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RESEARCH ARTICLE

The Relationship Between Long-Term Type 2 Diabetes Mellitus (T2DM) and Uric Acid Levels in DM Patients at Klinik Iman

Fatimah Zahra[1], Des Suryani[2*]

[1]Medical Study Program, Faculty of Medicine and Health Sciences, University of Muhammadiyah Sumatera Utara, Medan, North Sumatra
[2]Department of Histology, Faculty of Medicine and Health Sciences, University of Muhammadiyah Sumatera Utara, Medan, North Sumatra

[*]**Corresponding Email:** dessuryani@umsu.ac.id

Abstract: Type 2 Diabetes Mellitus (T2DM) is a chronic metabolic disease associated with purine metabolism disorders that may lead to increased uric acid levels. The duration of the disease, along with blood sugar control and cholesterol levels, can worsen metabolic control and increase the risk of hyperuricemia. This study aimed to determine the relationship between the duration of T2DM and uric acid levels, as well as the influence of blood sugar and cholesterol levels on uric acid levels in T2DM patients. This study was conducted at Klinik Iman from September to October 2025. Data were collected from 32 respondents, including duration of T2DM, uric acid, blood sugar, and cholesterol levels. Data analysis was performed using the Kruskal-Wallis and Chi-Square tests according to data distribution. The results showed a significant relationship between the duration of T2DM and uric acid levels ($p < 0,05$). This relationship was also associated with blood sugar levels ($p < 0,05$). A significant relationship was found between the duration of T2DM and cholesterol levels ($p < 0,05$), as well as between cholesterol and uric acid levels ($p < 0,05$). Therefore, controlling blood sugar and cholesterol levels is important to prevent hyperuricemia in T2DM patients.

Key Words: *blood sugar levels, cholesterol levels, diabetes mellitus, duration of T2DM, uric acid levels*

INTRODUCTION

The WHO defines diabetes mellitus as a chronic metabolic disease or disorder with various underlying etiologies, characterized by elevated blood sugar levels and insufficient insulin function, including disorders of carbohydrate, lipid, and protein metabolism (1). The International Diabetes Federation (IDF) states that Indonesia ranks fifth among countries with the highest number of diabetes sufferers in the world, reaching 19.47 million in 2021 and estimated to reach 28.6 million in 2045. This figure is predicted to continue to

JURNAL IMPLEMENTA HUSADA

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increase in line with changes in lifestyle and diet among the population (2).

Type 2 diabetes is often associated with various complications, including lipid metabolism disorders that can affect uric acid levels in the body. Uric acid is the end product of purine metabolism, and an increase in uric acid levels in the blood (hyperuricemia) can cause various health problems, including kidney disease, hypertension, and cardiovascular disease (3).

In patients with type 2 diabetes, uric acid levels tend to increase due to the accumulation or buildup of ketones, which are byproducts of fat metabolism. When uric acid levels in the body are high, this can affect insulin resistance, which ultimately worsens glycemic control and increases the risk of diabetes complications. Additionally, uric acid is closely associated with lipid profiles, with several studies finding that hyperuricemia is linked to increased cholesterol levels. The positive correlation between cholesterol and uric acid levels and the risk of hyperuricemia in patients with type 2 diabetes, based on previous research, indicates that the two are reciprocally related through purine metabolism and fat metabolism pathways (4).

One of the main challenges in managing type 2 diabetes is the increased risk of complications associated with the duration of the disease. Research shows that type 2 diabetes patients with chronic hyperglycemia tend to have higher uric acid levels, which can worsen the patient's health condition (5). Various complications of type 2 diabetes are associated with hyperuricemia, with several studies explaining that complications of type 2 diabetes are more severe in patients who also have hyperuricemia, compared to type 2 diabetes with normouricemia (6).

Based on several previous studies, type 2 diabetes and uric acid levels are closely related and have a reciprocal relationship. However, there have not been many studies that specifically examine the relationship between the duration of type 2 DM and uric acid levels, especially in primary health care facilities such as clinics. Therefore, this study aims to fill this gap by examining the relationship between the duration of type 2 DM and uric acid levels in DM patients at the Klinik Iman.

