Indonesian Journal of Engineering, Science and Technology
IJENSET
Volume 01 - Issue 01, June 2024
e-ISSN: 3089-2392
Journal Link: https://jurnal.umla.ac.id/index.php/ijenset/index

AGE, GENDER AND HEALTH HISTORY FACTORS ON BLOOD GLUCOSE AND URIC ACID LEVELS IN LAMONGAN SQUARE VISITORS

Putri Ayu Ika Setiyowati[1*], Angella Ananda Syaputra[2], Badriyatul Musyarofah[3], Lailatus Fitri[4], Nynda Ayu Nadira Savitri[5], Aji Naufal Syafiq[6]

*Corresponding Author Email: *putriayuikasetiyowati@gmail.com*

[1-6]Study Program of Biology; Faculty of Science Technology and Education;Universitas Muhammadiyah Lamongan; Lamongan 62218; Indonesia

Article Information

Submitted	:	December 11, 2023
Revised	:	May 21, 2024
Accepted	:	May 21, 2024
Paper page	:	14-21
DOI	:	10.38040/ijenset.v1i1.832

ABSTRACT

Non-communicable diseases (NCDs) are health problems faced locally, nationally and globally. The metabolic keys in controlling NCDs are the control of blood pressure, blood glucose and uric acid levels. All three, play a role in the occurrence of cardiocerebrovascular diseases such as coronary heart disease and ischemic stroke which are the cause of death worldwide. NCD control starts with early detection of blood glucose, and uric acid levels. The purpose of this study was to analyze the relationship of age and medical history with glucose and uric acid levels while providing health information to the Lamongan community about blood glucose and uric acid levels. The blood of respondents over 35 years old was drawn according to consent to check both indicators with an easy touch device meter. The screening results found that most Lamongan people had normal blood sugar levels (78%), and normal uric acid in both men and women respondents (95.5% vs 96.8%). This screening activity ran smoothly and received a good response.

Keywords−*NCDs, Age, Medical history, Blood Sugar, and Uric Acid*

I. INTRODUCTION

Non-communicable diseases (NCDs) are the leading cause of death globally and one of the major challenges of the 21st century (Arifin et al., 2022). NCDs are a health problem in Indonesia that mainly affects socioeconomic aspects(Marthias et al., 2021). NCDs continue to increase in percentage with major impacts on mortality and reduced quality of life. The four

metabolic keys in the increase of NCDs are blood pressure, body mass index, blood glucose and blood cholesterol levels (Kibret et al., 2023; Budreviciute et al., 2020). The main non-communicable disease groups are cardiovascular disease, cancer, respiratory diseases and diabetes. 71% of the total 57 million deaths were caused by NCDs (Arifin et al., 2022)(WHO, 2012). The majority of NCD deaths were caused by cardiovascular disease (41%), cancer (22%), chronic respiratory disease (9%) and diabetes (1.6%). The high prevalence of NCD deaths indicates that NCDs are still an unsolved health problem, especially for the elderly. Men are reported to be more at risk of NCDs than women (22% vs 18%)(Lancet, 2020). WHO reports that Southeast Asia has the highest mortality rate. Habits such as smoking, drinking alcohol, unhealthy diet, lack of physical activity will increase the risk of NCDs (WHO, 2012). Cardiovascular disease is high risk in people who have the above risk factors, such as smoking, high blood pressure, high cholesterol levels and/or diabetes (Bays et al., 2021)

Diabetes mellitus (DM) is a risk factor for coronary heart disease and stroke and the leading cause of non-accidental amputation. Diabetes is more common in developing countries with modern lifestyles. It is projected that in 2030 there will be an increase in the prevalence of diabetes from 177 million to 366 million sufferers in the world (Shahwan, 2020; Karamanou et al., 2016; Brownrigg et al., 2014). In Indonesia, untreated diabetes can result in the onset of cardiovascular disease, and reduce life expectancy by 5-10 years. People with DM are 3.2 times more at risk of suffering from coronary heart disease and an estimated increase of 2.1% to 8.4% in developing countries (Simbolon et al., 2020; Harahap & Rania, 2019).

