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CORRELATION BETWEEN BODY MASS INDEX (BMI) AND URIC ACID LEVELS IN PRE-ELDERLY AGES IN SURABAYA

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ABSTRACT

Background: Uric acid is the result from the breakdown of purine compounds originating from exogenous (diet) and endogenous (results of nucleic acid catabolism). Hyperuricemia occurs when uric acid levels that exceed normal limits, which is caused by several factors, one of which is obesity. This study aimed to determine the correlation between Body Mass Index (BMI) and uric acid levels in the elderly aged 45-59 years in patients at the Pakis Health Center, Surabaya. **Objective:** To analyze the relationship between Body Mass Index (BMI) and uric acid levels in pre-eldery age. **Method:** This research uses a cross-sectional approach with consecutive sampling. The total number of respondents in the study was 76 people. This research uses secondary data from patient medical records. Data processing uses the Spearman correlation test. **Results:** The study found a significant correlation between groups with p-value of 0.004 ($p < 0.05$) and a correlation coefficient of 0.326. **Conclusion:** The research found the correlation between Body Mass Index (BMI) and uric acid levels in pre-elderly people aged 45-59 years in patients at the Pakis Health Center, Surabaya.

INTRODUCTION

According to data from the World Health Organization (WHO) in 2017, the global prevalence of uric acid reached 34.2%. In the United States, the prevalence of uric acid reached 26.3% of the total population. The increase in the incidence of uric acid is not only evident in developed countries but also in developing countries, including Indonesia (Fitriani et al., 2021). The 2018 Riskesdas results revealed that uric acid disease affected 24.7% of Indonesia's population. The condition was most prevalent in individuals aged 75 and older, with a prevalence rate of 54.8%. Moreover, women (8.46%) were more affected than men (6.13%). The prevalence of gout was 17% in eastern Java and notably higher in Surabaya, reaching 56.8% (Riskesdas, 2018). Uric acid is a waste product or breakdown of purine substances, which are components of nucleic acids found in the nuclei of body cells. There are two main sources of purine formation: purines that come from the food consumed (exogenous) and purines produced by the body (endogenous). Hyperuricemia occurs when the levels of uric acid in the blood exceed a certain threshold, which is more than 6.0 mg/dl in women and more than 7.0 mg/dl in men (Stewart et al., 2019).

According to data from the World Health Organization (WHO), the global obesity rate has doubled since 1980. As of 2014, more than 1.9 billion adults over the age of 18 were overweight, and more than 600 million people worldwide were obese (WHO, 2014). Obesity rates continue to increase significantly in developing countries, including Indonesia. In Indonesia, the incidence of obesity with a BMI > 25 was 28.7% in 2013, rising to 33.5% in 2016, while the incidence of obesity with a BMI > 27 was 15.4% in 2013, rising to 20.7% in 2016 (Sirkesnas, 2016). According to the East Java Health Service in 2018, 16% of the population in East Java, which is approximately 1,163,118 people, were affected by obesity (Dinkes Jatim, 2018).

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The Body Mass Index (BMI) is a simple way of measuring the ideal body weight concerning height, and it is commonly used to assess the risk of health problems and obesity. However, it is important to note that BMI is not appropriate for use with babies, children, teenagers under 18, pregnant women, and athletes. (Dien et al., 2014). Individuals with a high BMI may have elevated leptin levels, leading to leptin resistance. When this resistance happens in the kidneys, it can lead to urinary resistance. This stops uric acid from leaving the body through urine, which raises the level of uric acid in the blood (Panjaitan et al., 2017). Based on the description above, researchers are interested in conducting research entitled The Correlation Between Body Mass Index (BMI) and Uric Acid Levels in Pre-elderly People Aged 45-59 Years in Patients at the Pakis Health Center, Surabaya.