METHOD

This study is an analytical observational study with a cross-sectional design that aims to analyze the relationship between the duration of type 2 diabetes mellitus (DM) and uric acid levels, as well as its relationship with cholesterol levels and blood sugar status in patients with type 2 DM.

The study was conducted at the Klinik Iman during the period of September–October 2025. The research subjects were type 2 DM patients who were treated during the study period and had been given prior information and instructions regarding the inclusion and exclusion criteria, including recommendations to avoid consuming foods high in purines for 24 hours and to fast for 8 hours before the examination.

The required sample size was 32 respondents based on the correlation sample size calculation. During the study period, there were 44 patients who met the inclusion criteria, but after selection based on the exclusion criteria, the number of subjects analyzed was 32 respondents.

The inclusion criteria included type 2 DM patients who had suffered from DM for at least 1 year, were aged 20–59 years, and were willing to participate. Exclusion criteria

JURNAL IMPLEMENTA HUSADA
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included a history of gout, chronic renal failure, pregnancy or breastfeeding, moderate to high-dose steroid use, chemotherapy, and certain comorbidities such as hematological cancer and psoriasis.

The data used is primary data. The duration of DM was obtained through a structured questionnaire, while uric acid levels, blood sugar levels, and total cholesterol were obtained through direct blood tests. Data analysis included normality tests, univariate analysis, and bivariate analysis. The Kruskal–Wallis test was used for non-normally distributed data, while the Chi-square test was used for categorical data with the Likelihood Ratio alternative test if the Chi-square assumption was not met (7).

RESULTS

This study has obtained permission and approval to conduct research from the Health Research Ethics Committee of the Faculty of Medicine and Health Sciences, University of Muhammadiyah North Sumatra, with the number: 1607/KEPK/FKUMSU/2025.

Table 1. Descriptive Analysis of Respondent Characteristics

Variable	Mean	SD	Minimum	Maximum
Age	52	7,898	23	59
Weight	60,88	6,6190	50,1	72,3
Height	161,59	6,786	145	173

Based on the results of descriptive analysis, it is known that the age of respondents in this study varied between 23 and 59 years, with an average age of 52 years. The average weight of the respondents in this study was 60.88 kg, ranging from 50.1 kg to 72.3 kg, while the average height was 161.59 cm, ranging from 145 cm to 173 cm.

Table 2. Analysis of Frequency Distribution of Respondent Characteristics

Variable		Frequency (N)	Percentage (%)
Gender	Male	14	44
	Female	18	56
BMI	Underweight	0	0
	Normal	15	46,9
	Overweight	7	21,9
	Obesity	10	31,2

Based on the results of the gender frequency distribution analysis, it was found that of the total 32 respondents, 14 respondents (44%) were male and 18 respondents (56%) were female. The results of the BMI frequency distribution analysis show that 15 respondents (46.9%) had a normal BMI, followed by 10 respondents (31.2%) in the obese category, 21.9% in the overweight category, and no respondents in the underweight category (0%).

Table 3. Data Distribution Analysis based on Duration of DM

Duration of DM	Frequency (N)	Percentage (%)
< 5 years	16	50
5 – 10 years	10	31
> 10 years	6	19
Total	**32**	**100**

Based on the results of the frequency distribution analysis, respondents who had suffered from DM for less than 5 years were the most numerous, with 16 respondents (50%), followed by those who had suffered from DM for 5–10 years, with 10 respondents (31%), and those who had suffered from DM for more than 10 years, with 6 respondents (19%).

Table 4. Data Distribution Analysis based on Blood Sugar Level Status

Blood Sugar Level Status	Frequency (N)	Percentage (%)
Controlled	16	50
Uncontrolled	16	50
Total	**32**	**100**

JURNAL IMPLEMENTA HUSADA

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Based on the analysis results, it was found that of all respondents, 16 respondents (50%) had controlled blood sugar levels and 16 other respondents (50%) were in the uncontrolled category.