Another trigger of cardiovascular disease is high cholesterol levels. High cholesterol levels will trigger plaque in the blood vessels called atherosclerosis (Novita et al., 2021; Nahdah et al., 2023). Risk factors associated with cholesterol levels include gender, a diet high in fiber and fat, smoking, obesity and physical activity. Another trigger for cardivascular disease is uric acid levels. High uric acid levels are a risk factor for ischemic stroke, especially in men (Yazdi et al., 2022; Gong & Wang, 2020). The incidence of NCDs is triggered by unhealthy lifestyles such as smoking, minimal alcohol consumption and an unregulated diet and lack of physical activity, in addition, physiological factors such as history of hypertension and body mass index also play a role (Kang et al., 2021; Parry, Charles; Patra, Jayadeep; Rehm, 2012). It can be seen that prevention of NCDs is necessary to avoid the high prevalence of cardiovascular disease.

This study aims to analyze blood sugar and uric acid levels in a number of visitors to the city square with variations in age and health history as well as to determine NCD risk factors related to diseases such as diabetes mellitus, and uric acid in the community, Lamongan District, Lamongan Regency, East Java Province. This activity is expected to provide data and information about community members who are at high risk of cardiovascular disease. Blood screening is expected to be a reference for NCD prevention and health development in Lamongan.

II. METHOD

The screening activity was located in Lamongan Square in December 2022, carried out by the Biology Student Association of Universitas Muhamamdiyah Lamongan (HIMABIO NELUMBO). The subjects were people who visited the square.

Tools and Materials Research Preparation

This activity began with the coordination and preparation stage. The main target of the screening was adults aged more than 20 years. The tools and materials needed include: Glucometer strips, glucometer merck *Easy touch,* uric acid strips, and alcohol swab.

Research Execution

Before blood collection, people who are willing are asked to sign informed consent. The tool used in this screening test is the Accu Check Meter Device. The blood sample is applied to the end of the test strip. Blood collection is applied to the respondent's fingertip. The blood sample is then tested on the device to monitor the levels of blood sugar, and uric acid. The data was then recorded on a control card that had been prepared by the Team and returned to the respondent as a health check data record. Furthermore, all data obtained were analyzed descriptively. The number of respondents taken was 50 people with the age taken above 35 years old men and women.

III. RESULT AND DISCUSSION

The number of respondents obtained in this activity was 50 people, who were visitors to the lamongan square. The characteristics of the respondents are as follows:

A. Gender

Figure 1 shows that respondents were more dominated by women (n=28) compared to men (n=22).

B. Age Distribution

In accordance with the inclusion criteria for data collection, the age distribution obtained in the field was between 20 – above 55 years old.

Figure 2 shows that 57% of the respondents with the age 41 – 55 years old.

C. Glucose Ad Random Levels

The reference for glucose ad randome levels used is according to Amir's research, 2015, which was categorized as normal, moderate, and high. This research reported that more respondents were found to have normal glucose ad random levels (110-144 mg/dL) as much as 53% in men and 48% in women. Moderate glucose ad random levels (145-179 mg/dL) as much as 46% in men and 50% in women . High glucose ad random levels (> 180 mg/dL) as much as 1% in men and 2% in women (Figure 3 and Table 1).

The percentage in men is much better glucose levels compared to women. This can be due to physical factors women have a greater chance of increasing body mass index premenstrual syndrome(Karamanou et al., 2016)(Rad, M.; Sabzevary, M.T.; Dehnavi, 2018).

Table 1. Comparison of temporal blood sugar levels of respondents based on gender

Gender	Glucose Ad Random Levels		
	Normal	**Moderate**	**High**
Male	53%	46%	1%
Female	48%	50%	2%

The following is a diagram (Figure 4) which represents the results of uric acid examination in visitors to the lamongan square based on normal and high categories.

