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URIC ACID LEVELS BY GENDER IN THE COMMUNITY

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ABSTRACT

Uric acid is a metabolic health condition with a rising global prevalence and the potential to cause complications such as gout, arthritis, kidney disorders, and cardiovascular diseases. Sex is recognized as a key biological determinant influencing uric acid levels; however, community-based evidence in North Sulawesi remains limited. This study aimed to analyze and compare uric acid levels based on sex among community residents. A descriptive correlational study with a cross-sectional design was conducted among 226 respondents aged 40–50 years, selected purposively in Sarongsong 2 Village. Uric acid levels were measured using the Easy Touch 3-in-1 device after fasting. Descriptive statistics were used for univariate analysis, while differences between groups were assessed using the Mann–Whitney U test. The findings revealed that most male participants were hyperuricemic (51%), whereas most females were normouricemic (67.74%). The mean uric acid level in males ($\bar{x}$ = 8.258; SD = 10.13975) was higher than in females ($\bar{x}$ = 7.0460; SD = 10.05560). Statistical analysis showed a significant difference in uric acid levels between sexes ($p < 0.001$). In conclusion, uric acid levels differ significantly by sex, with males exhibiting higher levels than females. These findings highlight the importance of sex-specific approaches in community-based prevention strategies. Future research should incorporate lifestyle-related risk factors and include postmenopausal women to better capture hormonal influences across the lifespan.

KEYWORDS: Ages, Blood Glucose, Cholesterol, Uric Acid

ABSTRAK

Asam urat merupakan salah satu masalah kesehatan metabolik yang prevalensinya terus meningkat dan berpotensi menimbulkan komplikasi seperti gout arthritis, gangguan ginjal, serta penyakit kardiovaskular. Jenis kelamin diketahui sebagai faktor biologis yang memengaruhi kadar asam urat, namun data berbasis komunitas di Sulawesi Utara masih terbatas. Penelitian ini bertujuan untuk menganalisis dan membandingkan nilai kadar asam urat berdasarkan jenis kelamin pada masyarakat Kelurahan Sarongsong 2. Penelitian ini menggunakan desain descriptive correlation dengan pendekatan cross-sectional. Sampel berjumlah 226 responden usia 40–50 tahun yang dipilih melalui purposive sampling. Pengukuran kadar asam urat dilakukan menggunakan alat Easy Touch 3-in-1 setelah responden berpuasa. Analisis univariat menggunakan frekuensi, persentase, mean, dan standar deviasi. Analisis bivariat dilakukan menggunakan Mann-Whitney U test. Hasil menunjukkan sebagian besar laki-laki berada pada kategori hiperurisemia (51%), sedangkan perempuan mayoritas berada pada kategori normourisemia (67,74%). Rerata kadar asam urat laki-laki (x=8.258; SD=10.13975) lebih tinggi dibandingkan perempuan (x=7.0460; SD=10.05560). Uji Mann-Whitney menunjukkan terdapat perbedaan yang signifikan antara kadar asam urat berdasarkan jenis kelamin (p=0,000). Berdasarkan hasil, dapat disimpulkan bahwa terdapat perbedaan signifikan kadar asam urat antara laki-laki dan perempuan, di mana laki-laki cenderung memiliki kadar lebih tinggi. Direkomendasikan pada penelitian selanjutnya untuk mengkaji faktor risiko gaya hidup dan memasukkan perempuan menopause untuk analisis yang lebih komprehensif.

INTRODUCTION

Gout is a metabolic health condition that is becoming increasingly common in the general population. Hyperuricemia occurs when blood uric acid levels exceed normal limits, which over time can lead to

gouty arthritis, kidney disease, and other metabolic complications (Du et al., 2024; Yanai et al., 2021). Changes in dietary habits, consumption of purine-rich foods, lack of physical activity, and modern lifestyles contribute to the rising incidence of gout (Kakutani-Hatayama et al., 2017; Shvabskaia et al., 2022). At community, many people are unaware of their high uric acid levels because they often do not cause symptoms in the early stages (Fiori et al., 2024). Therefore, regular monitoring of uric acid levels is important for early detection and prevention of complications.

Globally, the prevalence of gout and hyperuricemia has continued to rise over the past few decades. Data from the World Health Organization indicate that noncommunicable diseases, including metabolic disorders such as gout, are a major contributor to the global disease burden. The number of global gout cases rose to approximately 55–56 million people in 2020, with a prevalence increase of about 20–23% since 1990 (Cross et al., 2024). In Indonesia, the prevalence of this condition is approximately 7.3% based on clinical diagnosis, while it reaches 24.7% based on self-reported symptoms in the general population (Dehlin et al., 2020). In North Sulawesi Province, relatively high consumption of seafood and meat is believed to contribute to cases of hyperuricemia, although specific data on uric acid levels by gender at the community level remain limited (Astawan et al., 2020).

