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Association Between Fasting Glucose And C-Reactive Protein As A Predictor For Diabetic State

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Abstract

Diabetes mellitus (DM) is characterized by elevated blood glucose levels resulting from decreased insulin secretion by pancreatic beta cells. Fasting blood glucose (FBG) measurement is commonly used to monitor DM, requiring patients to fast for a minimum of eight hours. Insufficient insulin production impairs glucose uptake into body tissues, leading to hyperglycemia. Chronic hyperglycemia subsequently stimulates the production of inflammatory cytokines, which promotes the hepatic synthesis of c-reactive protein (CRP). This study aims to determine the relation between FBG levels and CRP levels in patients with diabetes mellitus at Rumah Sakit Daerah Mangusada. An observational analytic study with a cross-sectional design was conducted using purposive sampling, with a total sample of 25 DM patients at Rumah Sakit Daerah Mangusada. Data were analyzed using the Shapiro-Wilk test for normality and the Spearman's rank for correlation test. The analysis that has been carried out on the Shapiro-Wilk, obtained a sig. (2 tailed) 0.012 which means 0.012 < 0.05 and correlation coefficient is 0.493. Persistent hyperglycemia in diabetes mellitus patient induces pro-inflammatory cytokines that stimulate hepatic CRP synthesis. Elevated CRP reflects systemic inflammation, oxidative stress, and tissue injury, which accelerate metabolic damage and vascular complications such as atherosclerosis and coronary artery disease, establishing CRP as a reliable predictor of diabetes-related complications. It can be concluded that has a positive relation with a moderate correlation between blood glucose levels and CRP levels in diabetic patients at Rumah Sakit Daerah Mangusada.

Keyword: C-Reactive Protein; Fasting Glucose; Diabetes Mellitus

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INTRODUCTION

Diabetes mellitus (DM) remains a major public health problem worldwide, particularly in Indonesia, where the number of cases continues to increase (Isnaini & Ratnasari, 2018). International Diabetes Federation (IDF) reported that in 2021, Indonesia had 19,5 million people living with diabetes, and by 2045 this number is projected to increase to 28,6 million (IDF, 2021). Bali is among the provinces in Indonesia with one of the highest prevalence rates of DM, recorded at 1,5 percent (Kementerian Kesehatan Republik Indonesia, 2018). Based on the profile of the Dinas Kesehatan Provinsi Bali 2021, the number of DM patients in 2020 was 14,353, and in 2021 that number increased significantly to 53.726 (Dinkes, 2021). Data on the ten most common outpatient diseases at Rumah Sakit Daerah Mangusada, Badung Regency, in 2022 showed that DM was the second most common outpatient disease with 4.799 patients (RSD Mangusada, 2023) and in 2024 this number increased to 7.285 patients (RSD Mangusada, 2025).

Diabetes mellitus (DM) is classified into four categories, there are type 1 DM, type 2 DM, gestational diabetes and specific types of DM caused by other conditions. Type 2 DM accounts for 90–95% of all diabetes cases (Permatasari et al., 2020). DM is characterized by elevated blood glucose levels caused by reduced insulin secretion by pancreatic beta cells. The management of DM focuses on monitoring blood glucose status, which is routinely checked. This monitoring is intended to anticipate possible complications or sudden death (Sanatang & Syarif, 2023). A fasting blood glucose (FBG) level of ≥126 mg/dl or a random blood glucose (RBG) level of ≥200 mg/dl, accompanied by symptoms such as weight loss, polyphagia (excessive eating), polydipsia (excessive drinking), and polyuria (frequent urination) can confirm a diagnosis of DM. Proper blood glucose control can significantly reduce the risk of patients developing microvascular complications (Hasanah & Ikawati, 2021).

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Fasting blood glucose (FBG) is one method used to monitor plasma glucose levels, in which the patient must fast for at least eight hours before the test. During this period, no food is consumed so that the body maintains plasma glucose levels through the liver, peripheral tissues, and hormones that can influence blood glucose levels (Yusuf, Nafisah & Inayah, 2023).