The uric acid levels of the community visitors to the square were mostly in the normal group, both in men and women respondents (96.8% in men, while 95,5% in women). However, there were still 4,5% of women and 3,2% of men who had high uric acid (men >7.2 mg/dL; women >6 mg/dL).

In terms of demographic characteristics, the age distribution did not have a large variation, as young adults were not included in this activity. In general, people had normal blood sugar levels. Although statistically unrelated, there is a tendency for women to have worse blood sugar levels compared to men, reported in his study that women have a higher prevalence of diabetes mellitus (Rad, M.; Sabzevary, M.T.; Dehnavi, 2018; Sherwani et al., 2016).

Another result reported by WHO is that men have a higher prevalence, but more women live with diabetes This is due to differences in homeostatic regulation of blood sugar metabolism between women and men. One of them is the difference in sex hormones in

women and men, more women suffer from diabetes at an advanced age and who have experienced menopause. Women with post-menopausal therapy successfully reduce fasting blood sugar levels, but also impair glucose tolerance(Ciarambino et al., 2020; Klin et al., 2019).

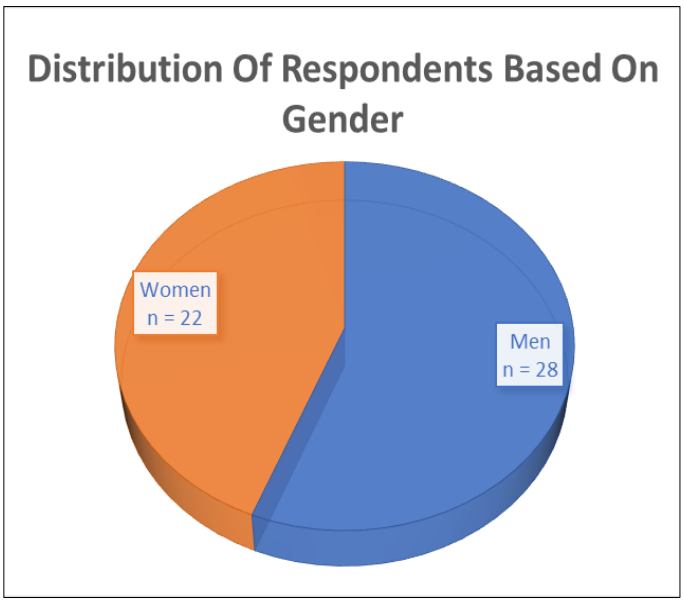

Figure 1. Distribution of respondents based on gender

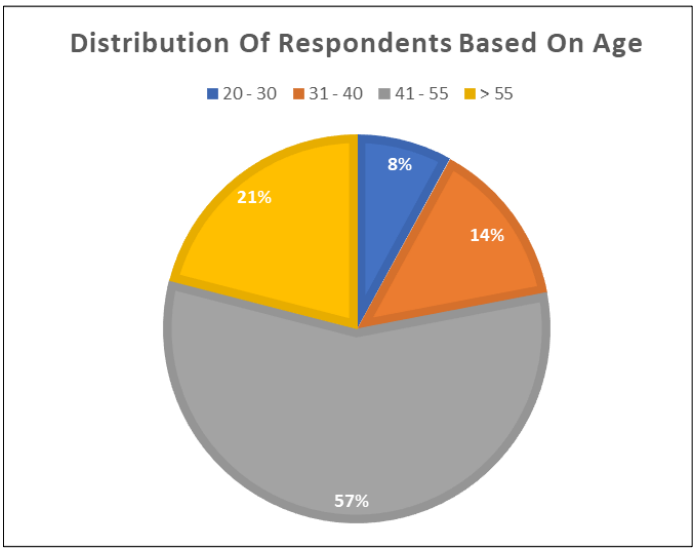

