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The Effect Of Consumption Of A High-Purine Diet On Increasing Uric Acid Levels And Blood Pressure In The Elderly In Kediri District

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ABSTRACT

High purine consumption is a factor that is closely related to hyperuricemia. Apart from that, hyperuricemia is also closely related to the occurrence of increased blood pressure (hypertension). The aim of this research is to determine the effect of consuming a high purine diet on increasing uric acid levels and blood pressure in the elderly in Kediri Regency. The research method used was observational analytics with a cross sectional design. The research results in this study are that there is a significant influence between a high purine diet and uric acid levels and blood pressure in the elderly in Kediri Regency. This can be seen from statistical tests using Linear Regression, which showed a significant influence of Sig (2-tailed) between high purine diet consumption and uric acid levels (DP-AU=0.000) with a value of $\alpha \leq 0.05$, there was a significant influence of Sig. (2-tailed) between Uric Acid Levels and Increased Systolic Blood Pressure in the elderly (AU-TS=0.028) and diastolen blood pressure (AU-TD = 0.032) with a value of $\alpha \leq 0.05$, meaning the hypothesis is accepted that there is a significant influence Between a high purine diet and uric acid levels and blood pressure in the elderly in Kediri Regency. Excessive intake of a diet high in purine causes the accumulation of purine crystals to build up in certain joints which can increase uric acid levels in the blood. High uric acid levels can cause increased blood pressure through the mechanisms, inflammation of the kidneys and endothelium, activation of the renin-angiotensin system, depletion of nitric oxide, proliferation of smooth muscle cells, formation of superoxide, mitochondrial dysfunction, and activation of the polyol pathway.

Keywords: Blood Pressure , Elderly, High Purine Diet, Uric acid levels

INTRODUCTION

One of the degenerative diseases that is often experienced by the elderly is gout. Gout is a metabolic disorder characterized by increased uric acid levels (hyperuricemia). Increased uric acid levels are influenced by intake of foods high in purine. Uric acid is the final metabolic product of purines, which are one of the nucleic acid components found in the nuclei of body cells. Increased uric acid levels in the blood are called hyperuricemia. Hyperuricemia is caused by two things, namely due to excessive formation of uric acid or due to decreased excretion of uric acid by the kidneys. Untreated hyperuricemia causes excessive uric acid in the blood, causing a buildup of uric acid crystals. If crystals are in joint fluid it will cause gout (Diantari and Kusumastuti, 2013; Castilla-Ojo et al., 2023)

Uric acid levels in the blood are determined by the balance between production and secretion. If the balance is disturbed, there will be an increase in serum uric acid levels above normal, which is called hyperuricemia. The normal value of uric acid in men is between 3.4 - 7 mg/dl, while in women it is 2.4 - 5.7 mg/dl. Elevated uric acid levels are a risk factor for various cardiovascular diseases, including hypertension. (Syawali and Ciptono, 2022; Agustira, Simbolon and Kusdalinah, 2023).

Hypertension or high blood pressure is defined as an increase in systolic blood pressure above 120 mmHg and diastolic blood pressure above 80 mmHg with 2 measurements every 5 minutes in a state of sufficient rest/calm. Long-term high blood pressure can damage the kidneys (kidney failure), heart (coronary artery disease) and brain (causing stroke) if not detected early and treated appropriately (Agustira, Simbolon and Kusdalinah, 2023; Castilla-Ojo et al., 2023).

World Health Organization (WHO) states that hyperuricemia sufferers increase every year in the world. The incidence of Gout is around 1-4% of the general population, in western countries men suffer from Gout more often than women at 3-6%. In some countries, prevalence can increase to 10% in men and 6% in women in the age range ≥80 years. The annual incidence of gout is 2.68 per 1000 people. Throughout the world, gout is gradually increasing due to bad eating habits such as the wrong diet, lack of exercise, obesity and metabolic syndrome. Based on data in the United States, 5.7 million people have gout. The incidence of gout is estimated to be more than 8 million people by 2030. Based on WHO data in the Non-Communicable Dissease Country Profile in Indonesia, the prevalence of gout at ages 55-64 years ranges from 45%, and at ages 65-74 years it ranges from 51.9%, and at ages >75 years it ranges from 54, 8% (Syarifuddin, Taiyeb, & Caronge. 2019).