Insulin dysfunction can occur when pancreatic beta cells that produce insulin are unable to produce it in sufficient amounts to meet the body's needs, resulting in glucose in the blood vessels being unable to enter the tissues, which is characterized by increased blood glucose levels in DM patients (Banjarnahor & Wangko, 2012). This leads to hyperglycemia because most glucose continues to remain in the bloodstream for a long period (Kalma, 2018). Chronic hyperglycemia stimulates the secretion of various inflammatory cytokines including Interleukin-6 (IL-6), Interleukin-1 (IL-1), and TNF-α, which in turn stimulate the liver to produce *C-Reactive Protein* (CRP). Prolonged exposure to hyperglycemia is currently recognized as a major causative factor in the pathogenesis of diabetic complications, including atherosclerosis in monocytes (Nisa, 2016).

C-Reactive Protein (CRP) is one of the acute phase proteins of the liver that functions as a biomarker of acute inflammation. CRP can be produced by metabolic and inflammatory factors related to the progression of DM, such as increased blood glucose levels, obesity, and high levels of free fatty acids. In DM patients, elevated CRP levels are a fairly accurate indicator to predict the occurrence of vascular complications, the development of cardiovascular disease (Stanimirovic et al., 2022) and can be considered a sensitive biomarker because CRP is an alpha-globulin produced in the liver with levels that increase significantly during inflammatory processes involving tissue damage and dysfunction of the vascular system, particularly in vascular endothelial cells. This condition contributes to the occurrence of vascular

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complications associated with the process of atherosclerosis, so that CRP can be used as a predictor of complications in DM patients (Suardi et al., 2022).

High CRP levels are a strong indicator of cardiovascular disease risk resulting from the inflammatory response in DM patients. Early detection of this inflammatory biomarker allows for the provision of appropriate therapy to be given promptly, thereby preventing the occurrence of chronic complications (Kalma, 2018).

Previous studies conducted by Kapero, Mahtuti & Rahmawati (2023) regarding CRP levels in type 2 DM patients found that there was an increase in CRP levels, with the highest titer of 96 found in 2 samples (6.7%) and a titer of 24 found in 17 samples (56.7%). In a study conducted by Dakabesy (2024) regarding CRP and fasting blood glucose in DM patients at Rumah Sakit Umum Prof. Dr. W. Z. Johannes in Kupang, reactive CRP was found in 10 samples (20%) out of 50 samples and high fasting blood glucose (>120 mg/dL) was observed in 66% of cases. Furthermore, research conducted by Suardi et al., 2022 also reported that DM patients are at risk of elevated CRP levels, where 80% (8 out of 10) of the examined patients showed positive CRP results at high fasting blood glucose levels.

Based on the above explanation, the authors are interested in studying the relationship between fasting blood glucose levels and CRP levels, where the examination employs a chemistry analyzer using the hexokinase method for FBG and the latex method for CRP, both of which are considered the gold standard in laboratory examinations. This interest is based on the high number of DM patients at Rumah Sakit Daerah Mangusada in 2024, so that CRP testing is expected to play a role in preventing chronic complications in DM patients through the provision of appropriate therapy.

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METHOD

1. RESEARCH DESIGN

This study employed an observational analytic design with a cross-sectional approach. An observational analytic study was chosen to examine the relationship between two variables without providing interventions or treatments to the respondents. The cross-sectional approach allows data collection at a single point in time, providing a snapshot of the association between fasting blood glucose (FBG) and C-reactive protein (CRP) levels (Harlan & Sutjiati, 2018).

2. TIME AND PLACE

The study was conducted at Rumah Sakit Daerah Mangusada, Badung, Bali. Data collection was carried out over a three months period, from February to April 2025.

3. TARGETS

The study population comprised all patients diagnosed with diabetes mellitus (DM) at Rumah Sakit Daerah Mangusada, totaling 7.285 patients in 2024.

4. RESEARCH PARTICIPANT

From the population, 25 patients with confirmed DM were selected as study participants through purposive sampling. All participants were informed about the study procedures and provided written informed consent prior to inclusion. The inclusion criteria for this study were patients who had been previously diagnosed with diabetes mellitus (DM), patients undergoing examination who had fasted for 8–10 hours, those with fasting blood glucose (FBG) levels ≥ 126 mg/dL, and individuals who were willing to participate by signing the informed consent form. Conversely, the exclusion criteria included patients with a history of heart disease, infectious diseases, or those who experienced difficulties in communication.

