PROCEEDING
5th International Conference of Health Polytechnic of Jambi 2025
icon@poltekkesjambi.ac.id
http://journal.poltekkesjambi.ac.id/index.php/ICoHPJ
doi.org/10.35910/icohpj.v5i0

CORRELATION OF HS-CRP LEVELS AND TOTAL CHOLESTEROL IN PATIENTS WITH TYPE 2 DIABETES MELLITUS AT DR. BRATANATA HOSPITAL JAMBI CITY

Fadhillah Nurul Amalia[1], James P. Simanjuntak[1*], Sholeha Rezekiyah[1]
[1]Medical Laboratory Technology Department, Health Polytechnic of Jambi, Indonesia
[2]PUI-PK Politeknik Kesehatan Kementerian Kesehatan Jambi, Jambi Indonesia
**Corresponding author:* james.p.simanjuntak@poltekkesjambi.ac.id

ABSTRACT

Background: *Type 2 Diabetes Mellitus (T2DM) is associated with disturbances in glucose and lipid metabolism that can trigger systemic inflammation. High-sensitivity C-reactive protein (hs-CRP) is a biomarker commonly used to predict cardiovascular risk, especially when assessed alongside total cholesterol levels. This study aims to investigate the relationship between high-sensitivity C-reactive protein (hs-CRP) levels and total cholesterol in individuals with type 2 diabetes mellitus.*
Method: *This descriptive-analytic study used a cross-sectional design and was conducted at Dr. Bratanata Hospital, Jambi City. The sample consisted of T2DM patients selected through purposive sampling based on inclusion and exclusion criteria. hs-CRP levels were measured using a Wondfo Meter, and total cholesterol was analyzed using an Autolyser BT 3500. Statistical tests were conducted to determine the relationship between the variables.*
Result: *The average hs-CRP level was 4.25 mg/L, and the average total cholesterol was 218 mg/dL. There was no significant correlation between hs-CRP and total cholesterol levels ($p > 0.05$). The regression plot suggested a possible negative trend, the correlation was weak and not statistically significant.*
Conclusion: *There is no significant correlation between hs-CRP and total cholesterol levels in T2DM patients at Dr. Bratanata Hospital, Jambi City.*

Keywords: *Diabetes Mellitus; Total Cholesterol; hs-CRP, Inflammation*

INTRODUCTION

Diabetes Mellitus (DM) is a chronic condition that happens when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin it does produce. Insulin plays a vital role in regulating blood glucose levels (WHO, 2023). Based on its underlying causes, DM is classified into two main types. Type 1 diabetes is caused by damage to the pancreatic beta cells, resulting in no insulin production. Meanwhile, type 2 diabetes — the more common form — is caused by a decline in insulin secretion from the pancreas (Kemenkes RI, 2020).

In individuals with diabetes, glucose metabolism—mainly from dietary carbohydrates like sugars and starches—is impaired. This is due to insulin dysfunction, which prevents glucose from being properly absorbed by cells, leading to elevated blood sugar levels, or hyperglycemia (Luhovyy & Kathirvel, 2022). This persistent state can affect nearly every tissue in the body, especially those sensitive to insulin. Hyperglycemia is known to trigger oxidative stress and inflammation, prompting the liver to produce C-reactive Protein (CRP), a marker of inflammation (Yerizel et al., 2015).

CRP is a key player in the acute-phase inflammatory response and is commonly used

as a biomarker for inflammation. One advanced method for measuring CRP is high-sensitivity C-reactive protein (hs-CRP), which can detect even very low levels of CRP, making it especially useful in predicting systemic inflammation and cardiovascular risk (Ridker, 2016). As a marker of systemic inflammation, CRP is also recognized as an independent risk factor for several cardiovascular diseases. Its predictive power becomes even more significant when assessed alongside cholesterol levels (Ansar, 2016).

There is a strong link between cholesterol and glucose metabolism in people with diabetes. Disruptions in cholesterol absorption and synthesis often reflect the severity of insulin resistance (Anggraini, 2018). Cholesterol is essential for the body in limited amounts, as it supports cellular function. It is normally kept in balance through synthesis and breakdown (Mailangkay et al., 2015). However, elevated cholesterol levels can lead to atherosclerosis, which may block blood vessels. Inflammation plays a central role in this process, often accompanied by increases in both CRP and cholesterol levels (Djamin, 2020).

