J Prima Med Sains (2025) 7(1):29-33
doi.org/10.34012/jpms.v7i1.6809

ORIGINAL ARTICLE

Factors associated with uric acid levels in elderly: A cross-sectional study

Suryati Sinurat[1]*, Maestro Bina Utama Simanjuntak[1], Jekson Martiar Siahaan[2], Mangatas Halomoan Parluhutan Hutagalung[3], Agus Husein Daulay[1], Leonardo Tarigan[1], Ruth Wydia Wati Aritonang[1], Bob Agustinus Sembiring[1], Titus Imanuel Nababan[1], Ruth Septianna Br. Tampubolon[1], Yuda Monang Salamon[1], Nur Azizah Ainun[1], Serevina Nainggolan[1]

ABSTRACT

Sustained elevated blood uric acid levels can lead to gout, a chronic inflammatory disease characterized by the deposition of uric acid crystals in the joints. Factors contributing to hyperuricemia include insufficient knowledge of risk factors and management, consumption of high-purine diets, and inadequate uric acid monitoring. Overweight and obesity are also frequently associated with increased uric acid production and reduced renal excretion. The aging process contributes to declining renal function, essential for uric acid elimination. This observational analytic cross-sectional study investigated the relationships between knowledge, nutritional status, and physical activity with blood uric acid levels in 30 elderly individuals at Hamparan Perak Health Center from March 5-19, 2025. Data were collected via questionnaires and analyzed using Chi-Square or Fisher Exact tests. The majority of respondents were female (73.3%) and aged 60-69 years (63.3%). Most had poor knowledge (56.7%) and high uric acid levels (63.3%). A significant relationship was found between knowledge (p=0.002) and nutritional status (p=0.000) with blood uric acid levels. However, no significant relationship was observed between physical activity levels and uric acid levels (p=0.125).

Keywords: physical activity, uric acid, elderly, knowledge, nutritional status

INTRODUCTION

Sustained elevations in blood uric acid levels can lead to gout, a condition characterized by the deposition of uric acid crystals in the joints.[1] Gout is a prevalent chronic inflammatory disease, with the 2017 Global Burden of Disease (GBD) data reporting 41.2 million cases worldwide. In Indonesia, the prevalence of gout reaches 11.9% of the total population.[2] Specifically, in North Sumatra, the 2018 Basic Health Research (RISKESDAS) survey indicated that 25.4% of older adults experienced joint diseases, including gout.[3] Furthermore, data from Deli Serdang Regency in 2018 revealed 174,686 cases of gouty arthritis, with a substantial proportion occurring among pre-elderly individuals (49.5% aged 45–59 years) and older adults (45.3% aged >60 years). Notably, women over 50 years old appeared to be more susceptible to this condition.[4] At Hamparan Perak Health Center (Puskesmas) alone, from July 2024 to February 2025, there were 531 recorded cases of joint problems.[5]

Hyperuricemia, defined as blood uric acid levels above the normal range, can be attributed to various factors.[6] Insufficient knowledge regarding gout risk factors and management may contribute to the consumption of diets high in purines and inadequate monitoring of uric acid levels, ultimately leading to elevated levels.[7] Additionally, overweight and obesity are frequently associated with increased uric acid production and reduced renal capacity for its excretion.[8,9] The aging process also contributes to a decline in renal function, which is essential for the elimination of uric acid from the body.[10]

Affiliation
[1]Faculty of Medicine, Universitas Methodist Indonesia, Medan, Indonesia
[2]Faculty of Medicine, Institut Kesehatan Deli Husada Deli Tua, Deli Serdang, Indonesia
[3]Faculty of Medicine, Dentistry, and Health Sciences, Universitas Prima Indonesia, Medan, Indonesia

Correspondence
dr.suryatisinurat@gmail.com

Physical activity also plays a crucial role. Low levels of physical activity can lead to obesity and metabolic disturbances that impact uric acid levels. Conversely, intense physical activity may also elevate uric acid levels due to increased lactic acid production, which inhibits renal uric acid excretion.[11,12] Most older adults tend to engage in light physical activity due to decreased flexibility and strength in their muscles and joints, thereby increasing their risk for metabolic diseases.[13–15] Given the complex interplay of factors influencing uric acid levels, this study aims to analyze the relationships between knowledge, nutritional status, and physical activity with blood uric acid levels in older adults at Hamparan Perak Health Center.

