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Identifying Purine Intake Among People with Gout and Its Relationship with Uric Acid Level: A Cross-Sectional Study

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ABSTRACT Gout was still one of the top chronic diseases suffered by the community, that was characterised by elevated uric acid levels. This condition is closely related to healthy lifestyle behaviour, especially highly purine food intake. However, there were only a few studies that discovered a relationship between purine intake with uric acid levels. This study aims to identify purine intake among people with gout and its relationship with uric acid levels. This study used a correlational design with a cross-sectional approach. The population was the community in village "x" who suffered from gout (70 people). From them, 66 people were selected as participants who met the inclusion criteria through a purposive sampling method. The instrument used was a questionnaire for the variable of purine intake, whereas the variable of uric acid level was measured with a GCU meter. The results showed that there was a positive correlation between purine intake with uric acid levels (p = 0,000; r = 0,567). The increasing level of uric acid occurred in the participants who had high purine intake. It was necessary to reduce or limit daily purine intake among people with gout by giving health education and health campaign against gout.

INDEX TERMS purine intake, uric acid levels, hyperuricemia.

I. INTRODUCTION

Gout is one of the top chronic diseases in society that needs primary concern [1]. It regarding to highly incidence per year [2], multiple complications, decreasing quality of life, as well as its potential impact on economic status [3]. The prevalence of gout has increased globally as well as nationally. The prevalence of gout globally in 2020 reached 55.8 million people worldwide [1,2]. This data shows an increase of 22.5% compared to 1990 [3,4]. The prevalence was predicted to increase up to 95.8 million people in 2050 [3,4]. Meanwhile, the prevalence of gout in Indonesia from 2022 to 2023 reached 3.21% [5]. This condition has been increasing over the last decades [5]. Its proportion has experienced increasing rates across all provinces in Indonesia, including in East Java that reaching 12.16% cases with a proportion of men at 24.3% and women at 11.7% (RISKESDAS, 2018). The preliminary study conducted in village "X" in Genteng-Banyuwangi found that 44 people of 120 people (36%) experienced increased uric acid levels with several complaints, including pain and joint inflammation.

Gout is the accumulation of monosodium urate (MSU) crystals in the joints and soft tissues, starting with hyperuricemia (high levels of uric acid in the blood) [7,10]. If the uric acid level in the blood is too high (hyperuricemia), uric acid will crystallise and settle in the joints, causing inflammation and pain, namely gout [35]. The previous studies found that the majority of patients with gout have experienced joint inflammation with severe pain [18,19]. The multiple complications that appear if not treated properly include permanent joint impairment, tophi formation (hard lumps), kidney stones, and impaired kidney function [6,7,10]. In addition, gout can also lead to sleep disorders, chronic pain, and even heart problems [18,19]. Gout also impacts decreasing quality of life among patients and their economic status [2]. Reported that younger patients or their family members had retired or lost their jobs because of gout, and 40% of them missed ≥5 days of work due to symptoms in the last 12 months [18,19].

The process of gout begins with the consumption of purine substances from food, which are then broken down by the body into uric acid [7,10]. This theory was supported by the result of previous studies that a high incidence of gout is

closely associated with unhealthy lifestyle behaviour [7], including consuming purine-rich food [8,9]. The studies proved that the incidence of gout occurs in the majority of respondents who consume purine-rich foods [10,11]. Other studies also proved that there was a relationship between consuming rich-purine with uric acid levels [12,13]. However, this study did not reveal how high the purine levels in food can stimulate an increase in uric acid levels and how long consuming that so can lead to these effects appearing. The theory reveals that consuming foods containing purine more than 200 mg per 100 grams of purines (seafoods) could toward developing gout [14,15]. It also explains that excessive consumption of low-purine foods, including spinach, tempeh, as well as tofu, is also more potentially to increase uric acid levels [18,19,20]. But other theories reported that low-purine food is generally safe for people with gout [21], and has no correlation with developing gout [16,17]. Meanwhile, the consumption of coffee at a moderate level could also be beneficial in reducing uric acid levels [22].

