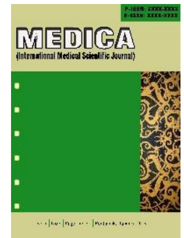
MEDICA

(International Medical Scientific Journal)
Vol.6, No.2, May 2024, pp. 70 – 75
ISSN 2622-660X (Online), ISSN 2622-6596 (Print)
https://journal.ahmareduc.or.id/index.php/medica



The Relationship Between Uric Acid Levels and Random Blood Glucose in the Elderly in Mas Village, Ubud Subdistrict, Gianyar Regency

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Info Article

Article History:
Received:
8 March 2024
Accepted:
10 April 2024
Published:
31 May 2024

Keywords:
Elderly
Uric Acid
Blood Glucose

Abstrak

Elderly individuals are those who have reached the age of 60 years and above. Older adults have a potential risk of increased uric acid and blood glucose levels due to the decline in organ function caused by aging cells. This study aims to determine the relationship between uric acid levels and random blood glucose in the elderly in Mas Village, Ubud Subdistrict, Gianyar Regency. This research is an analytical observational study with a cross-sectional design, involving independent and dependent variables collected simultaneously. The sample size consists of 32 respondents selected through purposive sampling based on inclusion and exclusion criteria. Uric acid and random blood glucose levels were measured using an Easy Touch device. The research results were analyzed using the chi-square correlation test, yielding a p-value of 0.454, which is greater than α (0.05). It can be concluded that there is no significant relationship between uric acid levels and random blood glucose levels in the elderly.

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1. INTRODUCTION

Elderly individuals are defined as those aged over 60 years. This age group is considered non-productive, during which individuals begin to experience a decline in organ function. This decline makes it difficult for older adults to maintain chemical and physical stability, or body homeostasis (Reswan, Alioes, & Rita, 2017). Disruptions in homeostasis lead to dysfunction in various organ systems and increase vulnerability to multiple diseases.

Blood glucose refers to the sugar present in the blood, formed from carbohydrates in food and stored as glycogen in the liver and skeletal muscles (Wulandari & Kurnianingsih, 2018). Glucose metabolism serves as a source of energy and as a precursor for nearly all types of biosynthetic reactions, particularly when cells cannot utilize other molecules for energy (Subiyono, Martsiningsih & Gabrela, 2016). In the elderly, disturbances in glucose regulation include three main issues: insulin resistance, loss of first-phase insulin release, and elevated postprandial blood glucose levels (Reswan, Alioes & Rita, 2017). Normal blood glucose levels range between 70 and 130 mg/dL.

The Indonesian Society of Endocrinology (PERKENI) emphasizes the importance of interpreting glucose levels from whole blood (capillary blood) samples. Glucose levels below 70 mg/dL are considered hypoglycemia, 70–139 mg/dL are considered normal, and levels above 139 mg/dL are categorized as hyperglycemia (PERKENI, 2021). Factors affecting blood glucose levels include age and sex (Yuniarti, Pradigdo & Rahfiludin, 2017). According to WHO, glucose levels increase by 1–2 mg/dL per decade of life after the age of thirty. With advancing age, the risk of elevated blood glucose and reduced glucose tolerance increases (Hartina, 2017). Sex also influences blood glucose levels, particularly due to changes in body fat composition in postmenopausal women, caused by declining estrogen and progesterone levels (Fakhruddin, 2017).

Uric acid is a diprotic acid and the final breakdown product of purine metabolism. High uric acid levels can lead to bone deformities and complications such as kidney disorders, heart disease, stroke, and type 2 diabetes mellitus. Older adults are more commonly affected by elevated uric acid levels, which in this age group tend to originate endogenously (Gustafsson & Unwin, 2023). This condition is associated with declining organ function and cell damage due to aging. According to WHO, the normal reference range for uric acid in the blood is 2.6–6 mg/dL for women and 3.5–7 mg/dL for men (Madyaningrum et al., 2020). Uric acid also functions as an extracellular antioxidant, scavenging reactive oxygen species (ROS) and hydroxyl radicals (OH). Several epidemiological studies indicate that uric acid is an independent risk factor for type 2 diabetes, with a 17% increased risk associated with elevated levels. Insulin may increase renal urate reabsorption and stimulate urate-anion exchange at the brush border membrane of the proximal renal tubules. During this process, uric acid levels rise along with increasing blood glucose levels when glycated hemoglobin (HbA1c) is below 7%, but decline when HbA1c exceeds 7%, indicating a relationship (Wardhana, & Rudijanto, 2018).

