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 NEUTROPHIL LYMPHOCYTE RATIO (NLR) AND HIGH SENSITIVITY C-REACTIVE PROTEIN (HS-CRP) LEVELS IN PATIENTS CORONARY HEART DISEASE (CHD) AT DR. BRATANATA HOSPITAL JAMBI CITY

**Restu Farizki[1], Siti Sakdiah[1,2*], Eka Fitriana[1,2]**
[1]Medical Laboratory Technology Department, Health Polytechnic of Jambi, Indonesia
[2]PUI-PK, Politeknik Kesehatan Kementerian Kesehatan Jambi, Jambi, Indonesia
*Coresponding author: sitisakdiah@poltekkesjambi.ac.id*

## ABSTRACT

***Introduction:*** *Coronary Heart Disease (CHD) is a disorder of heart function caused by reduced blood supply to the heart muscle, resulting in blockage of the coronary arteries due to plaque formation that known as atherosclerosis, this condition is caused by hypercholesterolemia which can induce Granulocyte-Colony Stimulating Factor (G-CSF) so that neutrophil extravasation occurs, a condition of increased neutrophil levels in the body. Increased atherosclerosis leads to apoptosis, resulting in elevated neutrophil levels and reduced lymphocyte levels in the blood, thereby affecting the Neutrophil Lymphocyte Ratio (NLR), which reflects an individual's immune status. Blood cells adhere to form atherosclerotic cell aggregates, stimulating active inflammatory cells. Inflammation can be detected by the biomarker High Sensitivity C-Reactive Protein (Hs-CRP).*
***Methods:*** *This descriptive-analytic study used a cross-sectional design and population comprised 30 CHD patients at Dr. Bratanata Hospital Jambi. The sample were selected by using purposive sampling, based on inclusion and exclusion criteria. Hs-CRP levels were measured using a Wondfo Meter and NLR was measured using the Mindray Hematology Analyzer. Statistical tests were conducted to determine the relationship between the variables.*
***Results:*** *The average NLR was 7.82 and also the average Hs-CRP level was 4.94 mg/L. But there was no significant correlation between NLR and Hs-CRP levels in CHD patients. Although the regression plot suggested a possible positive trend but still not statistically significant.*
***Conclusion:*** *There is no significant correlation between NLR and Hs-CRP levels in CHD patients at Dr. Bratanata Hospital Jambi.*

***Keywords:*** *Coronary Heart Disease, Hs-CRP, NLR, Inflammation*

## INTRODUCTION

Coronary Heart Disease (CHD) is classified under the global burden of disease and is a cardiovascular disorder where the heart and blood vessels fail to function properly (Linda & Rahayu, 2021; Saesarwati & Satyabakti, 2017). It is caused by a lack of blood supply to the heart muscle, leading to blockage or narrowing of the coronary arteries due to plaque buildup that is called atherosclerosis, resulting in reduced blood flow and oxygen insufficiency (Kemenkes RI, 2021).

In CHD patients, endothelial dysfunction combined with risk factors leads to a prolonged increase in lipids in the arteries, induced by *hypercholesterolemia*, which stimulates *Granulocyte-Colony Stimulating Factor* (G-CSF), chromatin in granulopoiesis and elevates *Chemokine CXC Ligand* (CXCL) 1 levels, affecting neutrophil migration via *Chemokine CXC Receptor* (CXCR) 2. Increased TNF and IL-17 levels result in neutrophil extravasation, a condition where neutrophil levels rise. Atherosclerosis progression also causes *apoptosis*, leading to reduced lymphocyte levels (Drechsler et al., 2010). The *Neutrophil*

*Lymphocyte Ratio* (NLR) combines the roles of two leukocyte subtypes into one predictive factor that significantly contributes to the inflammatory process underlying atherosclerosis (Aufa et al., 2021).

Blood cells adhere to form atherosclerotic aggregates, stimulating active inflammatory cells. *C-Reactive Protein* (CRP) is an acute-phase protein synthesized by hepatocytes and circulated in the blood, making it a highly sensitive marker for inflammatory stimuli (Nugraha & Badrawi, 2018). High Sensitivity C-Reactive Protein (Hs-CRP) testing is a sensitive assay for detecting cardiovascular disease risk and serves as a biomarker for systemic inflammation (Aipassa et al., 2023).

Previous studies by Aufa et al. (2021) and Aipassa et al. (2023) demonstrated a positive correlation between NLR and coronary artery stenosis severity. However, Sharma et al. (2017) reported that NLR values were significantly higher and more reliable than Hs-CRP as a marker for coronary artery disease.

Based on previous studies on CHD cases, the author is interested in further investigating the correlation between NLR values and Hs-CRP levels in CHD patients at Dr. Bratanata Hospital Jambi.