METHOD

This research was designed as an observational analytic study utilizing a cross-sectional approach. The investigation took place by gathering secondary data from the medical records of elderly patients who were registered at the Hamparan Perak Health Center. The data collection period spanned from March 5 to March 19, 2025. The study population consisted of secondary data pertaining to elderly individuals who were officially recorded at the health center.

To determine the sample, the researchers included only those elderly individuals whose data met specific inclusion criteria: they had to be over 60 years of age, have completed the informed consent process, and filled out the required questionnaire. Conversely, any data from individuals with incomplete questionnaires or a diagnosis of kidney disease were excluded from the sample. The sample size was calculated using an observational study formula tailored for a single population, which ultimately yielded a total of 30 participants.

Data collection was carried out through the use of questionnaires, ensuring that all relevant information was systematically gathered. For the analysis, the researchers employed the Chi-Square test to examine associations within the data. However, if the assumptions required for the Chi-Square test were not satisfied, the Fisher Exact test was used as an alternative to ensure the validity of the results.

RESULTS

Table 1 presents the demographic and health profiles of the 30 respondents included in the study. Regarding gender, the majority of the older adult participants were female, accounting for 22 individuals, or 73.3% of the total. Male participants numbered 8, making up 26.7% of the cohort. In terms of age distribution, the largest group fell within the 60-69 years age bracket, with 19 participants (63.3%). Following this, 10 participants (33.3%) were aged 70-79 years , and only one participant (3.3%) was over 80 years old. When examining employment status, a significant majority of the older adults were not working, totaling 21 individuals (70%). Conversely, 9 participants (30%) were employed. The knowledge assessment revealed that most respondents had less than good knowledge, with 17 individuals (56.7%) falling into this category. Those with good knowledge comprised 13 participants (43.3%).

Table 1. Older adults characteristic

Variable	Total (n= 30)	
	n	%
Gender		
Male	8	26,7
Female	22	73,3
Age		
60-69 years	19	63,3
70-79 years	10	33,3
> 80 years	1	3,3
Employment status		
Working	9	30
Not Working	21	70
Knowledge		
Good	13	43,3
Poor	17	56,7
Nutritional status		
Underweight	11	36,7
Normal	10	33,3
Overweight	9	30,0
Uric acid level		
Normal	11	36,7
High	19	63,3
Physical activity		
Light	11	36,7
Moderarte	15	50,0
Heavy	4	13,3

For nutritional status, the group with underweight status was the largest, comprising 11 individuals (36.7%). Participants with normal nutritional status numbered 10 (33.3%) , and 9 participants (30%) were classified as overweight. A notable finding regarding health status was the prevalence of high uric acid levels among the participants, affecting 19 individuals (63.3%). In contrast, 11 participants (36.7%) had normal uric acid levels.

Finally, for physical activity levels, the largest segment of older adults, 15 participants (50%), engaged in moderate physical activity. Participants with light physical activity numbered 11 (36.7%) , while only 4 participants (13.3%) engaged in heavy physical activity.

The data presented in Table 2, which examines the associations between knowledge, nutritional status, physical activity, and blood uric acid levels among older adults, reveal several key findings. A significant relationship was identified between knowledge and blood uric acid levels. Specifically, the majority of respondents with poor know-

ledge exhibited elevated uric acid levels, whereas a greater proportion of those with good knowledge maintained normal uric acid levels. Additionally, a significant association was observed between nutritional status and blood uric acid levels. Most respondents with normal or overweight nutritional status demonstrated high uric acid levels, while the majority of underweight respondents had normal uric acid levels.

Table 2. The association between knowledge, nutritional status, and physical activity and blood uric acid levels among older adults

Risk factors	Uric acid level						p
	Normal		High		Total		
	n	%	n	%	n	%	
Knowledge							
Good	9	69,2	4	30,8	13	100	0,002
Poor	2	11,8	15	88,2	17	100	
Nutritional status							
Underweight	9	81,8	2	18,2	11	100	0,000
Normal and overweight	2	10,5	17	89,5	19	100	
Physical activity							
Light	6	54,5	5	45,5	11	100	0,125
Moderate	5	26,3	14	73,7	19	100	
Heavy							

In contrast, no significant relationship was found between physical activity levels and blood uric acid levels. Although a majority of respondents engaging in moderate or vigorous physical activity had high uric acid levels, and more than half of those with light physical activity had normal uric acid levels, these differences were not statistically significant.