Research on the relationship between hs-CRP levels and total cholesterol has yielded mixed results. Djamin (2020) reported a weak correlation between the two, suggesting that hs-CRP may not have a significant role in raisinSg cholesterol levels. On the other hand, studies by Muniyal et al. (2022) and Meriga et al. (2020) found a strong association, indicating a potential link to higher atherosclerosis risk and cardiovascular complications.

Based on prior research and the mixed results of DM cases, the author is interested in further exploring the correlation Between hs-CRP Levels and Total Cholesterol in Patients with Type 2 Diabetes Mellitus at Dr. Bratanata Hospital Jambi City.

METHOD

This study is a descriptive-analytic research utilizing a cross-sectional design. It aims to investigate the relationship between high-sensitivity C-reactive protein (hs-CRP) levels and total cholesterol in individuals with type 2 diabetes mellitus. The study population and sample consisted of patients diagnosed with type 2 diabetes mellitus, with data collection from 40 respondents and analysis conducted at Dr. Bratanata Hospital between November 30 and December 7, 2024. The instruments used in this study included Wondfo meter for analyzing hs-CRP levels and Autolyser BT 3500 for measuring cholesterol levels.

Primary data were collected through purposive sampling, which applied specific inclusion and exclusion criteria.

Inclusion criteria included:

1. Patients who were willing to participate as respondents and had signed an informed consent form.
2. Patients who had been clinically diagnosed with type 2 diabetes mellitus, as confirmed by their medical records.

Exclusion criteria included:

1. Pregnant women
2. Patients with diabetes mellitus who had known complications such as tuberculosis, HIV, anemia, and others

The research of this study has obtained an ethical approval from the Ethics Committee at the Jambi Ministry of Health Poltekkes.

RESULTS AND DISCUSSION

3.1 Respondent Characteristics

In this study, the author's research findings about respondent characteristics including demographic attributes. The demographic distribution is presented graphically below.

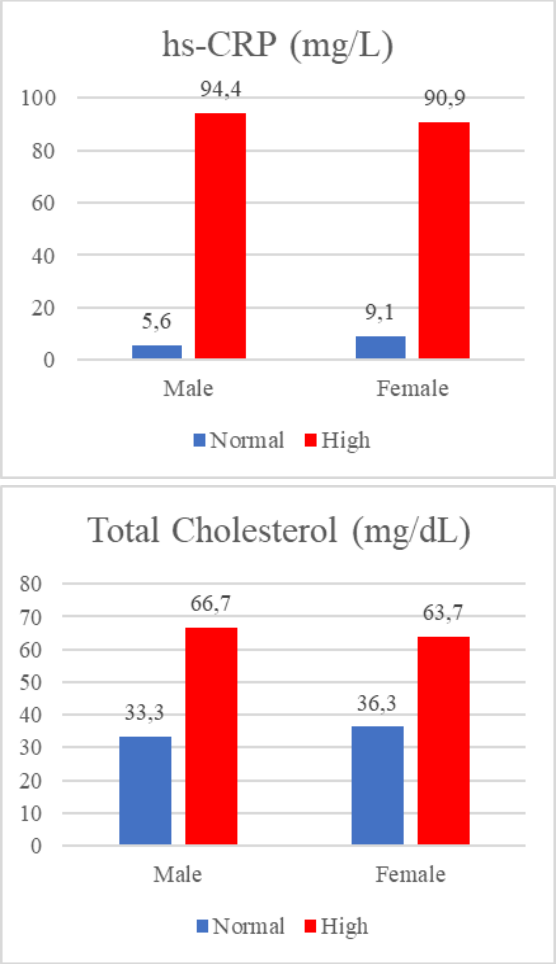

Figure 1. Distribution Based on Gender

Tabel 1. Results of Examination Based on Gender

HsCRP	N	Mean	Min	Max	SD	P-value
Male	18	4.31	0.8	5.1	1.20	0.386
Female	22	4.20	0.5	5.1	1.29	
Total Cholesterol						
Male	18	222.6	137	275	39.05	0.266
Female	22	214.7	120	301	39.12	

The distribution of hs-CRP and total cholesterol levels based on gender. The boxplot for hs-CRP shows a relatively similar distribution between males and females, with an average of 4.31 mg/L in males and 4.22 mg/L in females (p = 0.386), indicating no statistically significant difference. In the total cholesterol boxplot, females had a slightly higher median compared to males. The mean total cholesterol level was 222.6 mg/dL in males and 214.7 mg/dL in females (p = 0.266), also indicating no significant difference.