A survey conducted in Mas Village, Ubud Subdistrict, Gianyar Regency recorded 112 elderly individuals, with the majority being women (98) and 14 men. Some elderly individuals frequently consumed legumes and foods high in sugar and purines. There were also reports of elderly experiencing joint pain. This study aims to investigate the relationship between uric acid levels and random blood glucose in the elderly in Mas Village, Ubud Subdistrict, Gianyar Regency.

2. METHOD

This study employed a cross-sectional design. The sample consisted of 32 elderly individuals aged 60 years and above, selected using purposive sampling. Inclusion criteria included elderly participants in a healthy condition, without a history of gout or diabetes, not currently taking medications that affect uric acid or blood glucose levels, willing to participate in interviews and data collection, and consenting to capillary blood sampling. Uric acid and random blood glucose levels were measured using a Point-of-Care Testing (POCT) device. The data were categorized and analyzed using the Chi-Square statistical test.

POCT devices are widely used in clinical and community health settings due to their portability, rapid results, and minimal requirement for laboratory infrastructure. In this study, POCT allowed for immediate measurement of capillary uric acid and glucose levels, which is particularly advantageous in fieldwork with elderly populations in rural areas. These devices are considered reliable for screening and monitoring metabolic markers, although they are not a substitute for comprehensive laboratory diagnostics.

The Chi-Square test was chosen to analyze the relationship between categorical variables—namely, uric acid levels and random blood glucose levels. This statistical method is appropriate for identifying associations in non-parametric data, particularly when evaluating frequencies within predefined categories. It is important to note that while this approach can determine the presence of a relationship, it does not assess causality. Therefore, findings must be interpreted with caution, and further longitudinal or experimental studies may be needed to explore causal mechanisms.

3. RESULTS

Table 1. Characteristics of Elderly Participants by Age and Gender

Variable	Number of Respondents	Percentage (%)
Age Group		
60–74 years	24	75
75–90 years	8	25
>90 years	0	0
Total	32	100
Gender		
Male	12	37.5
Female	20	62.5
Total	32	100
Uric Acid Level (mg/dL)		
Low	0	0
Normal	14	43.7
High	18	56.2
Total	32	100

Table 1 shows that the majority of respondents were in the 60–74 age group (75%) and that most were female (62.5%). A majority of the elderly participants had high uric acid levels (56.2%).

Table 2. Uric Acid Levels by Age and Gender

Variable	Normal	High	Total
Age (Years)	n (%)	n (%)	n (%)
60–74	10 (31.2)	14 (43.7)	24 (75)
75–90	4 (12.5)	4 (12.5)	8 (25)
>90	0 (0)	0 (0)	0 (0)

Gender			
Male	7 (21.8)	5 (15.6)	12 (37.5)
Female	7 (21.8)	13 (40.6)	20 (62.5)

Table 2 indicates that the highest frequency of elevated uric acid levels was found in participants aged 60–74 years (43.7%).

Table 3. Random Blood Glucose Levels in Elderly Participants

Blood Glucose Level (mg/dL)	Number of Respondents	Percentage (%)
Low	0	0
Normal	25	78.1
High	7	21.9
Total	32	100

Table 3 shows that 21.9% of the elderly had high random blood glucose levels.

Table 4. Random Blood Glucose Levels by Age and Gender

Variable	Normal	High	Total
	n (%)	n (%)	n (%)
Age (Years)			
60–74	19 (59.4)	5 (15.6)	24 (75)
75–90	6 (18.7)	2 (6.2)	8 (25)
>90	0	0	0
Gender			
Male	6 (18.7)	6 (18.7)	12 (37.4)
Female	19 (59.3)	1 (3.1)	20 (62.4)

Table 4 shows that most cases of high blood glucose were found in the 60–74 age group (15.6%), followed by the 75–90 age group (6.2%). Gender-wise, normal blood glucose levels were observed in 6 males (18.7%) and 19 females (59.3%).