Related to the differences in findings from previous studies regarding the level of purine content in food, daily consumption patterns, as well as its potential impact on increasing uric acid levels, leads the researcher to initiate the study about identifying purine intake among people with gout and its potential impact on uric acid levels. This study aims to identify purine- food intake among people with gout and its potential impact on uric acid levels.

II. METHODS

This study design is an analytic correlational study with a cross-sectional approach. The aim is to identify purine intake among people with gout and its relationship with uric acid levels. The population is people with gout in village "x", with a total is 70 people. The sample involved 66 respondents who had met the inclusion criteria and were taken using purposive sampling techniques. The inclusion criteria include having gout for at least the last year, adults (20 years old or more), no history of complications (heart, hypertension, kidney failure) and willing to be participants.

The instrument of purine intake variable used a self-administered questionnaire that consisted of six closed questions with indicators including purine sources (animal protein, vegetables, drinks), the process of cooking, and the amount of consumption per day. The questions use closed-ended answer choices is yes or no. The result is classified into normal, low purine, and high purine. The questionnaire has been passed for validity and reliability (p-value <0.05; Cronbach's Alpha value> 0.60). The variable of uric acid levels is measured using the Easy Touch GCU Meter Device. The result is categorised into low, normal, and high levels. In men, normal uric acid levels are 2.5–7.0 mg/dL, low levels if below 2.5 mg/dL, and high levels if above 7.0 mg/dL. Whereas in women, normal uric acid levels are 1.5–6.0 mg/dL, low if below 1.5 mg/dL, and high if above 6.0 mg/dL.

The statistical tests using frequency distribution to determine of each variable, and using rank-spearman to analyse the correlation between two variables (purine intake and uric acid levels). This study has also been approved for ethical clearance to ensure the confidentiality and security of data, as well as the accuracy of research procedures with the registration number: 283/03/KEPK-STIKESBWI/VII/2024.

This study procedure consists of four stages, namely identification of respondents (according to inclusion criteria), explanation of the purpose and objectives of the study, data collection (using questionnaires and uric acid measurements using a GCU meter) as well as data analysis (univariate and bivariate).

III. RESULTS

A. FREQUENCY DISTRIBUTION OF INDEPENDENT AND DEPENDENT VARIABLES

TABLE 1
Frequency Distribution of Independent and Dependent Variables

Variables	Category	f	%
Purine intake	Normal	23	34,8
	Poor	11	16,7
	High	32	48,5
Uric acid level	Normal	19	28,8
	Low	3	4,5
	High	44	66,7

TABLE 1 shows that the majority of participants consume high-purine foods (48,5%), whereas only a few consume low-purine foods (16,7%). This indicates that mostly purine consumption patterns among participants are unhealthy, and only a few participants understand the impact of purines on their body health. Meanwhile, based on uric acid levels, the majority of participants have high levels of uric acid (66.7%), while only a few participants have low levels of uric acid (4,5%). This indicates that high levels of uric acid are a sign of a problem with uric acid metabolism in the body, which can occur due to excess intake or impaired excretion.

B. THE RELATIONSHIP BETWEEN PURINE INTAKE WITH URIC ACID LEVELS

TABLE 2
The Relationship Between Purine Intake with Elevated Uric Acid Level

Purine Intake	Uric Acid Level						p-value; r
	Low		Normal		High		
	f	%	f	%	f	%	
Normal	3	4,5	9	13,6	**11**	**16,7**	0,000; 0,567
Low	0	0	10	15,2	**1**	**1,5**	
High	0	0	0	0	**32**	**48,5**	
n	3	4,5	19	28,8	**44**	**66,7**	

TABLE 2 shows that there is a relationship between purine intake with uric acid levels (p=0.000; r=0.567). The majority of participants who have high purine intake also have high uric acid levels (48.5%), whereas only a few participants with low purine intake also have low uric acid levels (1.5%). This indicates that there is a positive correlation between purine intake with uric acid levels. The enhancing consume of high purine intake could lead to elevated uric acid levels among patients with gout. The sources of high purine intake are especially found in offal, red meat, seafood, as well as a daily intake that is more than the normal baseline (less than 1000 mg per day).

