to lose weight gradually. It also helps maintain weight and prevent weight gain in people who have an ideal body weight. According to [Andrea \(2013\)](#), stated that the physical activity can control weight through the process of increasing energy expenditure, improving aerobic capacity, improving body composition, increasing mobilization capacity and cholesterol oxidation, controlling food intake by controlling appetite and high cholesterol food intake. 2) Yoga exercise is soft, in the joints increase flexibility and circulation, therefore, unlike to prevent uric acid crystals from constriction in the joints, removing crystals already stored in joints by mobilizing and removing it. 3) Yoga makes us more concentrated and aware of the condition in the body. This awareness can help people to concentrate more on following a recommended diet to prevent other painful attacks. According [Fandhybp \(2016\)](#), stated that Yoga as well as helps in building stamina and energy for women and simultaneously reduce some discomfort and pain. The same thing is stated by ([Paul T Williams, 2008](#)), that exercise can reduce the risk of gout.

Ram Mani Bhandari states that after making dietary changes and some other lifestyle changes. It is advisable to try various poses in Yoga to reduce the uric acid levels in the body and simultaneously reduce the pain caused by the uric acid accumulation. In exercising balance, Yoga exercises will help regulate the uric acid levels in the body. Yoga Gymnastics naturally will reduce the uric acid levels in the body.

4. Conclusions

Based on the results and discussion can be concluded:

1. The mean uric acid levels before the intervention in the low purine diet intervention group with Yoga Gymnastics is 7.6 mg/dl and after the intervention, there is decreasing to 5.2 mg/dl. In the control group that only applied a low purine diet without Yoga exercises before the intervention is 7.2 mg/dl and after intervention also decreased to 5.44 mg/dl.
2. Uric acid levels after low purine diet intervention and physical activity are lower than before treatment ($p < 0.05$).
3. The low purine diet interventions and greater physical activity decreased uric acid levels compared with controls ($p < 0.05$).

The suggestions that can be referred related to the research results is for the women who have hyperuricemia, in addition to applying low purine diet is also recommended to perform physical activities unlike Yoga Gymnastics three times a week, with a duration about 60 minutes.

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