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5. PROCEDURES

Pre-analytical**:** patients were recruited after providing informed consent and receiving explanations regarding the study objectives and procedures. Venous blood samples were collected under standardized conditions. All personnel involved in the sampling process adhered to biosafety protocols by using personal protective equipment (PPE) such as gloves, masks, and laboratory coats. Samples were centrifuged at 3,000 rpm for 10 minutes to separate the serum, which was then transferred to sample cups for further analysis. Analytical**:** serum samples were analyzed in the Clinical Pathology Laboratory of Rumah Sakit Daerah Mangusada using the chemistry analyzer. Fasting blood glucose (FBG) levels were measured using the hexokinase method, while CRP levels were determined using the latex agglutination method. Both assays were performed according to the manufacturer's instructions, following the International Federation of Clinical Chemistry (IFCC) guidelines with a wavelength setting of 340 nm. Post-Analytical**:** results generated by the analyzer were documented in laboratory information system (LIS) records and subsequently validated by a clinical pathologist. In cases where critical values were detected, repeat testing and clinical correlation were performed prior to result validation. Medical waste generated during the study, including sharps and biohazardous materials, was disposed of following the hospital's biosafety and waste management protocols.

6. DATA COLLECTION TECHNIQUES

Data collection was carried out through three main techniques: observation, laboratory examinations and literature review

7. DATA ANALYSIS AND INSTRUMENT

Data analysis was performed using statistical tests to evaluate the relationship between FBG and CRP levels. Normality testing was conducted using the Shapiro–Wilk test and Spearman's rank correlation test was applied. The instruments used in this study included informed consent forms, laboratory equipment (chemistry analyzer,

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centrifuge, vacutainer tubes), data recording sheets, and documentation tools such as cameras and computers for data processing.

RESULT

Table 1. Distribution of Respondents According to Age

Age (years)	Frequency (N)	Percentage (%)
Adult (26 - 44)	2	8
Middle age (45- 59)	8	32
Elderly (60 - 74)	15	60
Total	25	100

As presented in Table 1, the largest proportion of respondents with diabetes mellitus (DM) were classified as elderly (60–74 years), representing 60% (n = 15) of the study sample. Meanwhile, the smallest proportion was observed among adults aged 26–44 years, accounting for only 8% (n = 2).

Table 2. Distribution of Respondents by Gender

Gender	Frequency (N)	Percentage (%)
Male	12	48
Female	13	52
Total	25	100

Based on the data in Table 2, the majority of respondents with diabetes mellitus were female, accounting for 52% (13 individuals).

Table 3. Minimum and Maximum Medical Test Results of Fasting Blood Glucose (FBG) and C-Reactive Protein (CRP) Levels

Medical Test	Minimum Result	Maksimum Result	Mean	Standard Deviation
FBG (mg/dL)	126	319	172.96	51.78
CRP (mg/L)	0,2	23.7	5.276	5.02

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Based on the data in Table 3, the lowest fasting blood glucose (FBG) level was 126 mg/dL, while the highest reached 319 mg/dL. For C-reactive protein (CRP), the lowest value was 0.2 mg/L, and the highest reached 23.7 mg/L.

Table 4. Normality Test

Medical Test	df	Sig.
Fasting Blood Glucose (FBG)	25	0.001
C-Reactive Protein (CRP)	25	0.000

The Shapiro–Wilk test was used to evaluate whether the data were normally distributed. Based on Table 4, the results of the normality test showed significance values of < 0.05 for both examinations, indicating that the data were not normally distributed.

Table 5. Spearman's Rank Correlation Test

		FBG	CRP
FBG	Correlation coefficient	1.000	.493*
	Sig. (2 tailed)	.	.012
	N	25	25
CRP	Correlation coefficient	. 493*	1.000
	Sig. (2 tailed)	.012	.
	N	25	25

Based on Table 5, the significance value (2-tailed) was 0.012 which is less than 0.05, indicating a significant relationship between fasting blood glucose (FBG) levels and C-reactive protein (CRP) levels. The correlation coefficient was 0.493, suggesting a positive relationship with a moderate level of correlation.