Figure 2. Distribution of respondents based on age

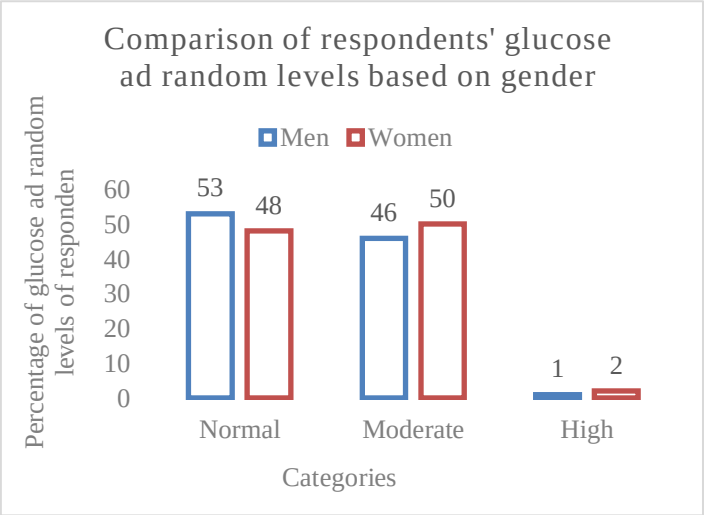

Figure 3. Comparison of respondents' glucose ad random levels based on gender.

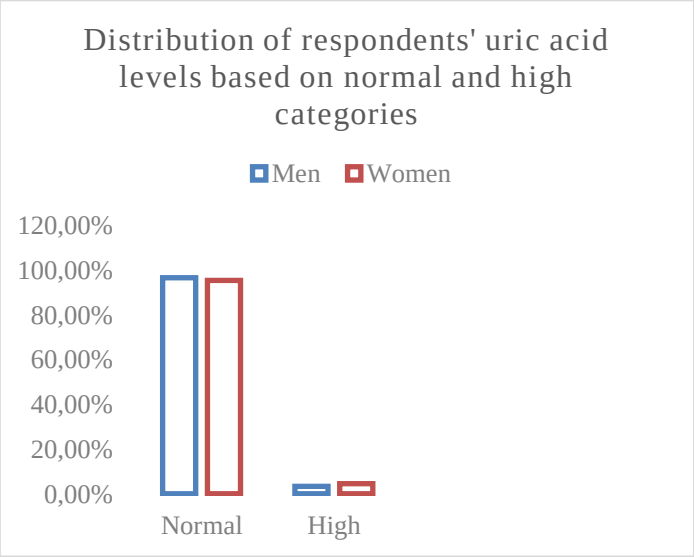

Figure 4. Distribution of respondents' uric acid levels based on normal and high categories.

Insulin sensitivity is also different between the two sexes. Compared to men, women have less skeletal muscle mass with high adipose tissue, more free fatty acids (FFA) so they have higher insulin resistance than men, which will impact the progression of diabetes mellitus(Wang & Mittendorfer, 2010). A study concluded that men are at risk for impaired fasting blood sugar, while women are more likely to have impaired blood sugar tolerance (Ciarambino et al., 2022; Kadowaki et al., 2023).

The number of people who have normal blood sugar levels indicates a good diet such as avoiding consuming foods high in sugar and fat in the diet every day and increasing regular physical activity (Asif, 2014). Diet is closely related to the incidence of diabetes mellitus (DM). Consuming foods high in carbohydrates and low in fiber is a risk factor of 5.09 times greater for the incidence of DM (Sami et al., 2017). A maintained body mass index is also a possibility that most respondents have a normal GDS although this data was not recorded during the activity (Cai et al., 2017; Klin et al., 2019)