## METHODS

This study used a descriptive-analytic design with a cross-sectional approach to examine the relationship between Neutrophil Lymphocyte Ratio (NLR) and High Sensitivity C-Reactive Protein (Hs-CRP) levels in CHD patients. The study population comprised 30 CHD patients receiving inpatient and outpatient care who met the inclusion and exclusion criteria at Dr. Bratanata Hospital, Jambi. The research was start from December 10, 2024, until January 20, 2025. Hs-CRP levels were measured using a Wondfo meter (mg/L) and NLR was measured using the Mindray Hematology Analyzer. Primary data were collected through purposive sampling.

**Inclusion criteria:**

- Diagnosed CHD patients (IMA (Acute Myocardial Infarction) STEMI (ST Elevation Myocardial Infarctio), UAP (Unstable Angina Pectoris)) based on medical records and had an signed an informed consent
- Aged over 18 years

**Exclusion criteria:**

- CHD patients with a history of hematological malignancies (leukemia) or carcinoma/cancer, and still chemotherapy
- CHD patients who had known complications such as TB, HIV/AIDS, Hepatitis, or Rheumatoid infections

This research obtained ethical approval from the Ethics Committee of the Jambi Ministry of Health Polytechnic.

## 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.

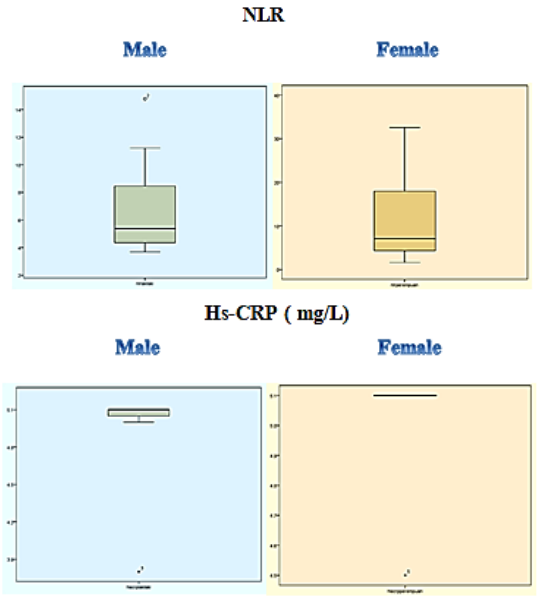


**Figure 1.** Distribution Based on Gender

**Tab1e 1.** Result of Examination based on gender

| NLR | N | Mean | Min | Max | SD | P-Value |
|---|---|---|---|---|---|---|
| Male | 23 | 7.07 | 3.69 | 14.78 | 4.23 | |
| Female | 7 | 12.26 | 1.64 | 32.59 | 12.73 | 0.052 |
| Total | 30 | 9.66 | 1.64 | 32.59 | 8.48 | |
| **Hs-CRP** | | | | | | |
| Male | 23 | 4.92 | 3.8 | 5.1 | 0.35 | 0.582 |
| Female | 7 | 5.01 | 4.5 | 5.1 | 0.22 | |
| Total | 30 | 4.96 | 3.8 | 5.1 | 0.28 | |

Distribution of NLR values with Hs-CRP levels by gender. In the NLR box plot, women have slightly higher medians and means compared to men. The mean NLR for men is 7.07 and the mean NLR for women is 12.26 (p = 0.052) and shows no significant difference. The box plot for Hs-CRP shows a relatively similar distribution between men and women, with a mean of 4.92 mg/L for men and 5.01 mg/L for women (p = 0.582) which also indicating no statistically significant difference.