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DISCUSSION

Based on Table 1, the largest proportion of respondents with diabetes mellitus (DM) were in the elderly category (60–74 years) accounting for 60% (15 individuals), while the smallest proportion was in the adult age group (26–44 years) accounting for only 8% (2 individuals). This finding is consistent with thesurvey of Riskesdas 2019 survey, which reported that the prevalence of DM in Indonesia is highest among individuals aged ≥55 years. Older adults tend to have greater difficulty controlling blood glucose levels compared to younger individuals. Poor glycemic control in the elderly is mainly attributed to degenerative factors, namely the progressive decline in body functions that affect multiple systems, particularly the endocrine system, resulting in insulin resistance (Purwandari, Wirjatmadi & Mahmudiono, 2022). The physiological decline is related to reduced insulin secretion, which limits the body's capacity to regulate blood glucose levels. These changes begin at the cellular level then extend to tissues eventually impairing organ function and disrupting homeostatic balance. Consequently, pancreatic beta-cell activity in producing insulin decreases alongside diminished cellular sensitivity, particularly in the ability of beta cells to secrete insulin (Imelda, 2018).

As presented in Table 2, the majority of DM respondents were female, accounting for 52% (13 individuals). Female are more likely than men to develop DM. Physiologically, hormonal changes that occur after menopause contribute to increased fat accumulation. A decline in estrogen and progesterone levels can further impair glucose regulation, thereby elevating the risk of DM in women. The reduction of estrogen during menopause is particularly associated with abdominal fat accumulation which triggers an increased release of free fatty acids leading to insulin resistance. In addition, poor glycemic control in women may also be influenced by excessive carbohydrate intake and psychological stress (Ekasari & Dhanny, 2022).

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Excessive carbohydrate consumption leads to increased blood glucose levels as carbohydrates are broken down into monosaccharides, which subsequently raise glucose concentrations in the blood. his condition stimulates insulin production, but when insulin secretion is insufficient, insulin resistance develops. This resistance impedes glucose distribution to peripheral tissues, resulting in hyperglycemia (Ekasari & Dhanny, 2022).

Stress exacerbates this condition by activating the sympathetic nervous system, which alters gluconeogenesis and promotes glycogen breakdown into glucose, thereby elevating blood glucose levels (Sari & Hersianda, 2019). Stress also increases cortisol production, which interferes with insulin action and contributes to hyperglycemia (Ekasari & Dhanny, 2022).

In this study, the lowest fasting blood glucose (FBG) level was 126 mg/dL, while the highest was 319 mg/dL. The lowest CRP level was 0.2 mg/L, whereas the highest was 23.7 mg/L, with standard deviations of 51.78 for FBG and 5.02 for CRP. High FBG and high CRP levels were observed in 44% of respondents (11 individuals), while high FBG with normal CRP levels were found in 56% (14 individuals). The respondent with the highest FBG value (319 mg/dL) also exhibited the highest CRP level (23.7 mg/L), both of which exceeded normal ranges. Hypothesis testing using the non-parametric Spearman's rank correlation revealed a significant association between FBG and CRP levels among DM patients at Rumah Sakit Daerah Mangusada with a significance value (2-tailed) of 0.012 (<0.05). The correlation coefficient of 0.493 indicated a positive and moderate correlation. This suggests that higher FBG levels in DM patients tend to be accompanied by increased CRP levels. These findings highlight that hyperglycemia in DM is associated with systemic inflammatory processes measurable through CRP levels.

The results of this study are consistent with those reported by Kapero, Mahtuti, & Rahmawati (2023) who found that among 30 DM patients with high FBG levels, 29 patients (96.7%) also exhibited elevated CRP levels. Similarly, Suardi et al. (2022)

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reported that DM patients are at risk of increased CRP with 80% (8 out of 10 patients) demonstrating positive CRP results at high FBG levels. In DM, blood glucose is unable to effectively enter tissues due to insulin resistance or beta-cell dysfunction, leading to persistent hyperglycemia as glucose accumulates in circulation. Chronic hyperglycemia stimulates the release of pro-inflammatory cytokines, including interleukin-6 (IL-6), interleukin-1 (IL-1) and tumor necrosis factor-α (TNF-α) from adipose tissue and immune cells. These cytokines, in turn stimulate the liver to synthesize and release CRP as part of the systemic inflammatory response to metabolic stress (Nisa, 2016).