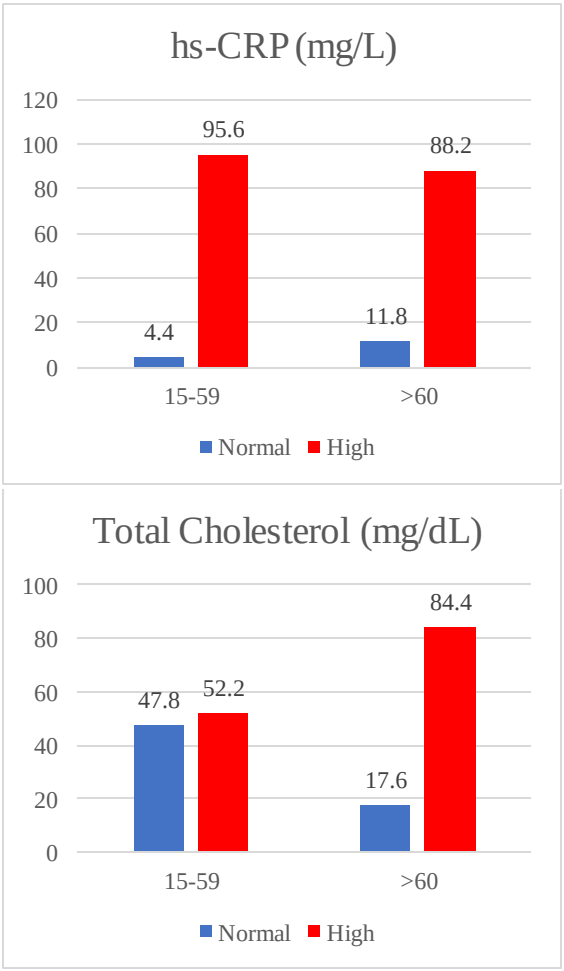

Figure 2. Distribution Based on Age

Table 2. Results of Examination Based on Age

HsCRP	N	Mean	Min	Max	SD	P-value
19 - 59	23	4.3	0.9	5.1	1.08	0.319
>60	17	4.1	0.5	5.1	1.44	
Total	40	4.2	0.5	5.1	1.26	
Total Cholesterol						
19 - 59	23	206	120	260	32.58	0.012
>60	17	234	137	301	41.85	
Total	40	220	120	301	14.8	

The distribution of hs-CRP and total cholesterol levels based on age group. The hs-CRP boxplot reveals similar distributions between the two groups, with a mean of 4.3 mg/L for individuals aged 19–59 years and 4.1 mg/L for those aged over 60 years (p = 0.319), suggesting no significant difference. In contrast, the total cholesterol boxplot shows a higher median in the >60 years group. The

mean cholesterol level was 206 mg/dL in the 19–59 years group and 236 mg/dL in the >60 years group (p = 0.012), indicating a statistically significant difference.

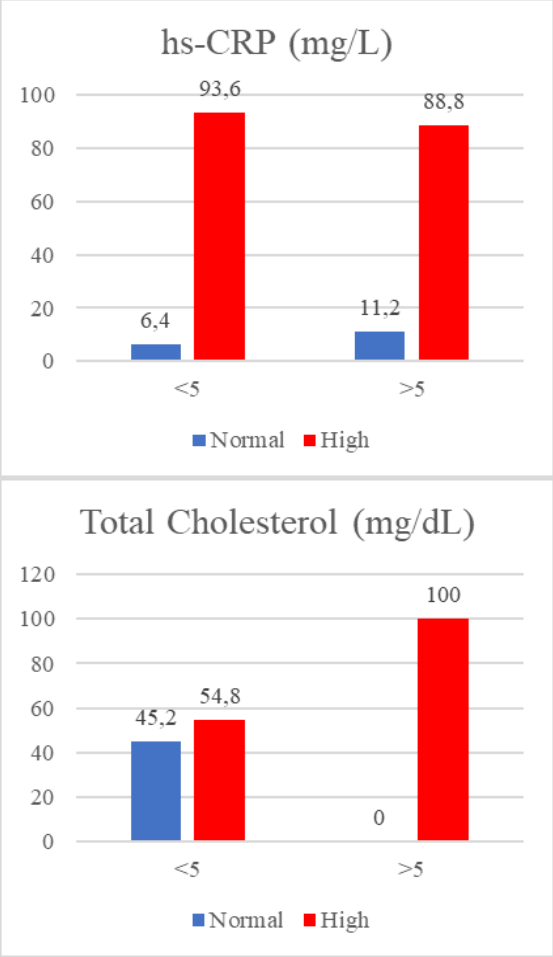

Figure 3. Distribution Based on Duration of Illness

Table 3. Results of Examination Based on Duration of Illness

HsCRP	N	Mean	Min	Max	SD	P-value
<5	31	4.35	0.8	5.1	1.14	0.164
>5	9	3.88	0.5	5.0	1.53	
Total	40	4.11	0.5	5.1	1.33	
Total Cholesterol						
<5	31	213	120	275	37.62	0.093
>5	9	233	190	301	41.16	
Total	40	223	120	301	39.39	