Table 5. Data Distribution Analysis based on Cholesterol Levels

Cholesterol Levels	Frequency (N)	Percentage (%)
Normal	14	44
Borderline high	10	31
High	8	25
Total	**32**	**100**

Based on the results of the frequency distribution analysis, respondents with normal cholesterol levels were the most numerous, with 14 respondents (44%), followed by 10 respondents (31%) with borderline high cholesterol levels and 8 respondents (25%) with high cholesterol levels.

Table 6. Normality Test Results

Variable	Statistic (Shapiro-Wilk)	df	Sig.
Uric acid level	0.691	32	0.001

The Shapiro-Wilk test results show a significant value of $p = 0.001$ ($p < 0.05$), indicating that the distribution of uric acid levels is not normal and further analysis using non-parametric tests is required.

Table 7. Statistical Test Analysis of Duration of Diabetes Mellitus with Uric Acid Levels

Variable	Statistical Test	df	Asymp. Sig.
Duration of DM Uric acid level	Kruskal-Wallis	2	0.001

Based on the Kruskal–Wallis nonparametric test, a p-value of 0.001 ($p < 0.05$) was obtained, indicating a significant difference in uric acid levels between groups with long-term type 2 DM.

Table 8. Statistical Test of Duration of Diabetes Mellitus with Uric Acid Levels based on Blood Sugar Level Status

Variable	Statistical Test	df	Asymp. Sig.
Duration of DM Uric acid level Blood sugar level status	Kruskal-Wallis	2	0.001

Based on the Kruskal-Wallis nonparametric test, a p-value of 0.001 ($p < 0.05$) was obtained, indicating a significant difference in uric acid levels between the controlled and uncontrolled blood sugar level.

Table 9. Statistical Test of Analysis of Duration of Diabetes Mellitus with Uric Acid Levels based on Gender

Gender	Variable 1	Variable 2	Statistical Test	Asymp. Sig
Male	Duration of DM	Uric acid level	Kruskal-Wallis	0.015
Female	Duration of DM	Uric acid level		0.004

Based on the results of the Kruskal–Wallis test analysis, there were significant differences in uric acid levels ($p < 0.05$) between groups with long-term DM in men ($p = 0.015$) and women ($p = 0.004$).

Table 10. Statistical Test of Duration of Diabetes Mellitus with Uric Acid Levels based on BMI

BMI	Variable 1	Variable 2	Statistical Test	Asymp. Sig
Normal	Duration of DM	Uric acid level	Kruskal-Wallis	0.007
Over-weight	Duration of DM	Uric acid level		0.053
Obesity	Duration of DM	Uric acid level		0.037

The Kruskal–Wallis test analysis showed that in the normal BMI group, the p-value was 0.007 ($p < 0.05$), indicating a significant difference in uric acid levels based on the duration of DM. In the overweight group, the p-value was 0.053 ($0 > 0.05$), indicating no significant difference even

JURNAL IMPLEMENTA HUSADA

E-ISSN :2722-0877

though the value was close to the significance threshold. Meanwhile, in the obese group, the p-value was 0.037 ($p < 0.05$), meaning that there was a significant difference in uric acid levels based on the duration of DM. Overall, these results conclude that the correlation between the duration of DM and uric acid levels was significant in the normal BMI and obese groups, but not in the overweight BMI group.

Table 11. Statistical Test Analysis of Duration of Diabetes Mellitus with Cholesterol Levels

Variable	Pearson Chi-Square	Likelihood Ratio	Linear-by-Linear Association
Duration of DM Cholesterol level	0.046[a]	0.013	0.005

a: 7 cells (77.8%) have expected count less than 5. The minimum expected count is 1.50.