Table 5. Relationship Between Uric Acid and Random Blood Glucose Levels

Variable	Pearson Chi-Square
Uric Acid vs Blood Glucose	0.456

Table 5 indicates a p-value of 0.456, which is greater than 0.05, suggesting no significant relationship between uric acid levels and random blood glucose among the elderly in Mas Village.

DISCUSSION

The results presented in Table 1 are consistent with findings from Efendi and Natalya (2022), who reported that 52.2% of respondents experienced hyperuricemia, while 47.8% had normal uric acid levels. This condition is frequently associated with physiological changes related to aging, such as a reduced ability to excrete uric acid and increased consumption of purine-rich foods. Nasir (2017) also emphasized that elevated uric acid levels may be caused by both primary (genetic) and secondary factors, including comorbid conditions and dietary habits (Nasir, 2019).

The results in Table 2 may reflect declining metabolic efficiency with age, which affects the production of enzymes and hormones responsible for uric acid metabolism. For instance, the enzyme uricase plays a role in oxidizing uric acid to allantoin, a more soluble compound that is easier to excrete. However, with increasing age, the body's ability to produce allantoin diminishes, contributing to higher serum uric acid levels (Efendi & Natalya, 2022).

The study also found that hyperuricemia was more prevalent among female respondents (40.6%) compared to males. This may be due to hormonal changes associated with menopause, particularly the decline in estrogen levels, which reduces renal excretion of uric acid and subsequently increases serum concentrations (Efendi & Natalya, 2022).

The findings shown in Table 3 are in line with the study by Hayyumahdania Reswan et al. (2017), which reported that 14.81% of elderly residents in a social care institution had elevated blood glucose levels. Similarly, Rosyada and Trihandini (2013) found that 35.5% of elderly patients attending a public health clinic exhibited hyperglycemia. Contributing factors include age-related impairments in glucose metabolism, reduced physical activity, and changes in body composition.

Table 4 reinforces these findings, showing a comparable prevalence of high glucose levels across age groups. Reswan et al. (2017) reported that 16.7% of individuals aged 60–74 and 13.3% aged 75–90 had elevated glucose levels. Correspondingly, Rosyada and Trihandini (2013) found that 29.3% of participants aged 60–69 and 20.8% of those over 70 had high glucose levels. These data suggest that gender may not significantly influence glucose levels. However, Fakhruddin (2013) noted that hormonal changes during menopause could affect glucose metabolism due to alterations in body fat distribution.

The results presented in Table 5 are supported by Pertiwi et al. (2014), who reported no significant association between glucose and uric acid levels ($p = 0.48$). Conversely, Saktiningsih and Sulistyowati (2017) observed a statistically significant positive correlation ($p = 0.008$) between the two variables. These inconsistencies may reflect the complex and nonlinear relationship between serum uric acid and glucose, which can be influenced by various factors including research methodology, population characteristics, and confounding variables such as diet, physical activity, obesity, hormonal status, and family history.

Uric acid, as the final product of purine metabolism, exhibits dual biological roles. While it functions as an antioxidant that scavenges free radicals, elevated levels can exert deleterious effects by disrupting glucose homeostasis and insulin sensitivity through oxidative stress mechanisms. Insulin has been shown to enhance renal urate reabsorption, potentially increasing serum uric acid in hyperglycemic states. Moreover, high uric acid levels may stimulate reactive oxygen species (ROS) production via xanthine oxidase, interfere with insulin signaling pathways, and impair insulin secretion from pancreatic beta cells. These processes contribute to insulin resistance, chronic inflammation, and reduced insulin production, all of which are key mechanisms underlying the development of impaired glucose metabolism and type 2 diabetes (Wardhana & Rudijanto, 2018).

4. CONCLUSION

Based on the study of 32 elderly individuals in Mas Village, Ubud Subdistrict, Gianyar Regency, it can be concluded that there is no significant relationship between uric acid levels and random blood glucose levels ($p = 0.456 > 0.05$). Although some participants exhibited elevated levels of either variable, the statistical analysis did not reveal a meaningful correlation. Therefore, further research with a larger sample size and longitudinal design is recommended to better understand the potential relationship. Additionally, continuous health education regarding balanced diets and physical activity is essential to prevent metabolic complications such as hyperuricemia and diabetes, and regular screening using POCT devices should be implemented at the community level for early detection.

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