Blood uric acid levels are influenced by various factors, including gender. Physiologically, men tend to have higher uric acid levels than women. This is related to the role of the hormone estrogen in women, which helps increase the excretion of uric acid through the kidneys (Wang & Charchar, 2021; Yahyaoui et al., 2008). After menopause, estrogen levels decline, increasing the risk of elevated uric acid levels in women (Chang et al., 2021; Ciarambino et al., 2022). Thus, biological differences between men and women are an important factor to consider when analyzing uric acid levels in the general population.

When broken down by gender, men are generally more prone to hyperuricemia from young adulthood through middle age, while in women, the risk increases after menopause (Liu et al., 2011). In addition to hormonal factors, lifestyle differences such as alcohol consumption, a diet high in purines, and smoking, which is more common among men, can also affect uric acid levels. In women, hormonal changes, the use of certain contraceptives, and metabolic conditions such as obesity also play a role (He et al., 2022; Teramura et al., 2023). Therefore, analyzing uric acid levels by gender is important not only from a biological standpoint but also from a behavioral and social perspective.

Several previous studies have shown significant differences in uric acid levels between men and women, both in clinical and community populations. However, most of these studies have focused on patients diagnosed with gout or specific age groups (Koo et al., 2021; Zitt et al., 2020). There remains a limited body of research specifically evaluating uric acid levels by gender in the general population, particularly in North Sulawesi. This study offers novelty compared to previous research in several aspects. It was conducted on a community-based general population in North Sulawesi, a group that has been rarely reported in the literature, as most previous studies have focused primarily on clinical populations or patients diagnosed with gout. This study also specifically analyzes differences in uric acid levels by gender in the 40–50 age group, thereby providing a more focused picture of the community's productive age group. This study not only assesses biological differences but also considers local contexts, such as dietary patterns and lifestyles, thereby generating more contextually relevant data for the development of community-level promotive and preventive interventions. Thus, this study makes a new contribution by providing region-specific community-based epidemiological data and strengthening our understanding of sex-based differences in uric acid levels in the general population.

Based on the above discussion, this study was conducted to analyze and compare uric acid levels by gender in the general population. Specifically, this study is expected to identify differences in average uric acid levels between men and women and to provide a scientific basis for community-level promotive and preventive efforts.

MATERIALS AND METHODS

This study employs a descriptive correlation design with a cross-sectional approach. It examines the relationship between the independent and dependent variables. The independent variable in this study is gender, and the dependent variable is uric acid levels.

The sampling technique used was purposive sampling. The inclusion criteria for respondents were residents of Sarongsong 2 Village, aged 40–50 years, willing to participate by signing an informed consent form, and willing to have their uric acid levels measured. The exclusion criteria were residents of Sarongsong 2 Subdistrict who did not live at the study site, were unwilling to participate, were unable to perform activities independently, consumed alcoholic beverages, took uric acid-lowering medications, suffered from chronic kidney disease, hypertension, or type 2 diabetes mellitus, and postmenopausal women. Postmenopausal women were excluded from this study to control for hormonal variables, particularly the effect of estrogen on uric acid excretion. By excluding the postmenopausal group, this study aims to obtain a more homogeneous comparison of uric acid levels between men and women under relatively stable hormonal conditions. To determine the sample size, the researcher used the Slovin formula, yielding a sample of 226 respondents.

Data collection took place from December 2023 to April 2024. Uric acid levels were measured using an Easy Touch 3-in-1 uric acid meter, along with lancets and a lancet pen for drawing blood samples. Respondents' uric acid levels were categorized by gender. For men, the low category (hypouricemia) was defined as uric acid levels <3.4 mg/dL, the normal category (normouricemia) as 3.4–7.0 mg/dL, and the high category as >7.0 mg/dL. For women, the low category (hypouricemia) was defined as uric acid levels <2.4 mg/dL, the normal category (normouricemia) as 2.4–6.0 mg/dL, and the high category as >6.0 mg/dL. Blood samples were collected after the researchers contacted participants 1 day prior to sampling, as participants were required to fast to ensure more accurate results.

Data analysis was performed using the Statistical Package for the Social Sciences (SPSS) software. For the univariate analysis of uric acid levels in the Sarongsong 2 subdistrict community, frequency, percentage, mean, and standard deviation were calculated. For the bivariate analysis, a Kolmogorov-Smirnov test was first conducted to assess data normality, as the sample size exceeded 50. After analyzing the variables of gender and uric acid levels, the results were found to be non-normally distributed and significant, with p-values of 0.000 for both variables. This was followed by a bivariate analysis using the Mann-Whitney U test.

RESULT

Following the data analysis, the results for the gender distribution and uric acid levels of the population in Sarongsong 2 Village are presented in Table 1.