The Pearson Chi-Square test cannot be used because 77.8% of cells have an expected count <5. Therefore, the analysis uses Likelihood Ratio, where the results show a significant relationship ($p = 0.013$), as does the Linear-by-Linear Association test, which is also significant ($p = 0.005$). Thus, there is a significant relationship between the duration of DM and total cholesterol levels ($p < 0.05$).

Table 12. Statistical Test Analysis of Duration of Diabetes Mellitus with Cholesterol Levels based on Gender

Gender	Pearson Chi-Square	Likelihood Ratio	Linear-by-Linear Association
Male	0.339[a]	0.179	0.168
Female	0.006[b]	0.001	0.007

a: 9 cells (100.0%) have expected count less than 5. The minimum expected count is 0.43.
b: 9 cells (100.0%) have expected count less than 5. The minimum expected count is 0.83.

The Chi-Square analysis indicates that Pearson Chi-Square does not meet the assumption criteria because all cells have an expected count <5. Therefore, interpretation was performed using the Likelihood Ratio ($p = 0.179$) and Linear-by-Linear Association ($p = 0.168$), both of which showed that there was no significant relationship between the duration of DM and cholesterol levels in male respondents ($p > 0.05$). Meanwhile, in female respondents, Pearson Chi-Square also did not meet the assumption criteria. Alternative analysis using Likelihood Ratio showed significant results ($p = 0.001$), as did Linear-by-Linear Association ($p = 0.007$). Thus, there was a significant relationship between the duration of DM and cholesterol levels in female respondents ($p < 0.05$).

Table 13. Statistical Test Analysis of Duration of Diabetes Mellitus with Cholesterol Levels based on BMI

BMI	Pearson Chi-Square	Likelihood Ratio	Linear-by-Linear Association
Normal	0.269[a]	0.243	0.124
Overweight	0.646[b]	0.576	0.386
Obesity	0.153[c]	0.076	1

a: 5 cells (83.3%) have expected count less than 5. The minimum expected count is 0.33.
b: 6 cells (100.0%) have expected count less than 5. The minimum expected count is 0.29.
c: 6 cells (100.0%) have expected count less than 5. The minimum expected count is 0.40.

In the group with normal BMI, the Pearson Chi-Square test did not meet the assumptions because 83.3% of cells had an expected count <5. Therefore, interpretation was performed using the Likelihood Ratio ($p = 0.243$) and Linear-by-Linear Association ($p = 0.124$). Both indicate that there is no significant relationship between the duration of DM and cholesterol levels in respondents with normal BMI ($p > 0.05$). In the overweight BMI group, all cells had an expected count <5, so Pearson Chi-Square could not be used. Alternative analysis using Likelihood Ratio ($p = 0.576$) and Linear-by-Linear Association ($p = 0.386$) also showed no significant relationship between the duration of DM and cholesterol levels in the overweight group ($p > 0.05$). Meanwhile, in the obese BMI group, all cells also had an expected count <5, so Pearson Chi-Square was not valid.

JURNAL IMPLEMENTA HUSADA

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The Likelihood Ratio test yielded p = 0.076 and Linear-by-Linear Association p = 1.000. These results showed no significant relationship between the duration of DM and cholesterol levels in the obese group (p > 0.05).

Table 14. Statistical Test of Cholesterol Levels with Uric Acid Levels

Variable	Statistical Test	df	Asymp. Sig.
Cholesterol level Uric acid level	Kruskal-Wallis	2	0.026

Based on the results of the Kruskal–Wallis nonparametric test, an Asymp. Sig. value of 0.026 (p < 0.05) was obtained, which means that there is a significant difference in uric acid levels between the normal, borderline high, and high cholesterol groups. This indicates that cholesterol levels affect uric acid levels in patients with type 2 DM.

DISCUSSION

The results showed that the respondents' ages ranged from 23 to 59 years, with an average of 52 years. This finding is in line with data from the Indonesian Health Survey, which states that the prevalence of type 2 DM increases with age and peaks in the 45–54 age group (8).