Prevalence of gout arthritis in Indonesia in 2018 was around 11.9%, with Aceh at 18.3%, West Java at 17.5%, and Papua at 15.4%. Based on the symptoms of gouty arthritis in East Nusa Tenggara as much as 33.1%, as well as West Java as much as 32.1%, and Bali also as much as 30%

(Juraschek et al., 2021; Lindawati R. Yasin, Rona Febriyona and Andi Nur Aina Sudirman, 2023).

WHO states that around two-thirds of the estimated 1 billion people with hypertension, namely around 972 million (26%) adults in the world, are in developing countries. The prevalence of adults with hypertension aged ≥ 25 years is around 38.4%. This figure is expected to increase further in 2025 (Susanti, et al, 2020). The results of Basic Health Research (2018) show that the prevalence of hypertension in Indonesia has increased to 34.1% based on blood pressure measurements in people aged 18 years and over. Meanwhile, hypertension sufferers in East Java Province in 2020 were 35.60% or 3,919,489 people(Kementrian Kesehatan RI, 2019).

Factors that cause recurrence of hypertension are divided into 2 groups, namely factors that cannot be modified/cannot be changed, including gender, age, genetics. Other factors that can be modified are diet, exercise habits, sleep patterns, stress, and so on. However, these risk factors do not necessarily cause hypertension. It requires the role of other risk factors together (common underlying risk factors) to cause a recurrence of hypertension (Rajagukguk et al., 2021).

The influence between uric acid levels and blood pressure is not yet clear, although most studies show a reduction in blood pressure in patients treated with uric acid lowering drugs. Research in several countries proves that there is a significant relationship between increasing uric acid levels and increasing blood pressure. Research in Indonesia also shows the same trend (Ali et al., 2019; Borghi et al., 2022; Szydlik et al., 2023).

Based on this background, the researcher intends to conduct research with the title "The Effect of Consuming a High Purine Diet on Increasing Uric Acid Levels and Blood Pressure in the Elderly in Kediri Regency".

METHODS

The research method used was observational analytics with a cross sectional design. The number of subjects obtained was 140 elderly people using systematic random sampling techniques. Data collection was carried out in September 2023. The population in this study was all 250 elderly people who visited the Kediri Regency Health Center in 1 month. The number of samples was calculated based on population proportions using the Slovin formula, resulting in a sample of 154

Data were collected using High Purine Diet Consumption using Food Frequency observation sheets to determine respondents' eating patterns over the last 1 week. Respondents were categorized as consuming a high purine diet if the respondent consumed lung, liver, meat broth every day, and/or 3-6 times per week, and if the respondent also consumed beef, tuna, chicken, tofu, tempeh, spinach, kangkong, seeds. melinjo, fried foods, coconut oil and coconut milk every day. Respondents were categorized as not consuming high purine diets if they did not consume these menu items (lungs, liver, meat broth, beef, tuna, chicken, tofu, tempeh, spinach, kangkong, melinjo seeds, fried foods, coconut oil and coconut milk) within 1 week .

Data on blood pressure and uric acid levels were obtained from direct examination results during the research. Blood pressure is checked using a calibrated digital sphygmomanometer. To measure uric acid levels, respondents used the Easy Touch GCU Meter Device which had been calibrated. Next, the data was analyzed using a linear regression test for data that met the assumption test. This research has received Etical Clearance Certificate Number 000954/EC/KEPK/II/04/2024.