The distribution of hs-CRP and total cholesterol levels based on the duration of type 2 diabetes. The mean hs-CRP level was higher in patients with a disease duration of less than 5 years (4.35 mg/L) compared to those with more than 5 years (3.88 mg/L), although the difference was not statistically significant (p = 0.164). For total cholesterol, patients with a disease duration of more than 5 years had a higher mean level (233 mg/dL) compared to those with less than 5 years (213 mg/dL), but the difference was also not statistically significant (p = 0.093).

3.2 Correlation of hs-CRP Levels and Total Cholesterol in Patients with Type 2 Diabetes Mellitus at Dr. Bratanata Hospital Jambi City

The correlation analysis is presented in the figure below. Prior the test, data normality was assessed using the Shapiro-Wilk test, hs-CRP showed a p-value ≤ 0.05, while total cholesterol had a p-value > 0.05, indicating non-normal distribution. Therefore, the non-parametric Spearman correlation test was applied.

Table 4. Results of Correlation Spearman

Parameter	n	Mean	Median	Minimal-maximal	sd	Koefisien Korelasi	P
hs-CRP	40	4.25	4.9	0.5 – 5.1	1.2	-0.249	0.121
Kolesterol total	40	218.3	211.5	120.0 – 301.0	38.7		

Table 4 presents the Spearman correlation results between hs-CRP and total cholesterol levels among 40 patients with type 2 diabetes mellitus. The mean hs-CRP level was 4.25 mg/L, while the mean total cholesterol level was 218.3 mg/dL. Spearman correlation analysis revealed a weak negative correlation (r = -0.249) between hs-CRP and total cholesterol, which was not statistically significant (p = 0.121).

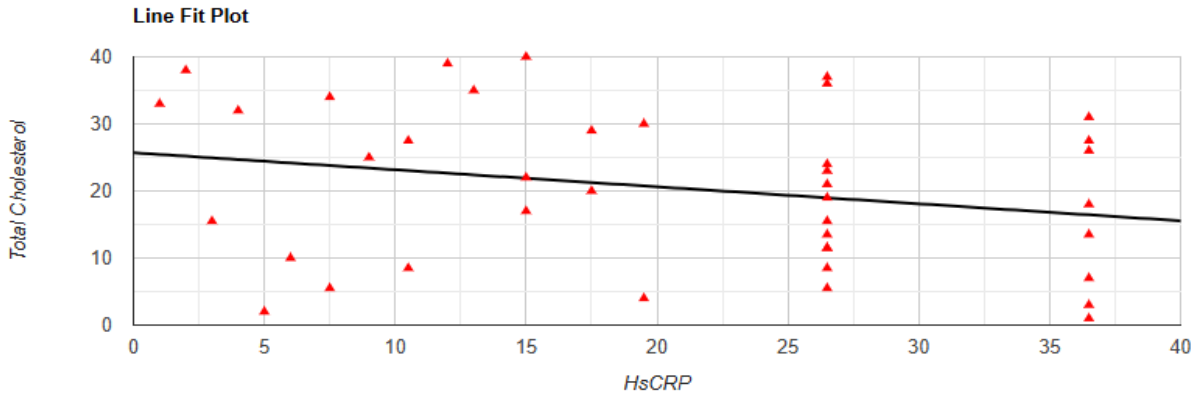

Figure 4. Results of Correlation Spearman

The correlations of hs-CRP levels (X) and total cholesterol levels (Y), with a linear regression line shown in black. Overall, the regression line has a negative slope, suggesting a potential inverse relationship between the two variables. In other words, as hs-CRP levels increase, total cholesterol levels tend to decrease. However, the wide spread of data points and the lack of a clear pattern indicate that this relationship may be weak or highly variable. Therefore, there is insufficient evidence to confirm a linear association between these two variables based on the findings of this study.

