

Analysis of uric acid and blood glucose levels on the lifestyle of the population in Lebosari village, Kangkung district

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ABSTRACT

Cardiovascular disease (CVD) is a significant global health problem, including in Indonesia. Modifiable CVD risk factors, such as unhealthy lifestyles, play an essential role in the development of this disease. This study aims to analyze the relationship between lifestyle and uric acid and blood glucose levels in the Lebosari Village community, Kangkung district, to understand CVD risk factors at the Lebosari Village level. This study adopted a descriptive observational approach to comprehensively describe the profile of uric acid levels in the population studied. Through direct observation of the examination results, this study aims to accurately show the prevalence and distribution of uric acid levels in the field. From the activities that have been carried out, the results of uric acid examinations in the Lebosari village community, Kangkung district, showed that out of 50 samples, there was 1 male with normal uric acid levels in women, 39 normal, 4 had gout, and 4 had high blood sugar levels.

Keywords:

Blood sugar; Lebosari; Uric acid.

Introduction

Since ancient times, high levels of uric acid have often been associated with excessive diet and high alcohol consumption. In humans, about two-thirds of uric acid is excreted through the kidneys, while the other third is excreted through the digestive tract. An increase or decrease in the body's ability to excrete uric acid can cause the accumulation of uric acid levels in the blood to exceed the normal solubility threshold. When this happens, monosodium urate (MSU) crystal formation will occur more rapidly, especially in and around the joints. The accumulation of MSU crystals can irritate joint tissue and trigger an inflammatory reaction. As a result, the immune system responds by creating inflammation, known as a gout attack, characterized by pain, swelling, and redness in the affected area. This process repeats when MSU crystals release and activate an immune response (Roman, 2023).

Uric acid is a weak acid produced as an end product of purine metabolism, which forms important biological particles such as DNA, RNA, ATP, GTP, c-AMP, and NADH (Skoczyńska et al., 2020). Most uric acid (UA) is naturally produced by the body and is derived from the breakdown of nucleic acids and the biosynthesis of new purines. It is estimated that the body produces about 500-600 mg of endogenous purines daily, while purines obtained from food (exogenous purines) range from 100-200 mg per day. Foods rich in purines include organ meats (such as liver and kidney), anchovies, nuts, sardines, yeast, and beer. Although fructose-rich products do not contain purines directly, fructose consumption can increase blood uric acid levels by accelerating the breakdown of adenosine triphosphate (ATP).

Interestingly, human uric acid catabolism differs from most other mammalian species. In humans, UA is the end product of purine metabolism. In contrast, most other mammals produce the enzyme uricase that breaks down UA to allantoin, a more soluble compound that is more easily excreted in the urine. One emerging hypothesis assumes that the gene encoding uricase was lost during evolution to help maintain the higher blood pressure required to support the upright human posture (Desideri, 2014).

Hyperglycemia and carbohydrate, fat, and protein metabolism disorders affect various body organs, disrupting their normal functions gradually. These disorders are mainly due to the negative impact of hyperglycemia and related metabolic disorders on the structure and function of micro and macro blood vessels, which form the core of the structure and function of organs throughout the body. These disorders cause structural and functional damage to various organ systems, ultimately leading to organ damage, dysfunction, and failure. These complications affect several vital organs, including the eyes, kidneys, heart, and nerves. In the eyes, complications can cause retinopathy, leading to blindness. In the kidneys, complications can cause nephropathy and the risk of kidney failure. Complications in the heart include hypertension and coronary heart disease, while nerve complications cause neuropathy, both autonomic and peripheral (Banday et al., 2020).

Diabetes, with its increasing global prevalence, is now one of the most significant health challenges facing the world's population. The increase in diabetes cases in various parts of the world is closely related to rapid economic development, which has triggered urbanization and the adoption of a modern lifestyle (Blas, 2010). In 2019, the number of people with diabetes among adults aged 20-79 years was estimated to reach around 463 million, or 9.3% of the global adult population. This figure is projected to increase to 578 million in 2030, equivalent to 10.2% of the world's adult population, and continue to grow to 700 million in 2045, which will cover 10.9% of the global adult population (Saedi et al., 2019).

Methods

Place and Time

The uric acid and blood sugar check activity was carried out on July 15, 2024, at the Raharjo village Hall, Kungkung district.

Research Design

The research design used in this activity is descriptive observational, aiming to describe the results of uric acid and blood sugar level examinations based on data obtained from direct observation.