C-reactive protein (CRP) is a well-established acute-phase marker of inflammation associated with tissue damage. This indicates that chronic hyperglycemia has the potential to cause widespread tissue injury, particularly in insulin-dependent tissues while also triggering a chronic inflammatory response such as elevated CRP levels (Nisa, 2016). The increase in CRP is associated with oxidative stress and the accumulation of reactive oxygen species (ROS), which are free radicals generated when oxygen molecules capture unpaired electrons. Excess ROS can damage both large and small blood vessels through inflammatory processes leading to vascular injury and endothelial dysfunction (Situmorang, Waruwu & Napitulu, 2023). These conditions contribute to vascular complications related to atherosclerosis and coronary heart disease. Therefore, CRP may serve as a predictor of complications in patients with DM (Suardi et al., 2022).

CONCLUSIONS

It can be concluded that has a positive relationship with a moderate correlation between blood glucose levels and CRP levels in diabetes mellitus patients at Rumah Sakit Daerah Mangusada.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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REFERENCES

Banjarnahor, E., & Wangko, S. (2012). Sel Beta Pankreas Sintesis dan Sekresi Insulin. *Jurnal Biomedik*, *4*(3), pp. 156–162. Available at: https://ejournal.unsrat.ac.id/index.php/biomedik/article/view/795. Retrieved November 20, 2024.

Dakabesy, M. D. (2024). Gambaran C-Reactive Protein (CRP) dan Kadar Glukosa Darah Puasa Pada Pasien Diabetes Melitus di RSUD Prof. Dr. W. Z. Johannes Kupang. Available at: http://repository.poltekeskupang.ac.id/5028/, Retrieved November 25, 2024.

Dinas Kesehatan. (2021). Profil Kesehatan Provinsi Bali Tahun 2021. Available at https://www.dinkes.denpasarkota.go.id/public/uploads/download/downl oad_222107010739_laporan-profil-dikes-2021.pdf. Retrieved November 20, 2024.

Ekasari, & Dhanny, D. R. (2022). Faktor Yang Mempengaruhi Kadar Glukosa Darah Penderita Diabetes Melitus Tipe II Usia 46-65 Tahun di Kabupaten Wakatobi. *Journal Of Nutrition Collage*, *11*(2), pp. 154–162. Available at https://ejournal3.undip.ac.id/index.php/jnc/article/view/32881. Retrieved April 17, 2025.

Harlan, J., & Sutjiati, R. (2018). Metodologi Penelitian Kesehatan. Jakarta : Universitas Gunadarma.

Hasanah, N., & Ikawati, Z. (2021). Analisis Korelasi Gula Darah Puasa, HbA1c, dan Karakteristik Partisipan. *Jurnal Manajemen dan Pelayanan Farmasi (Journal Of Management And Pharmacy Practice)*, *11*(4), pp. 240 - 253. Retrieved November 17, 2024.

Imelda, Sonta. (2018). Faktor – Faktor Yang Mempengaruhi Terjadinya Diabetes Melitus di Puskesmas Harapan Raya Tahun 2018. *Scienta Journal*, 8 (1), pp. 28 -39. Available at : https://media.neliti.com/media/publications/286563-faktor-faktor-yang-mempengaruhi-terjadin-28cc3637.pdf. Retrieved May 8, 2025.

International Diabetes Federation. (2021). IDF Diabetes Atlas 10th Edition. Available at www.diabetesatlas.org. Retrieved November 20, 2024.

Corresponding author: wilankrisna@ymail.com

Isnaini, N., & Ratnasari. (2018). Faktor Risiko Mempengaruhi Kejadian Diabetes Mellitus Tipe Dua. *Jurnal Kebidanan dan Keperawatan Aisyiyah*, *14*(1), pp. 59–68. Available at: https://ejournal.unisayogya.ac.id/index.php/jkk/article/view/550. Retrieved December 10, 2024.

Kapero, F. W., Mahtuti, E. Y., & Rahmawati, P. Z. (2023). Description Of C-Reactive Protein (CRP) In Patients with Type 2 Diabetes Mellitus at Mulyorejo Health Center In Malang City. *Jurnal Analis Medika Biosains (Jambs)*, *10*(2), pp. 75–81. Available at: https://jambs.poltekkes-mataram.ac.id/index.php/home/article/view/32. Retrieved November 20, 2024.

Kalma. (2018). Studi Kadar C-Reactive Protein (CRP) Pada Penderita Diabetes Melitus Tipe 2. *Jurnal Media Analis Kesehatan*, *1*(1), pp. 62–68. Available at: https://journal.poltekkes-mks.ac.id/ojs2/index.php/mediaanalis/article/view/222. Retrieved November 25, 2024.