Table 1. Analysis of Uric Acid Levels by Gender

Gender	Gout Category	Frequency	Percentage	Mean	SD
Man	Hypouricemia	0	0	8.2580	10.13975
	Normouricemia	49	49%		
	Hyperuricemia	51	51%		
	Total	100	100		
Woman	Hypouricemia	0	0	7.0460	10.05560
	Normouricemia	84	67.74		
	Hyperuricemia	42	32.26		
	Total	126	100		

Table 1 presents the results of a descriptive analysis of uric acid levels among residents of Sarongsong 2 Village by gender. The analysis results indicate that the majority of male participants fall into the hyperuricemia category (51 participants, 51%), while among women, the majority fall into the

normouricemia category (84 participants, 67.74%). When comparing mean uric acid levels between men and women, men had higher levels (x = 8.258, SD = 10.13975) than women (x = 7.0460, SD = 10.05560). The standard deviation in this study was relatively large, indicating significant variation in uric acid levels among respondents. This is likely due to heterogeneity in respondent characteristics within the community setting, including differences in dietary patterns, physical activity, and metabolic conditions that were not fully controlled for in this study. Additionally, the presence of outliers in some respondents may also contribute to the increased standard deviation. This variation reflects real-world conditions in the community; however, it also poses a limitation in data interpretation due to the wide distribution of values.

To determine whether there was a significant difference in uric acid levels between the two genders, a Mann-Whitney U test was conducted after a normality test indicated that the data were not normally distributed. The results of the analysis are shown in Table 2.

Table 2. Comparative Analysis of Uric Acid Levels by Gender

Analysis	Result
Mann-Whitney U	2536.000
Wilcoxon W	10537.000
Z	-7.714
Asymp. Sig. (2-tailed)	.000

The results of the analysis in Table 2 show that there is a significant difference in uric acid levels between men and women. This significance is demonstrated by the results of the Mann-Whitney U test, with a p-value of 0.000. The significant difference is further supported by the data in Table 1, which indicates that men tend to have higher levels than women.

DISCUSSION

The results of this study indicate a significant difference in uric acid levels between men and women. Analysis of the mean uric acid levels shows that men have higher levels than women. These findings are consistent with various studies indicating that sex is an important biological determinant in the regulation of uric acid metabolism. Epidemiological, metabolomic, and hormonal intervention studies support the notion that sex is not merely a demographic variable but a key biological determinant in the production, excretion, and clinical impact of uric acid (Kuhns & Woodward, 2020; Wang & Charchar, 2021). Statistically, these significant mean differences reinforce the hypothesis that men at the community level are at higher risk of hyperuricemia compared to women.

Physiologically, higher uric acid levels in men are associated with hormonal factors. In women, the hormone estrogen increases uric acid excretion through the kidneys, thereby helping keep uric acid levels within normal limits. In contrast, men lack this hormonal protection, so they tend to have higher uric acid levels starting in young adulthood (Huang et al., 2020). In this study, female participants did not include those who had undergone menopause. This is important because after menopause, a decrease in estrogen levels occurs, which can increase the risk of hyperuricemia in women (Xiao & Liu, 2024). By excluding the postmenopausal group, the women's uric acid levels in this study remain relatively influenced by the protective effects of estrogen, making the differences compared to men more pronounced.

In addition to biological factors, behavioral and lifestyle factors at the community level further support these findings. Men are generally more frequently exposed to risk factors such as consumption of high-purine foods (red meat, organ meats, seafood), alcohol consumption, smoking, and uncontrolled eating patterns (Mustafa et al., 2025; Shvabskaia et al., 2022). In the context of the community in North Sulawesi Province, culinary traditions rich in seafood and processed meat, and the consumption of alcoholic beverages during various social and traditional activities, can predispose to increased uric

acid levels, particularly in men. In various social activities and traditional celebrations, men generally play a more dominant role in consuming these risky foods and beverages, resulting in greater exposure to risk factors.

Furthermore, the culture of masculinity in some communities can also influence men's health behaviors. Men tend to pay less attention to routine health checkups and are slower to seek medical help when symptoms appear. This can result in hyperuricemia going undetected in its early stages and persisting for a longer period (Smith & Hebdon, 2024). Within the community context, a lack of awareness regarding healthy lifestyles and low male participation in promotive-preventive programs further increase the likelihood of elevated uric acid levels.

Thus, the significant difference in uric acid levels between men and women in this study can be understood as the result of an interaction between biological and sociocultural factors. The exclusion of postmenopausal women from the study further underscores the physiological differences between the groups. Meanwhile, the traditions and lifestyles of the people of North Sulawesi, which do not support a healthy lifestyle, particularly among men, serve as contextual factors contributing to the high average uric acid levels in that group. These findings underscore the importance of gender-sensitive promotive and preventive approaches that account for local cultural contexts in efforts to control hyperuricemia at the community level.

CONCLUSIONS

After analysis, the results showed that the majority of residents in Sarongsong 2 subdistrict fell into the hyperuricemia category for men and the normouricemia category for women. Furthermore, the results showed a significant difference in uric acid levels by gender. Uric acid levels in men were higher than those in women. Future research should conduct a more comprehensive analysis of lifestyle risk factors, including high-purine dietary patterns, alcohol consumption, smoking habits, body mass index (BMI), and physical activity, to better understand the determinants of uric acid levels in the community. It is also recommended to include postmenopausal women to facilitate a more comprehensive comparison regarding the hormonal influence on uric acid levels.

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