RESULTS

Diskripsi Responden

Table 1: Baseline characteristics of the Responden

	Respondent	
	n	%
Age (Years)	67,26±13,674	
Gender		
Male	46	34,03%
Female	88	65,07%
Diit Purin		
High purine diet	91	66,4%
Low Purine Diet	43	31,4%
Systolic Blood Pressure	147,2±100,00	
Diastolic Blood Pressure	85,08 ±40,00	
Uric acid levels	7,00±10,6	

Based on the respondent characteristics data in Table 1, it was found that the average age of the respondents was 67.26 ± 13.674. Meanwhile, based on gender, there were 46 (34.03%) male respondents, 88 (65.07%) female respondents. For the characteristics of respondents based on a high purine diet, it was 91 (66.4%), and a low purine diet was 43 (31.4%). The average systolic blood pressure was 147.2 ± 100.00 mmHg and the highest

systolic blood pressure was 200 mmHg. The average diastolic blood pressure was 85.08 ± 40.00 mmHg, with the highest diastolic blood pressure being 100 mmHg. The average uric acid level of respondents was 7.00 ± 10.6 mg/dl and the highest value for respondents' uric acid level was 13.9 mg/dl.

Effect of a High Purine Diet on Uric Acid Levels in Elderly Patients

Table 2. Results of Statistical Analysis of High Purine Diets on Uric Acid Levels

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	60.618	1	60.618	19.796	.000[b]
	Residual	401.145	131	3.062		
	Total	461.763	132			

a. Dependent Variable: asam urat

b. Predictors: (Constant), diet puirin

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.581	.570		8.032	.000
	diet puirin	1.452	.326	.362	4.449	.000

a. Dependent Variable: asam urat

Data from linear regression analysis shows that there is a significant Sig (2-tailed) influence between high purine diet consumption and uric acid levels (DP-AU=0.000) with a value of $\alpha \leq 0.05$.

c. Effect of Uric Acid Levels on Systolic Blood Pressure in Elderly Patients

Table 3. Results of Statistical Analysis of Uric Acid Levels on Systolic Blood Pressure

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2005.842	1	2005.842	4.913	.028[b]
	Residual	53892.307	132	408.275		
	Total	55898.149	133			

a. Dependent Variable: TS

b. Predictors: (Constant), AU

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	132.774	6.742		19.693	.000
	AU	2.061	.930	.189	2.217	.028

a. Dependent Variable: TS

From the results of linear regression analysis, there is a significant Sig (2-tailed) effect between uric acid levels and increased systolic blood pressure in the elderly (AU-TS=0.028) with a value of $\alpha \leq 0.05$.

Pengaruh Kadar Asam Urat terhadap Tekanan Darah Diastole pada Pasien Lansia
Table 4. Results of Statistical Analysis of Uric Acid Levels on Diastolic Blood Pressure

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	481.078	1	481.078	4.695	.032[b]
	Residual	13525.019	132	102.462		
	Total	14006.097	133			

a. Dependent Variable: TD

b. Predictors: (Constant), AU

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	78.013	3.378		23.097	.000
	AU	1.009	.466	.185	2.167	.032

a. Dependent Variable: TD

From the results of linear regression analysis, there is a significant Sig (2-tailed) effect between uric acid levels and increased diastolic blood pressure (AU-TD=0.032) with a value of $\alpha \leq 0.05$.

DISCUSSION

The results of this study showed that 91 (66.4%) of the respondents consumed a high purine diet, while the average uric acid level of the respondents was 7.00 ± 10.6 mg/dl, and the highest value of the uric acid level of the respondents was 13. .9 mg/dl. From the results of linear regression analysis, there is a significant Sig (2-tailed) influence between high purine diet consumption and uric acid levels (DP-AU=0.000) with a value of $\alpha \leq 0.05$.

Consuming foods high in purine can cause an increase in uric acid levels in the blood. It is suspected that one of the causes is due to excessive purine intake which causes the accumulation of purine crystals to build up in certain joints which can increase uric acid levels in the blood. Research shows that excessive purine intake contributes to increasing the occurrence of gout, and animal purines make a greater contribution to increasing uric acid compared to purines from plants. (Fitriani et al., 2021).