Kementerian Kesehatan. (2018). Laporan Riskesdas 2018 Nasional. Jakarta: Lembaga Penerbit Badan Penelitian dan Pengembangan Kesehatan (LPB).

Nisa, H. (2016). Peran C-Reactive Protein Untuk Menimbulkan Risiko Penyakit. *JMI*, *13*(1), pp. 1–8. Available at: https://repository.uinjkt.ac.id/dspace/handle/123456789/32073. Retrieved December 25, 2024.

Permatasari, N. D., Rachmawati, B., Riansari, A., & Limijadi, E. K. S. (2020). Hubungan HbA1c Dengan CRP Pada Penderita Diabetes Melitus Tipe-2 Dengan Obesitas dan Tanpa Obesitas. *Journal Of Nutrition College*, *9*(4), pp. 267–272. Available at: https://ejournal3.undip.ac.id/index.php/jnc/article/view/29011. Retrieved November 22, 2024.

Purwandari, C. A., Wirjatmadi, R. B., & Mahmudiono, Trias. (2022). Faktor Risiko Terjadinya Komplikasi Kronis Diabetes Melitus Tipe 2 Pada Pra Lansia. *Amerta Nutrition,* 6(3), pp. 262-271. Available at: https://e-journal.unair.ac.id/AMNT/article/view/19970. Retrieved May 7, 2025.

Riskesdas. (2019). Laporan Nasional Riset Kesehatan Dasar. Jakarta: Lembaga Penerbit Badan Penelitian dan Pengembangan Kesehatan (LPB).

RSD Mangusada (2023). 10 Penyakit Terbanyak Rawat Jalan di RSD Mangusada Kabupaten Badung Pada Tahun 2022.

RSD Mangusada. (2025). 10 Penyakit Terbanyak Rawat Jalan di RSD Mangusada Kabupaten Badung Pada Tahun 2024.

Sanatang & Syarif, S. (2023). Pemeriksaan Gula Darah Sewaktu (GDS) dan Gula Darah Puasa (GDP) Penderita Diabetes Melitus (DM) di Wilayah Kerja Beberapa Puskesmas Kota Kendari. *Jurnal Pengabdian Saintek Mandala Waluya (JPSMW)*, *3*(2), pp. 9–15. Retrieved November 24, 2024.

Corresponding author: wilankrisna@ymail.com

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https://ejournal.poltekkes-denpasar.ac.id/index.php/icmahs

Situmorang, P. D., Waruwu, N.A., & Napitulu, D. A. (2023). Analisis C-Reactive Protein dan Jumlah Leukosit Pada Pasien Diabetes Melitus Tipe 2 di Rumah Sakit Santa Elisabeth Medan. *Mahesa: Malahayati Health Student Journal*, 3(8), pp. 2355 - 2365. Available at: https://ejurnalmalahayati.ac.id/index.php/MAHESA/article/view/10824. Retrieved May 9, 2025.

Stanimirovic, J., Radovanovic, J., Banjac, K., Obradovic, M., Essack, M., Zafirovic, S., Gluvic, Z., Gojobori, T., & Isenovic, E. R. (2022). Role Of C-Reactive Protein In Diabetic Inflammation. In *Mediators Of Inflammation*, pp. 1–15. Available at: https://pubmed.ncbi.nlm.nih.gov/35620114/. Retrieved November 22, 2024.

Suardi, Arisanti. D., & Kai, K. W. (2022). Deteksi C-Reactive Protein (CRP) Pada Penderita Diabetes Melitus (DM) Di RSUD Labuang Baji Kota Makassar. *Jurnal Medika: Media Ilmiah Analis Kesehatan*, *7*(2), pp. 55–60. Available at: https://jurnal.poltekmu.ac.id/index.php/medika/article/view/325. Retrieved February 21, 2025.

Yusuf, B., Nafisah, S., & Inayah, N. (2023). Literatur Review: Gula Darah Puasa Pada Penyakit Diabetes Melitus. *Pharmacy Medical Journal*, *6*(1), pp. 28–33. Available at: https://ejournal.unsrat.ac.id/v3/index.php/pmj/article/view/47617. diakses pada tanggal 20 Desember 2024.

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