The studies conducted by Muniyal et al. (2022) and Meriga et al. (2020) reported contrasting findings, showing a significant positive association between hs-CRP levels and lipid parameters, specifically total cholesterol in patients with type 2 diabetes. In those studies, patients with hs-CRP levels above 3 mg/L tended to have higher total cholesterol levels, suggesting that increased systemic inflammation may be accompanied by elevated blood lipid levels.

These differing results may be due to variations in subject characteristics, such as medication use, glycemic control, statistical analysis methods, laboratory measurement techniques, sample size, and the inclusion and exclusion criteria applied. Additionally, the current study involved patients at the primary care level, many of whom may have already been receiving treatment or therapy, potentially resulting in lower observed cholesterol levels despite elevated hs-CRP values.

CONCLUSION

Based on research, we concluded that the average hs-CRP level in patients with type 2 diabetes mellitus at Dr. Bratanata Hospital, Jambi City, is 4.25 mg/L, The average total cholesterol level in patients with type 2 diabetes mellitus at Dr. Bratanata Hospital, Jambi City, is 218 mg/dL, and there is No significant relationship was found between hs-CRP levels and total cholesterol in patients with type 2 diabetes mellitus at Dr. Bratanata Hospital, Jambi City.

ACKNOWLEDGMENT

The author would like to extend gratitude to the lecturer of Medical Technology Laboratory, Health Polytechnic of Jambi for the invaluable assistance, direction, guidance, and insightful suggestions that greatly contributed to the seamless progression of this writing process.

CONFLICT OF INTEREST

The author declares there is no conflict of interest during this study.

REFERENCES

World Health Organization. (2023, 5 April). Diabetes. https://www.who.int/news-room/fact-sheets/detail/diabetes

Kemenkes RI. (2020). Infodatin 2020 Diabetes Melitus, Pusat dan Informasi Kementerian Kesehatan RI. Available at: https://pusdatin.kemkes.go.id/download.php?file=download/pusdatin/infodatin/Infodatin-2020-DiabetesMelitus.pdf

Luhovyy, B. L., & Kathirvel, P. (2022). Food proteins in the regulation of blood glucose control. Advances in Food and Nutrition Research, 102, 181–231. https://doi.org/10.1016/BS.AFNR.2022.05.001

Yerizel, E., Hendra, P., Edward, Z., Bachtiar, H. (2015). Pengaruh Hiperglikemia terhadap High Sensitive C-Reactive Protein (hsCRP) pada Penderita Diabetes Melitus Tipe 2. Prosiding Seminar Ilmiah PBBMI, 51-55. (n.d.).

Ridker, P. M. (2016). THE PRESENT AND FUTURE REVIEW TOPIC OF THE WEEK A Test in Context High-Sensitivity C-Reactive Protein. http://www.acc.org/jacc-journals-cme

Ansar, W., & Ghosh, S. (2016). Biology of C Reactive Protein in Health and Disease. Springer India. ISBN 978-81-322-2678-9.

Meriga, R, K., Nareddy, V, A., Bhavya, S, V, S, S., & Sreekeerthi, C. (2020). Correlation between glycemic control, lipid profile and C-reactive protein in adults with type 2 diabetes mellitus done in a tertiary care hospital of Nellore, Andhra Pradesh, India. International Journal of Advances in Medicine. https://doi.org/10.18203/2349-3933.ijam20203513

Muniyal, H., Jheetay, S., & Mishra, A. (2022). Association between high-sensitivity C-reactive protein and lipid profile in patients with type 2 diabetes mellitus. International Journal of Health Sciences, 9541–9554. https://doi.org/10.53730/ijhs.v6ns6.12490

Djamin, R. D., Hanifah M., Zelly D.R., & Efrida. (2020). Korelasi Kadar HighSensitivity C-Reactive Protein Dengan Kadar Low Density Lipoprotein Pada Obesitas. Jurnal Human Care. 5(3) : 676-681

Anggraini, R. (2018). Korelasi kadar kolesterol dengan kejadian Diabetes Mellitus Tipe 2 pada laki-laki. Medical and Health Science Journal, 2(2), 55-60.

Mailangkay, M., Mewo, Y, M., & Tiho, M. (2015). HUBUNGAN KADAR KOLESTEROL TOTAL DARAH DENGAN KADAR HIGH SENSITIVITY C-REACTIVE PROTEIN PADA REMAJA OBES. Jurnal Kedokteran Komunitas dan Tropik : Volume III