Uric acid is the breakdown product of purines from DNA, RNA, ATP and cAMP, can accumulate in the blood due to increased production (intake of alcohol or foods high in purines) or reduced elimination due to impaired renal function (Johson, R.J.; Lanaspa, M.A.; Gaucher, 2012). Urate crystals often accumulate in connective tissue in joints, tendons and kidneys and sometimes in heart valves (Huang et al., 2021). Hyperuricemia

results from increased uric acid production, impaired renal excretion, or a combination of both. Hyperuricemia is a risk factor for various diseases including ischemic stroke, gout, renal dysfunction, hypertension, hyperlipidemia, diabetes and obesity (Skoczyńska et al., 2020; Stewart et al., 2019). Research shows that as many as 31% of men with stroke have high uric acid (Padda et al., 2021). Elevated serum uric acid levels have been shown to play a role in the occurrence of diseases such as vascular inflammation, including atherosclerosis. Almost 100% of respondents had normal uric acid levels, indicating a good lifestyle and dietary management (Kimura et al., 2021; Freilich et al., 2022).

IV. CONCLUSION

The screening results showed that most visitors to Lamongan square had normal blood sugar levels, and normal uric acid.

ACKNOWLEDGEMENT

We would like to thank the S1 Biology Study Program, Faculty of Science Technology and Education, Universitas Muhammadiyah Lamongan for providing support in the form of funding and guidance during the research activities.

REFERENCES

Arifin, H., Chou, K., Ibrahim, K., Ulfah, S., Pradipta, R. O., Rias, Y. A., Sitorus, N., Wiratama, B. S., Setiawan, A., Setyowati, S., Kuswanto, H., & Mediarti, D. (2022). Analysis of Modifiable , Non-Modifiable , and Physiological Risk Factors of Non-Communicable Diseases in Indonesia : Evidence from the 2018 Indonesian Basic Health Research. *Journal of Multidisciplinary Healthcare*, *15*(September), 2203–2221.

Asif, M. (2014). The prevention and control the type-2 diabetes by changing lifestyle and dietary pattern. *Journal of Education and Health Promotion*, *3*(January), 1–8. https://doi.org/10.4103/2277-9531.127541

Bays, H. E., Taub, P. R., Epstein, E., Michos, E. D., Ferraro, R. A., Bailey, A. L., Kelli, H. M., Ferdinand, K. C., Echols, M. R., Weintraub, H., Bostrom, J., Johnson, H. M., Hoppe, K. K., Shapiro, M. D., German, C. A., Virani, S. S., Hussain, A., Ballantyne, C. M., Agha, A. M., & Toth, P. P. (2021). American Journal of Preventive Cardiology Ten things to know about ten cardiovascular disease risk factors. *American Journal of Preventive Cardiology*, *5*(January), 100149. https://doi.org/10.1016/j.ajpc.2021.100149

Brownrigg, J. R. W., Hughes, C. O., Jones, K. G., Patel, N., Thompson, M. M., Hinchliffe, R. J., & Kingdom, U. (2014). In fl uence of foot ulceration on cause-speci fi c mortality in patients with diabetes mellitus. *Journal of Vascular Surgery*, *Oktober*, 983–986. https://doi.org/10.1016/j.jvs.2014.04.052

Budreviciute, A., Damiati, S., Sabir, D. K., & Onder, K. (2020). Management and Prevention Strategies for Non-communicable Diseases (NCDs) and Their Risk Factors. *Frontiers in Public Health*, *8*(November), 1–11. https://doi.org/10.3389/fpubh.2020.574111

Cai, J., Ma, A., Wang, Q., Han, X., Zhao, S., Wang, Y., Schouten, E. G., & Kok, F. J. (2017). Association between body mass index and diabetes mellitus in tuberculosis patients in China : a community based cross-sectional study. *BMC Public Health*, *228*, 1–7. https://doi.org/10.1186/s12889-017-4101-6

Ciarambino, T., Crispino, P., Leto, G., Mastrolorenzo, E., Para, O., & Giordano, M. (2022). Influence of Gender in Diabetes Mellitus and Its Complication. *International Journal of Molecular Sciences*, *23*(16), 1–13.