The average weight of respondents was 60.88 kg, ranging from 50.1 to 72.3 kg, indicating a fairly wide anthropometric variation. These results are in line with previous studies reporting that type 2 DM patients in Indonesia generally weigh between 55 and 70 kg, with a tendency to be overweight (9).

The average height of respondents was 161.59 cm, ranging from 145 to 173 cm. This finding is consistent with previous studies of type 2 DM patients in primary health care facilities, which found that the average height of respondents was between 150 and 168 cm, which is very close to the results of this study (10).

The gender distribution showed that of the 32 respondents, 56% were female and 44% were male. These results are consistent with SKI data reporting a higher prevalence of type 2 DM in women (8).

The BMI distribution shows that 46.9% of respondents were in the normal category, 31.2% were obese, and 21.9% were overweight, with no underweight respondents. This pattern is consistent with national epidemiology, which shows a high proportion of overweight and obese adults (11).

Univariate analysis showed that most respondents (50%) had suffered from DM for less than 5 years, followed by 31% with a duration of 5–10 years and 19% for more than 10 years. This pattern is consistent with previous studies. Long-term DM is associated with poor glycemic control, increased insulin resistance, and progressive kidney damage that affects uric acid excretion (12).

A total of 50% of respondents had controlled blood sugar levels and 50% had uncontrolled levels. This balanced distribution allowed for a proportional comparative analysis. Uncontrolled blood sugar levels can trigger insulin resistance and decreased kidney function, which ultimately affects uric acid levels in the body (13).

The distribution of cholesterol levels showed that 44% of respondents were in the normal category, 31% were borderline high, and 25% were high. These findings are in line with previous studies on type 2 DM patients at Sanglah General Hospital in Denpasar, which reported that 42% of patients had hypercholesterolemia (14).

Bivariate analysis showed a significant difference in uric acid levels between DM

JURNAL IMPLEMENTA HUSADA
E-ISSN :2722-0877

duration groups (p = 0.001), with higher uric acid levels in the group with longer DM duration. These findings are consistent with previous studies stating that chronic hyperglycemia can increase uric acid production through progressive kidney damage and oxidative stress. Chronic insulin resistance also plays a role in increasing uric acid synthesis and inhibiting its excretion through the kidneys (15). Thus, it can be concluded that the risk of increased uric acid levels tends to increase with the duration of DM.

Significant differences in uric acid levels were also found between patients with controlled and uncontrolled blood sugar level (p = 0.001), with higher uric acid levels in the uncontrolled blood sugar level group. Chronic hyperglycemia can increase uric acid production through the polyol pathway and oxidative stress, as well as decrease insulin sensitivity, which affects uric acid excretion (11). These findings support the theory that uric acid levels are influenced by the duration of DM and the quality of glycemic control.

Analysis based on gender shows a significant difference between the duration of DM and uric acid levels in both men (p = 0.015) and women (p = 0.004), with stronger significance in women. These findings are consistent with the literature stating gender and sex hormones play an important role in regulating uric acid levels. The stronger significance of uric acid levels observed in women in this study may be explained by the prodominance of menopausal age among female respondents. Although men generally have higher uric acid levels due to the uricosuric effect of estrogen in women, this hormonal protection diminishes in postmenopausal women. Estrogen is known to enhance renal uric acid excretion and lower serum uric acid levels in women. As estrogen levels starting to decline, women may experience impaired uric acid excretion, resulting in higher uric acid levels compared to men (16).

Based on BMI, significant differences in uric acid levels based on DM duration were found in the normal BMI group (p = 0.007) and the obese group (p = 0.037), while in the overweight group the results were close to significance (p = 0.053). This indicates that the effect of DM duration on uric acid levels is not the same in each BMI category. These findings indicate that, in addition to nutritional status, other factors such as metabolic dysfunction, insulin resistance, and kidney function also play a role in regulating uric acid levels (17).