Results and Discussions

Analysis of data from examination of uric acid and blood sugar levels in the Lebosari village area, Kungkung district, Kendal regency in Figure 1.



Figure 1. (a) Health check-up of Lebosari Village residents and (b) blood sampling to check uric acid and blood sugar levels.

Based on Gender, Female

Based on Table 1, the examination results show the characteristics of uric acid and blood sugar, where 40 people (80%) have normal uric acid levels, 40 people (80%) have gout, and 6 people (12%) have high blood sugar. After conducting uric acid and blood sugar examinations on the people of Lebosari Village, Kangkung District, with a total of 50 samples, the following results were obtained: in the male gender 3 people, 1 person has normal uric acid levels, while 2 people have gout. For the female gender, 39 people have normal uric acid levels, 4 have gout, and 4 have high blood sugar levels. Uric acid is the end product of purine metabolism in humans. Serum urate levels vary between species, with humans having the highest urate levels compared to other mammals. High uric acid levels in humans are caused by the loss of uricase enzyme activity during the Neogene era (Roman, 2023). This complex metabolic disorder is characterized by hyperglycemia, an abnormal physiological condition with persistently elevated blood glucose levels. Hyperglycemia occurs due to disturbances in insulin secretion, function, or both. This condition chronically and variably affects carbohydrate, fat, and protein metabolism. Diabetes follows a progressive development with complicated pathogenesis and varied symptoms (Banday et al., 2020).

Table 1. Results of Uric Acid and Blood Sugar Examination in the Lebosari Village Population

No	Check up result	Amount	Presentation (%)
1.	Normal	40	80
2.	Blood sugar	4	8
3.	Uric Acid	6	12
	Amount	50	100

Based on the Age of the Population of Lebosari Village

Table 2 shows the distribution based on age group, where the majority consists of individuals aged 41-50 years, as many as 12 people (24%). Then, the age group of 31-40 years and over 50 years each consists of 38 people, with a percentage of 76%.

Table 2. Results Based on Age Groups in Lebosari Village

No	Age (Years)	Amount	Presentation (%)
1.	41-50	12	24%
2.	>50	38	76%
	Total	50	100%

Based on the Gender Population of Lebosari Village

The results in Table 3 show characteristics based on gender with a total of 50 people (100%). Most patients were female, totaling 47 people (94%), while male patients were only 3 people (6%). Routine screening for this condition in patients with hyperuricemia can help determine preventive interventions, early diagnosis, and appropriate treatment. Uric acid levels can also serve as an essential prognostic tool in the clinical monitoring of chronic kidney disease, heart failure, and cardiovascular disease progression, as well as a predictor of mortality in these disorders. Prevention of diabetes and gout can be done through a healthy lifestyle. For diabetes, maintaining a balanced diet by reducing the consumption of foods high in sugar and fat, exercising regularly, controlling weight, and monitoring blood sugar levels regularly is very important. Avoid smoking and excessive alcohol consumption, and do early detection of risk factors such as high blood pressure and cholesterol.

Meanwhile, limiting the consumption of foods high in purines, such as red meat, seafood, and offal, is essential to prevent gout. Drink plenty of water to help remove uric acid from the body, and avoid alcoholic and high-fructose drinks. Regular exercise and maintaining ideal body weight also help reduce the risk of gout. Uric acid-lowering therapy (ULT) may need to be given to patients with chronic kidney disease, diabetes, cardiovascular disease, heart failure, or a history of cardiovascular disease to reduce mortality associated with high cardiovascular risk. However, there is currently no international consensus on managing hyperuricemia in these patients. Further studies on the long-term effects of ULT in patients with high cardiovascular risk are needed to draw more definitive conclusions (Skoczyńska et al., 2020).

Table 3. Results by Gender

No	Age (Years)	Amount	Presentation (%)
1.	Woman	47	94%
2.	Man	3	6%
Total		50	100%

Conclusion

Examination in Lebosari Village showed that most women had normal uric acid levels, while some experienced gout and high blood sugar. In men, gout cases were fewer. Uric acid results from purine metabolism, which in humans is very high due to the loss of the enzyme uricase, and diabetes is a metabolic disorder that causes hyperglycemia. Prevention of both conditions involves a healthy lifestyle, including a balanced diet, regular exercise, weight management, and avoiding risk factors such as alcohol consumption, high-sugar foods, and purines.

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