Freilich, M., Arredondo, A., Zonnoor, S. L., & Mcfarlane, I. M. (2022). Elevated Serum Uric Acid and Cardiovascular Disease : A Review and Potential Therapeutic Interventions. *Cureus*, *14*(3), 1–7. https://doi.org/10.7759/cureus.23582

Gong, M., & Wang, C. (2020). Converging Relationships of Obesity and

Hyperuricemia with Special Reference to Metabolic Disorders and Plausible Therapeutic Implications. *Diabets, Metabolic Syndrome and Obesity: Targets and Therapy*, *13*, 943–962.

Harahap, J., & Rania, R. (2019). Cataracts Risk Factors and Comparison of Blood Glucose Levels in Diabetic and Non-Diabetic Patients towards the Occurrence of Cataracts. *Journal of Medical Sciences*, *7*(20), 3359–3362.

Huang, Z., Xie, N., Illes, P., Virgilio, F. Di, Ulrich, H., Semyanov, A., & Verkhratsky, A. (2021). From purines to purinergic signalling : molecular functions and human diseases. *Signal Transduction and Targeted Therapy*, *February*. https://doi.org/10.1038/s41392-021-00553-z

Johson, R.J.; Lanaspa, M.A.; Gaucher, E. A. (2012). Uric acid: A Danger Signal from the RNA World that may have a role in the Epidemic of Obesity, Metabolic Syndrome and CardioRenal Disease: Evolutionary Considerations. *Semin Nephrol*, *31*(5), 394–399. https://doi.org/10.1016/j.semnephrol.2011.08.002.Uric

Kadowaki, S., Tamura, Y., Sugimoto, D., Kaga, H., & Suzuki, R. (2023). A Short-Term High-Fat Diet Worsens Insulin Sensitivity with Changes in Metabolic Parameters in Non-Obese Japanese Men. *Journal of Clinical Medicine*, *12*(12), 1–19.

Kang, S., Kang, M., & Lim, H. (2021). Global and Regional Patterns in Noncomunicable Diseases and Dietary Factors across National Income Levels. *Nutrients*, *13*(10), 1–16.

Karamanou, M., Protogerou, A., Tsoucalas, G., Androutsos, G., Poulakou-rebelakou, E., Karamanou, M., & Tsoucalas, G. (2016). Milestones in the history of diabetes mellitus : The main contributors. *World Journal of Diabetes*, *7*(1), 1–7. https://doi.org/10.4239/wjd.v7.i1.1

Kibret, K. T., Backholer, K., Peeters, A., & Tesfay, F. (2023). Burdens of non- - communicable disease attributable to metabolic risk factors in regression analysis of the Global Burden of Disease Study. *BMJ Open*, *13*(7), 1–10. https://doi.org/10.1136/bmjopen-2022-071319

Kimura, Y., Tsukui, D., & Kono, H. (2021). Uric Acid in Inflammation and the Pathogenesis of Atherosclerosis. *International Journal of Molecular Sciences*, *22*(22), 1–19.

Klin, W., Suppl, W., S, S., Jürgen, A. K., Heidemarie, H., Raimund, A., Peter, W., Hoppichler, F., & Lechleitner, M. (2019). Geschlechtsspezifische Aspekte bei Prädiabetes und Diabetes mellitus – klinische Empfehlungen (Update 2019). *Wiener Klinische Wochenschrift*, *131*, 221–228. https://doi.org/10.1007/s00508-018-1421-1

Lancet. (2020). *Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID- research that is available on the COVID-19 resource centre - including this for unrestricted research re-use a*. Lancet.

Marthias, T., Anindya, K., Ng, N., Mcpake, B., Atun, R., Arfyanto, H., Hulse, E. S. G., Zhao, Y., Jusril, H., Pan, T., Ishida, M., & Lee, J. T. (2021). Impact of non- - communicable disease multimorbidity on health service use , catastrophic health expenditure and productivity loss in Indonesia : a based panel data analysis study. *BMJ Open*, *11*(2), 1–13. https://doi.org/10.1136/bmjopen-2020-041870

Nahdah, N. O., Abduh, M. S., Sumarawati, T., Kedokteran, F., Islam, U., & Agung, S. (2023). Hubungan Atherosclerotic Cardiovascular Disease Score dengan derajat stenosis berdasarkan gensini score. *Jurnal Ilmiah Sultan Agung*, 1178–1186.