DISCUSSION

The study on uric acid levels found that most older adults had elevated uric acid levels. Individuals over 40 years of age are more susceptible to metabolic disturbances, including issues with the uricase enzyme, which is crucial for oxidizing uric acid into allantoin to facilitate excretion.[16] Regarding physical activity, the majority of older adults in this study engaged in moderate levels of activity, which is considered appropriate for their age. It is generally not recommended for older adults to engage in strenuous physical activity due to the natural decline in bodily functions associated with aging.[17]

The analysis revealed a significant association between knowledge and uric acid levels in older adults. This finding is consistent with previous research, which also reported a relationship between public knowledge about uric acid and gout prevention behaviors. The ability to recognize, understand, and obtain information regarding gouty arthritis contributes to increased public awareness of the importance of health maintenance.[18] Improved knowledge, particularly concerning gouty arthritis, can directly or indirectly motivate individuals to consistently adopt healthier lifestyles. Thus, a good understanding of and engagement in preventive behaviors against gouty arthritis are expected to reduce or even eliminate the presence of the disease in individuals' lives.[19]

Furthermore, a significant relationship was found between nutritional status and uric acid levels in older adults. This result aligns with Rahmasari et al.[20] study, which demonstrated a significant association between nutritional status and blood uric acid levels in older adults. Obesity is a primary risk factor for hyperuricemia, a condition characterized by excessive body fat accumulation. In obese individuals, elevated blood uric acid levels are generally attributed to higher body fat mass. Additionally, obesity is linked to an increased body surface area, which contributes to higher uric acid production compared to individuals with an underweight nutritional status.[21–23]

However, no significant relationship was observed between physical activity and uric acid levels in older adults. This finding is consistent with previous studies by Fitriana & Fayasari[24] and Purnasari et al.[25], which also showed no significant association between physical activity and uric acid levels in older adults. Older adults typically reduce their physical activity as they age. This suggests that other factors may have a greater influence on uric acid levels than physical activity, such as a high-purine diet. This could explain a potential bias in the study, as it is possible that older adults with light physical activity levels frequently consume high-purine foods, leading to higher uric acid levels than expected. Conversely, high uric acid levels in older adults engaged in heavy physical activity can be attributed to increased lactic acid production, as uric acid excretion decreases when lactic acid levels rise.[26]

This study has several limitations. Firstly, the small sample size of 30 individuals restricts the generalizability of the findings to a broader older adult population. Secondly, the cross-sectional design provides only a snapshot of the relationships at a single point in time, thereby precluding the establishment of cause-and-effect relationships. For future research, it is recommended to employ a longitudinal design to explore causal relationships between the investigated factors and uric acid levels in older adults. Additionally, studies with larger sample sizes and involving multiple health centers could enhance the generalizability of the findings. Qualitative research could also provide in-depth insights into the perceptions and experiences of older adults regarding gout and its management.

CONCLUSION

There is a significant relationship between knowledge and nutritional status with uric acid levels in older adults. However, physical activity levels do not show a significant association with uric acid levels in older adults at the Hamparan Perak Health Center. The findings suggest a critical need for targeted health education programs for older adults at the Hamparan Perak Health Center. These programs should emphasize the importance of understanding gout, maintaining healthy nutritional status, and adopting lifestyle modifications to manage uric acid levels. Such interventions are expected to help prevent gout complications and improve the overall quality of life for older adults.