METHODS

This research uses correlation analytical methods to test whether there is a correlation between variables by collecting cross-sectional data. A cross-sectional approach is research carried out simultaneously or once at the same time (Adiputra et al., 2021). The data obtained from the patient's medical records was then processed using a computer application to analyze statistical data, namely the Statistical Program for Social or SPSS with version 29. Data processing in this study was a non-parametric associative test, the Spearman correlation test.

The population in the study were all pre-elderly patients who had their uric acid levels checked at the Pakis Health Center from January to December 2023, totaling 348 people. The Subjects were selected using the consecutive sampling method, namely subjects who met the inclusion criteria: patients aged 45-59 years, patients who had complete medical record data, namely name, age, weight, height, and medication history (except patients who took drugs that could decrease and increase uric acid levels) and there is also data regarding the patient's uric acid levels, all medical records have been approved for research. Exclusion criteria: patients with blood disorders, cancer, and hemodialysis patients. The number of samples in this study was 76 people obtained using the lameshow formula. In this study, the independent variable is body mass index, and the dependent variable is uric acid levels. This research uses secondary data, namely, patient medical records.

RESULTS

The research results in Table 1 show the characteristics of respondents, consisting of age, gender, body mass index, and uric acid. In this study, most respondents were aged 50–54 years, with 29 respondents (38.2% of the total respondents). Most the respondents were female, namely 54 people (51.1% of the total respondents). Most of the respondents had a normal BMI; 39 people (51.3% of the total respondents). Most the respondents had normal uric acid levels, namely 54 people (71.1% of the total respondents). Respondents with normal BMI and normal uric acid levels were 33 people (61.1%). Respondents with a high BMI and normal uric acid levels were 20 people (37.0%). Respondents with a normal BMI and high uric acid levels were six (18.8%). Respondents with a high BMI and high uric acid levels were 16 people (50.0%).

Based on analysis using the Spearman correlation test, a p-value of 0.004 was obtained, meaning there was a correlation between BMI and uric acid levels in pre-elderly aged 45-59 years in Pakis Health Center patients. In the correlation coefficient column, a value of 0.326 was obtained, which means that the level of correlation between BMI and uric acid levels in pre-elderly aged 45-59 years at the Pakis Health Center is low.

Table 1. Sample Characteristics

Characteristics	Frequency	Percentage (%)
Age		
45-49	19	25,0
50-54	29	38,2
55-59	28	36,8
Gender		
Female	54	71,1
Male	22	28,9
Body Mass Index		
Low	1	1,3
Normal	39	51,3
high	36	47,4
Uric acid levels		
Low	0	0
Normal	54	71,1
high	22	28,9

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Table 2. Results of the Spearmen Correlation Test

Body Mass Index (BMI)	Uric Acid Level				Total	Correlation coefficient (r)	P value
	normal		high				
	n	%	n	%			
Low	1	1,9	0	0	1	0,326	0,004
Normal	33	61,1	6	18,8	39		
High	20	37,0	16	50,0	36		
Total	54	100	32	100	76		

DISCUSSION

This study shows that most respondents were aged 50-54 years, with 29 respondents (38.2%); this research aligns with research carried out by Faqih et al. (2023), which states a correlation between age and uric acid levels. According to Theodore Fields, a professor and expert in joint diseases, the older a person is, the greater the risk of gout. This is because, with increasing age, kidney function tends to decrease, which can cause an increase in uric acid levels in the body (Karuniawati, 2018).

The research results showed that the majority were female, namely 54 respondents (71.1%). This research aligns with research by Rini (2017), which shows that uric acid levels are higher in female respondents than in men. Based on theory, men generally have higher uric acid levels than women. However, in women who experience the menopause phase, uric acid levels will increase (Firdayanti et al., 2019). Most of the respondents were over 50 years old. At that age, women have experienced menopause, which is marked by a decrease in estrogen hormone levels. This hormone plays a role in increasing uric acid excretion, so if estrogen levels decrease, it can cause an increase in uric acid levels (Yuliartik et al., 2022).