Novita, I., Mahmuda, N., Nurkusumasari, N., Nofaldi, F., Astuti, P. P., & Syafitri, F. D. (2021). Coronary Heart Disease : Diagnosis and Therapy. *Solo Journal of Anesthesi, Pain, and Critical Care*, *1*(2), 75–87.

Padda, J., Khalid, K., Padda, S., Boddeti, N. L., & Malhi, B. S. (2021). Hyperuricemia and Its Association With Ischemic Stroke. *Cureus*, *13*(9), 1–8. https://doi.org/10.7759/cureus.18172

Parry, Charles; Patra, Jayadeep; Rehm, J.

(2012). Alcohol consumption and non-communicable diseases: epidemiology and policy implications. *Addiction*, *106*(10), 1718–1724. https://doi.org/10.1111/j.1360-0443.2011.03605.x.Alcohol

Rad, M.; Sabzevary, M.T.; Dehnavi, Z. M. (2018). Factors associated with premenstrual syndrome in Female High School Students. *Journal of Education and Health Promotion*, *7*, 1–5. https://doi.org/10.4103/jehp.jehp

Sami, W., Ansari, T., Butt, N. S., Rashid, M., & Hamid, A. (2017). Effect of diet on type 2 diabetes mellitus : A review. *International Journal of Health Sciences*, *11*(2), 65–71.

Shahwan, A. J. (2020). Epidemiology of Cardiovascular disease and associated risk factors in Gaza Strip- Palestine Amal Jamee Shahwan To cite this version : HAL Id : tel-02560078 Amal Jamee Shahwan. *HAL Science*.

Sherwani, S. I., Khan, H. A., Ekhzaimy, A., Masood, A., & Sakharkar, M. K. (2016). Significance of HbA1c Test in Diagnosis and Prognosis of Diabetic Patients. *Biomarkers Insights*, *11*, 95–104. https://doi.org/10.4137/BMI.S38440.TYPE

Simbolon, D., Siregar, A., & Talib, R. A. (2020). Physiological Factors and Physical Activity Contribute to the Incidence of Type 2 Diabetes Mellitus in Indonesia. *National Public Health Journal*, *15*(3), 120–127. https://doi.org/10.21109/kesmas.v15i3.3354

Skoczyńska, M., Chowaniec, M., Szymczak, A., Langner-hetmańczuk, A., Maciążek-chyra, B., & Wiland, P. (2020). Pathophysiology of hyperuricemia and its clinical significance – a narrative review. *Reumatologia*, *58*(5), 312–323.

Stewart, D. J., Langlois, V., & Noone, D. (2019). Hyperuricemia and Hypertension : Links and Risks. *Integrated Blood Pressure Control*, *12*, 43–62.

Wang, X., & Mittendorfer, B. (2010). Metabolic actions of insulin in men and women. *Physical Activity and Public Health*, *26*(7), 1–16. https://doi.org/10.1016/j.nut.2009.10.013

WHO. (2012). A Comprehensive Global Monitoring Framework , Including Indicators , And A Set Of Voluntary Global Targets For The Prevention And Control Of Noncommunicabale Diseases Introduction PART 1 : Global monitoring framework for NCDs , including a set of indicato. WHO.

Yazdi, F., Reza, M., Amir, S., Javad, M., Hamid, N., Fatemeh, N., & Samira, Y. (2022). Hyperuricaemia and its association with other risk factors for cardiovascular diseases : A population- -based study. *Endocrinology, Diabetes and Metabolism*, *5*(6), 1–6. https://doi.org/10.1002/edm2.387