Analysis of the relationship between duration of DM and total cholesterol levels showed a significant relationship based on the Likelihood Ratio test (p = 0.013). This relationship can be explained by chronic inflammation and lipid metabolism disorders that occur in long-term DM. However, further analysis shows that this relationship is significant in women (p = 0.001) but not in men (p = 0.179), which is likely related to hormonal changes and a decrease in estrogen protection against lipid metabolism in women (18).

Based on BMI, no significant relationship was found between the duration of DM and cholesterol levels in the normal BMI, overweight, and obese groups ($p > 0.05$). These findings indicate that in these groups, cholesterol levels are more influenced by other factors such as the amount of adipose tissue, chronic inflammation, diet, and physical activity than by the duration of DM alone (19).

The Kruskal-Wallis test results showed a significant difference in uric acid levels between the normal, borderline high, and high

JURNAL IMPLEMENTA HUSADA

E-ISSN :2722-0877

cholesterol groups (p = 0.026). Higher cholesterol levels are associated with higher uric acid levels, which can be explained physiologically through increased oxidative stress, activation of inflammatory pathways, impaired kidney function, and increased xanthine oxidase activity. These findings are consistent with previous studies reporting an independent positive association between dyslipidemia and hyperuricemia (20).

Based on the results of the analysis presented, the relationship between the duration of DM and uric acid and cholesterol levels showed different variations in each group. Although some relationships appeared to be significant, others did not show statistical significance. These differences may be influenced by the possible effects of confounding factors that were not analyzed, such as diet, medication use (statins, anti-gout drugs), and physical activity, which can affect uric acid and cholesterol levels and may cause the results of the relationship to appear weak or insignificant. The uneven distribution of respondent characteristics, such as gender composition and unbalanced BMI categories, also caused relationships in certain subgroups to appear weak, not because the relationships did not exist, but because the group size was too small.

CONCLUSION

This study shows a significant relationship between the duration of type 2 diabetes and uric acid levels in type 2 diabetes patients at the Iman Clinic, where uric acid levels tend to increase with the duration of the disease. This relationship also remains significant based on blood sugar levels, with higher uric acid levels in patients with uncontrolled blood sugar levels, especially in groups with a duration of diabetes of more than five years. Additionally, the relationship between the duration of type 2 diabetes and uric acid levels was also significant based on gender, with stronger significance in women than in men. Based on BMI, a significant relationship was found in the normal and obese BMI groups, but not in the overweight BMI group.

This study also found a significant relationship between the duration of type 2 DM and cholesterol levels. Analysis based on gender showed a significant relationship in women, but not in men. Meanwhile, based on BMI category, no significant relationship was found between the duration of type 2 DM and cholesterol levels in all BMI categories. In addition, there was a significant relationship between normal, borderline high, and high cholesterol levels and uric acid levels, where an increase in cholesterol levels tended to be followed by an increase in uric acid levels.

Although some relationships appeared to be significant, others did not show statistical significance. These differences may be influenced by sample characteristics, which are also limitations in this study. In addition, the possible influence of confounding factors that were not analyzed, such as diet, medication use (statins, anti-gout drugs), and physical activity, may affect uric acid and cholesterol levels and cause the results of the relationship to appear weak or insignificant. The uneven distribution of respondent characteristics, such as gender composition and unbalanced BMI categories, also caused the relationship in certain subgroups (e.g., men only or obese only) to appear weak, not because the relationship did not exist, but because the group size was too small.