The research showed that most respondents had a normal BMI, namely 39 people (51.3%). As we grow older, the need for carbohydrate and fat nutrients is generally lower due to a decrease in basal metabolism. A decreased metabolic process in old age will be at risk of causing obesity because there is a decrease in physical activity, so excess calories will be converted into fat, resulting in obesity. Peak weight gain occurs in women aged 55-65 years and men aged 34-54 years (Rahayu et al., 2020). Several factors influence obesity apart from age, namely gender, genetics, diet, and also a person's physical activity (Dewi & Aisyah, 2021).

The research showed that the majority of respondents had normal uric acid levels, namely 54 people (71.1%). In this study, more respondents had normal BMI, so in this study, more respondents had normal uric acid levels compared to hyperuricemia. People with a normal BMI tend to have lower uric acid levels compared to people with a higher BMI. BMI is a measurement used to evaluate body proportions based on weight and height. Normal BMI ranges from 18.5 to 25. A normal BMI level is often associated with a healthy lifestyle, including a good diet by paying attention to the type, amount, and timing of meals and adequate physical activity (Ramadhania et al., 2024).

Based on the results of this research, it was found that there is a correlation between body mass index (BMI) and uric acid levels. The results of the bivariate analysis show a p-value of 0.004, so it can be concluded that there is a correlation between BMI and uric acid levels in pre-elderly aged 45-59 years in patients at the Pakis Health Center, Surabaya. Apart from that, from the results of the correlation coefficient, a value of 0.326 was obtained, which shows that the level of correlation between BMI and uric acid levels in pre-elderly aged 45-59 years at Pakis Health Center is low.

The results of this research are in line with several similar studies that have been conducted previously. Soputra et al. (2018) showed that the prevalence of hyperuricemia in the obese group was higher than in the group of individuals who were not obese, with an OR of 3.278 stating that individuals with obesity were at 3.278 times greater risk of experiencing hyperuricemia than the non-obese group. This can be caused by high uric acid levels in individuals with an overweight or obese BMI because individuals who are overweight tend to have high-fat stores. Someone who is overweight generally has the habit of eating too much compared to their body's

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needs. This diet may also contain excessive purine intake, besides carbohydrates, protein, and fat (Wulandari et al., 2022).

Hyperuricemia can occur due to increased consumption of foods containing many purines and disturbances in uric acid excretion. One factor that can influence uric acid excretion is leptin resistance. Leptin resistance generally occurs in individuals who are obese. When BMI increases, leptin levels in the body also increase. Leptin is a helical protein secreted by adipose tissue. Leptin plays a role in stimulating sympathetic nerves, increasing insulin sensitivity, natriuresis, diuresis, and angiogenesis. This increase in leptin levels is associated with increased uric acid levels in the blood. This is caused by interference in uric acid reabsorption in the kidneys. If leptin resistance occurs in the kidneys, diuresis disorders can occur in urinary retention. Urinary retention causes a decrease in the body's ability to excrete uric acid through urine, thereby causing an increase in uric acid levels in the blood of individuals who are obese (Lubis & Lestari, 2020).

The limitation of this research was that the latest data collection mechanism in each elderly posyandu cadre encountered obstacles because the existing data was the latest data depending on the completeness of the secondary data obtained from the health centre.

CONCLUSION

The results of this study show that there is a correlation between Body Mass Index and uric acid levels in pre-elderly patients in Surabaya with the strength of the correlation between variables being low.

ETHICAL APPROVAL

The Health Research Ethics Committee of the Faculty of Medicine, Wijaya Kusuma University, Surabaya, has permitted this research to be carried out with certificate number 71/SLE/FK/UWKS/2023.

CONFLICTS OF INTEREST

The author declares that there is no conflict of interest in this research.

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AUTHOR CONTRIBUTIONS

NPW: sampling, data collection, data analysis and methodology. WDP: coresponding the manuscript, validation, writing and review. S: Writing, reviewing and revising the manuscript.

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