This research is in line with the opinion of Fitriani et al., 2021 that elderly respondents who consume a high purine diet such as eating offal (lungs, liver, meat broth every day, and/or 3-6 times per week, and respondents who consume beef, tuna, chicken, tofu, tempeh, spinach, kangkong, melinjo seeds, fried foods, coconut oil and coconut milk every day can increase uric acid levels in the blood. Apart from food consumption, uric acid levels can also occur due to lack of physical activity. In the elderly, due to lack of physical activity, it will cause a buildup

of lactic acid. An increase in lactic acid will cause a decrease in uric acid excreted by the kidneys, resulting in a buildup of uric acid in the blood. (Suntara, Alba and Hutagalung, 2022)

The results of this study showed that the average uric acid level of respondents was 7.00 ± 10.6 mg/dl, and the highest value was 13.9 mg/dl for 91 (66.4%). Meanwhile, the average systolic blood pressure was 147.2 ± 100.00 and the highest systolic blood pressure was 200 mmHg. The results of the linear regression statistical test showed a significant effect of Sig (2-tailed) between uric acid levels and Systolic Blood Pressure (AU-TS=0.028) with a value of $\alpha \leq 0.05$.

Increased uric acid levels are influenced by oxidative stress which will activate the renin-angiotensin system, resulting in endothelial dysfunction and vasoconstriction in peripheral blood vessels. This can trigger activity that increases blood pressure (Syawali and Ciptono, 2022).

High uric acid can cause hypertension through various mechanisms, including inflammation of the kidneys and endothelium, activation of the renin-angiotensin system, nitric oxide depletion, smooth muscle cell proliferation, superoxide formation, mitochondrial dysfunction, and activation of the polyol pathway. A direct and dose-dependent relationship between uric acid levels and increases in systolic and diastolic blood pressure is known (Agustira, Simbolon and Kusdalinah, 2023)

The results of this study showed that the average uric acid level of respondents was 7.00 ± 10.6 mg/dl, and the highest value was 13.9 mg/dl for 91 (66.4%). Meanwhile, the average diastolic blood pressure was 85.08 ± 40.00 mmHg, with the highest diastolic blood pressure being 100 mmHg. From the results of linear regression analysis, there is a significant effect of Sig (2-tailed) between uric acid levels and Diastolic Blood Pressure (AU-TD=0.032) with a value of $\alpha \leq 0.05$.

Research that supports the relationship between uric acid levels and blood pressure in the elderly explains that increasing uric acid levels in the blood can cause hypertension, which is related to the influence of uric acid levels on increasing oxidative stress and the renin-angiotensin Q system, which causes endothelial dysfunction and vasoconstriction. peripheral vessels, causing blood pressure to increase (hypertension). Increased uric acid levels result in endothelial dysfunction, increased ROS (Reactive Oxidative Stress) production and decreased NO (Nitric Oxide). Endothelial dysfunction results in renal vascular lesions and causes hypertension (Pualillin, Rampengan and Wantania, 2015; Ali et al., 2019).

The mechanism of the relationship between hypertension in humans and increased uric acid levels involves various pathophysiology. The inflammatory effect of uric acid deposition causes endothelial dysfunction and blood vessel damage (vascular gout) which can occur when acid levels exceed normal levels. Apart from that, it is caused by kidney blood vessel disorders caused by increased uric acid levels. In this study, the overall pathophysiology of the relationship between uric acid levels and hypertension is caused by increased oxidative stress which involves the production of uric acid (XOR, NADPH oxidase) (Borghi et al., 2022).

CONCLUSION

The conclusion obtained from the research results is that elderly people who consume a high purine diet can increase uric acid levels and increasing uric acid levels in the elderly can increase the occurrence of an increase in blood pressure, both systolic and diastolic blood pressure. So it is recommended for the elderly to reduce high purine diets in their daily food consumption so that it will be able to normalize uric acid levels in the blood and reduce blood pressure in the elderly.

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