IV. DISCUSSION

The result proves that there is a positive correlation between purine intake with uric acid levels. This indicates that the higher level of purine intake is the higher level of uric acid. This is proven by the study result that the majority of participants who consume foods with containing a high level of purines show high levels of uric acid. Whereas, the participants who consume low or normal levels of purine show lower or normal levels of uric acid.

The results of this study are consistent with the previous studies that there is a positive correlation between purine-rich food intake and elevated uric acid levels [17,23,24], the previous studies also prove that participants who are habitually consuming a high- purine is has more higher level of uric acid than other participants who consume foods with low purine levels [25,26]. The previous studies also proved that participants who have high level of purine are also have a history of consuming foods high in purines more than baseline per day [46,47]. The types of purines consumed are offal, seafood, nuts, spinach, sticky rice, cassava, and sweet potatoes. Whereas, there are a few participants who have high uric acid levels are only consume high-purine foods under a tolerance baseline, even the other have no history of consuming foods containing high purines, but have a high level of uric acid [20,21,22].

Hyperuricemia is a condition where elevated uric acid in the blood exceeds the normal borderline [36,37]. This can be caused by three factors, including increased uric acid production, decreased uric acid excretion by the kidneys, or a combination of both [38,39,40]. Uric acid itself is a product of purine metabolism in the body [41,42]. Purines are produced in both the body (endogenous purines) and in some foods and drinks as exogenous purines [26,13]. Our bodies naturally produce purines, which are part of the body's cells known as endogenous purines [43,44]. While exogenous purines are sources of purines that are derived from food, including offal (liver, kidney, brain), red meat, seafood (shrimp, shellfish, sardines), alcoholic beverages, and some types of vegetables (spinach, broccoli, cauliflower) [13,45].

Whereas, several previous studies showed different results that increased uric acid levels are not directly related to the consumption of high-purine foods [21,22], several participants who have high uric acid levels were not found to have a history of consuming high purine-foods [27,28], or the participants who consume high purin foods shows normal level of uric acid [48,49].

The difference in findings between the results of this study with the previous studies is based on sample conditions (number and characteristics). This study used a relatively small sample and was in one community (cluster/one village) and a relatively using short period (less than one year). In these conditions, the tendency for high homogeneity, meaning that respondents (patients with gout) like to consume high-purine foods, could be due to trends or habits acquired due to community (people like to consume high-purine foods) or from themselves because of their hobbies. Whereas in some previous studies using a relatively large number of samples, from various communities, and a relatively long period (cohort method) that the correlation level is more specific [48,49]. This can be identified from how long uric acid levels have been high and how long respondents have been consuming high-purine foods, which came first, or both occurred simultaneously [46,47].

Several previous studies using cohort methods revealed that initially the incidence of gout (hyperuricemia) that manifested by high uric acid levels due to consumption of high purine foods (types of offal, seafood) routinely or continuously [29,30], but after some time the purine consumption pattern stopped or was reduced, but uric acid levels remained high [31,32,33]. While in this study, data collection for both variables was carried out simultaneously, so that to avoid comparisons, further study is needed to identify more deeply the pattern of consumption of high purine foods (how long consumption, the reasons for consuming the food: is it purely individual, is there any influence from the environment).

V. CONCLUSION

There is a significant correlation between purine intake with uric acid levels (p = 0,000; r = 0,567). The increasing level of uric acid occurred in the participants who had high purine intake. Whereas, the participants who get low purine intake show a normal or low level of uric acid.

VI. ACKNOWLEDGMENT

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