JURNAL IMPLEMENTA HUSADA

E-ISSN :2722-0877

REFERENCES

1. World Health Organization. The Global Diabetes Compact: what you need to know. Oms. 2021;6.
2. Federation ID. Annual Report 2023. 2023; Available from: www.cpcb.nic.in
3. Uzeli U, Doğan AG. The Relationship Between Diabetic Neuropathy and Uric Acid/High-Density Lipoprotein Ratio in Patients With Type-2 Diabetes Mellitus. Cureus. 2023;15(9):1–6.
4. Lin H, Xu J, Teng C. Correlation between remnant cholesterol and hyperuricemia in patients with type 2 diabetes mellitus: a cross-sectional study. Lipids Health Dis. 2024;23(1):1–10.
5. Jais A, Hepiyansori, Yurman, Adha MA. Pengaruh Asam Urat Dalam Darah Penderita Diabetes Melitus Pada Peningkatan Kadar Gula Darah. J Ris Media Keperawatan. 2021;4(1):1–7.
6. Arersa KK, Wondimnew T, Welde M, Husen TM. Prevalence and determinants of hyperuricemia in type 2 diabetes mellitus patients attending jimma medical center, Southwestern Ethiopia, 2019. Diabetes, Metab Syndr Obes. 2020;13:2059–67.
7. AGRESTI A. Categorical Data Analysis. John Wiley & Sons, Interscience Publications; 2013.
8. Kemenkes. Survei Kesehatan Indonesia 2023 (SKI). Kemenkes. 2023;235.
9. Apovian CM, Okemah J, O'Neil PM. Body Weight Considerations in the Management of Type 2 Diabetes. Adv Ther [Internet]. 2019;36(1):44–58. Available from: https://doi.org/10.1007/s12325-018-0824-8
10. Moelyo AG, Sitaresmi MN, Julia M. Secular trends in Javanese adult height: the roles of environment and educational attainment. BMC Public Health [Internet]. 2022;22(1):1–9. Available from: https://doi.org/10.1186/s12889-022-13144-6
11. Pinjar MJ, K C, Manogna G. Association of blood uric acid with the duration of diabetes in type 2 diabetics: A pilot study. Indian J Clin Anat Physiol. 2021;7(4):334–7.
12. Wang C, Wang J, Wan R, Yuan T, Yang L, Zhang D, et al. Relationship between baseline and changed serum uric acid and the incidence of type 2 diabetes mellitus: a national cohort study. Front Public Heal. 2023;11(July):1–18.
13. Guo L, Cai L, Hu L, Zhou Y. The dose-response relationship and gender differences of serum uric acid with total cholesterol: a cross-sectional study. J Int Med Res. 2025;53(2):1–15.
14. Fayazi HS, Mortazavi Khatibani SS, Motamed B, Yaseri M. Evaluation of levels of uric acid and lipid profile in hospitalized patients with diabetes. BMC Res Notes. 2023;16(1):1–5.
15. Samin KA, Ullah K, Shah MI, Ansari A, Khalil S, Saeed M. A Study on Serum Uric Acid Level in Type II Diabetes Mellitus. Pakistan J Med Heal Sci. 2021;15(7):2317–9.
16. Cui Y, Qu Z, Li L, Hu W. Gender difference in the association between serum uric acid and metabolic dysfunction - associated steatotic liver disease in patients with newly diagnosed type 2 diabetes. BMC Gastroenterol [Internet]. 2025; Available from: https://doi.org/10.1186/s12876-025-03917-9
17. Yang Y, Xian W, Wu D, Huo Z, Hong S. The role of obesity , type 2 diabetes , and metabolic factors in gout : A Mendelian randomization study. 2022;(August):1–12.
18. Ambrož M, Vries ST De, Vart P, Dullaart RPF, Lennep JR Van, Denig P, et al. Sex Differences in Lipid Profile across the Life Span in Patients with Type 2 Diabetes : A Primary Care-Based Study. 2021;
19. Ardhya S, As P, Wahyuni RD, Putrie IR. HUBUNGAN DIABETES MELITUS TIPE

JURNAL IMPLEMENTA HUSADA
E-ISSN :2722-0877

2 DENGAN KADAR PROFIL LIPID PASIEN DI RSUD UNDATA PROVINSI SULAWESI TENGAH TAHUN 2023. Med Tadulako (Jurnal Ilm Kedokteran). 2025;10(1):25–32.
20. Płaczkowska S, Pawlik-sobecka L, Kokot I, Piwowar A. Clinical research The association between serum uric acid and features of metabolic disturbances in young adults. 2021;