REFERENCES

1. Danve A, Neogi T. Rising Global Burden of Gout: Time to Act. Arthritis Rheumatol. 2020 Nov 17;72(11):1786–8.
2. Kyu HH, Abate D, Abate KH, Abay SM, Abbafati C, Abbasi N, et al. Global, regional, and national disability-adjusted life-years (DALYs) for 359 diseases and injuries and healthy life expectancy (HALE) for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. Lancet. 2018 Nov 10;392(10159):1859–922.
3. Kementerian Kesehatan Republik Indonesia. Riset Kesehatan Dasar 2018 (2018 Basic Health Research). Jakarta; 2018.
4. Dinas Kesehatan Kabupaten Deli Serdang. Profil Kesehatan Kabupaten Deli Serdang Tahun 2018. Lubuk Pakam; 2019.
5. Puskesmas Hamparan Perak. Laporan Rutin Puskesmas Hamparan Perak. Lubuk Pakam; 2025.
6. George C, Leslie SW, Minter DA. Hyperuricemia. Treasure Island (FL): StatPearls Publishing; 2023.
7. Hainer BL, Matheson E, Wilkes RT. Diagnosis, treatment, and prevention of gout. Am Fam Physician. 2014 Dec 15;90(12):831–6.
8. Cheang C, Law S, Ren J, Chan W, Wang C, Dong Z. Prevalence of hyperuricemia in patients with severe obesity and the relationship between serum uric acid and severe obesity: A decade retrospective cross-section study in Chinese adults. Front Public Heal. 2022 Aug 26;10.
9. AlAteeq MA, Almaneea A, Althaqeb EK, Aljarallah MF, Alsaleh AE, Alrasheed MA. Uric Acid Levels in Overweight and Obese Children, and Their Correlation With Metabolic Risk Factors. Cureus. 2024 Sep 25;16(9).
10. Weinstein JR, Anderson S. The Aging Kidney: Physiological Changes. Adv Chronic Kidney Dis. 2010 Jul;17(4):302–7.
11. Muhlisoh, Hasaini A, Sukmawaty M. How Much BMI and Physical Activity Level Induce Elevated Uric Acid? Indones J Glob Heal Res. 2023 Apr 20;5(2).
12. Hou Y, Ma R, Gao S, Kaudimba KK, Yan H, Liu T, et al. The Effect of Low and Moderate Exercise on Hyperuricemia: Protocol for a Randomized Controlled Study. Front Endocrinol (Lausanne). 2021 Sep 2;12.
13. Bouchard C, Blair SN, Katzmarzyk PT. Less Sitting, More Physical Activity, or Higher Fitness? Mayo Clin Proc. 2015 Nov;90(11):1533–40.
14. Wickramarachchi B, Torabi MR, Perera B. Effects of Physical Activity on Physical Fitness and Functional Ability in Older Adults. Gerontol Geriatr Med. 2023 Jan 23;9.
15. Hallal PC, Andersen LB, Bull FC, Guthold R, Haskell W, Ekelund U. Global physical activity levels: surveillance progress, pitfalls, and prospects. Lancet. 2012 Jul;380(9838):247–57.
16. Agatha NWMR. Hubungan Usia dan Jenis Kelamin Terhadap Kadar Asam Urat pada Masyarakat di Desa Abang, Kecamatan Abang, Kabupaten Karangasem. Poltekkes Kemenkes Denpasar; 2022.
17. World Health Organization. WHO Guidelines on Physical Activity and Sedentary Behaviour. Geneva: World Health Organization; 2020.
18. Ningsih TH, Yuniartika W. The Effect of Health Education about Low Purine Diet through Video Media on the Level of Knowledge of Gout Patients. Indones J Glob Heal Res. 2024 Oct 9;6(5).
19. Hao X, Wang A. The Status Quo and Influencing Factors of Self-Management Behavior in Patients with Recurrent Gout in China: A Cross-Sectional Study. Patient Prefer Adherence. 2025 Jun;19:1793–806.
20. Rahmasari NC, Briawan D, Dewi M. Correlation of menopausal status, nutritional status, and uric acid level in Indonesian women. J Gizi dan Diet Indones. 2024 Nov 30;12(6):397.
21. Liu Y, Zhao W, Liu X, Jiang H, Wu Y, Luo L, et al. Identifying reliable obesity indices for hyperuricemia among middle-aged and elderly populations: a longitudinal study. Lipids Health Dis. 2024 Sep 26;23(1):305.
22. Aune D, Norat T, Vatten LJ. Body mass index and the risk of gout: a systematic review and dose–response meta-analysis of prospective studies. Eur J Nutr. 2014 Dec 11;53(8):1591–601.
23. Juraschek SP, Miller ER, Gelber AC. Body mass index, obesity, and prevalent gout in the United States in 1988–1994 and 2007–2010. Arthritis Care Res (Hoboken). 2013 Jan 27;65(1):127–32.

24. Fitriana GG, Fayasari A. Pola Konsumsi Sumber Purin, Aktivitas Fisik, dan Status Gizi dengan Kadar Asam Urat Pada Lansia di Puskesmas Kecamatan Makasar Jakarta. J Gizi dan Pangan Soedirman. 2020;4(1).
25. Purnasari G, Setianingsih S, KR R. Faktor -Faktor yang Berhubungan dengan Kadar Asam Urat pada Lansia di Posbindu Sedap Malam Desa Cikarawang. In: Seminar Nasional INAHCO (Indonesian Anemia & Health Conference) 2019. Jember: Politeknik Negeri Jember; 2019.
26. Natania N, Malinti E. Hubungan Aktivitas Fisik dengan Kadar Asam Urat di RW 13 Kampung Mokla, Kecamatan Parongpong. Klabat J Nurs. 2020 Oct 31;2(2):17.