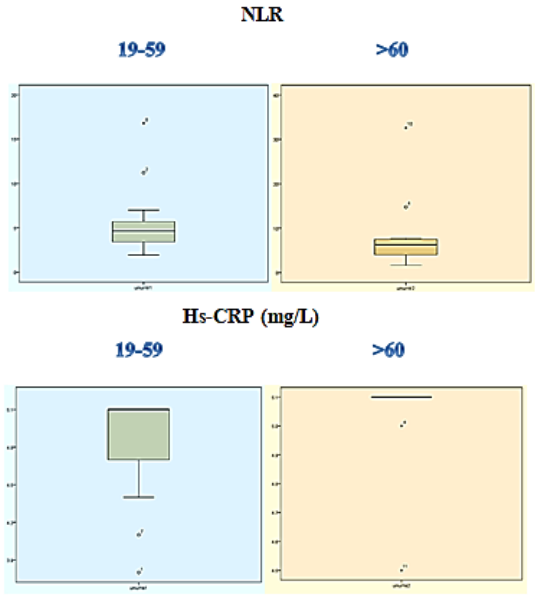


**Figure 2.** Distribution Based on Age

**Table 2.** Result of Examination Based on Age

| NLR | N | Mean | Min | Max | SD | P-Value |
|---|---|---|---|---|---|---|
| 19-59 | 13 | 5.64 | 1.93 | 16.79 | 4.13 | |
| >60 | 17 | 7.90 | 1.64 | 32.59 | 8.15 | 0.426 |
| Total | 30 | 6.77 | 1.64 | 32.59 | 6.14 | |
| **Hs-CRP** | | | | | | |
| 19-59 | 13 | 4.79 | 3.8 | 5.1 | 0.438 | |
| >60 | 17 | 5.04 | 4.5 | 5.1 | 0.166 | 0.734 |
| Total | 30 | 4.91 | 3.8 | 5.1 | 0.302 | |

Distribution between NLR values and Hs-CRP levels based on age groups. The NLR box plot shows that the median and mean are higher in the age group above 60 years. The mean NLR value in the 19-59 age group is 5.64 while in the age group above 60 years is 7.90 (p = 0.426) but the difference is also not statistically significant. The hs-CRP box plot shows a nearly similar distribution between the two groups, with a mean of 4.97 mg/L for individuals aged 19-59 years and 5.04 mg/L for individuals aged above 60 years (p = 0.734) indicating no statistically significant difference.

### 3.2 Correlation between NLR values and Hs-CRP levels in coronary heart disease patients at Dr. Bratanata Hospital, Jambi

Correlation analysis is presented in the table below. Before processing, the data was assessed with a normality test using the Shapiro Wilk test. NLR showed a p-value ≤ 0.05 and Hs-CRP showed a p-value ≤ 0.05 which indicated that the data had an abnormal distribution. Therefore, the non-parametric Spearman correlation test was applied in this data processing.

**Table 3.** Spearman correlation test results

| | N | Mean | Median | Min - Max | SD | Coeffisien Correlation | P-Value |
|---|---|---|---|---|---|---|---|
| NLR | 30 | 7.82 | 5.29 | 1.64-32.59 | 1.34 | 0.258 | 0.168 |
| Hs-CRP | 30 | 4.94 | 5.1 | 3.8-5.1 | 0.06 | | |

Table 4 presents the results of the Spearman correlation between Hs-CRP and NLR values in 30 Coronary Heart Disease patients at Bratanata Hospital, Jambi. The average Hs-CRP level was 4.94 mg/L while the average NLR value was 7.82. Spearman correlation analysis revealed a correlation (Rho = 0.258) between NLR and Hs-CRP which was statistically insignificant (p = 0.168)

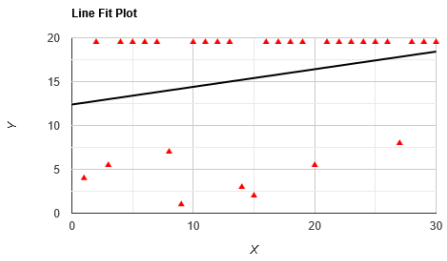


**Figure 3.** Result of Correlation Spearman

Correlation of NLR (X) and Hs-CRP (Y) levels, with a linear regression line shown in black. Overall, the regression line has a positive slope, indicating a potential positive relationship between variable X and variable Y, in other words, if the X value increases, it is followed by an increase in the Y value. However, the diverse distribution of data points suggests that this relationship may be weak or highly variable. Therefore, there is insufficient evidence to confirm a linear relationship between these two variables based on this study.

Research that published by Aufa et al. (2021) and Aipassa et al. (2023) reported research results showing a significant positive relationship between NLR values and Hs-CRP levels in coronary heart disease patients. In this study, the average patient who had Hs-CRP levels above 3 mg/L tended to have higher NLR values and showed that increased systemic inflammation could be accompanied by increased Neutrophils and lymphocytes in the body.

The results in this study differed, possibly due to many factors, starting from variations in subject characteristics such as the classification of coronary heart disease patients, the length of time the patient has suffered from coronary heart disease, the treatment or therapy that has been undergone, complications experienced by the patient, statistical analysis methods, parameter measurement techniques in the laboratory, sample size, and the inclusion and exclusion criteria applied.

## CONCLUSION

1. The average NLR in CHD patients at Dr. Bratanata Hospital Jambi is 7.82.
2. The average Hs-CRP level in CHD patients at Dr. Bratanata Hospital Jambi is 4.94 mg/L.
3. There was no significant correlation between NLR and Hs-CRP levels among CHD patients at Dr. Bratanata Hospital, Jambi.

## ACKNOWLEDGMENT

The author extends heartfelt gratitude to Mrs. Siti Sakdiah, SKM, M.Biomed, and Mrs. Eka Fitriana, S.Si, M.Kes for their guidance, motivation, invaluable assistance, insightful suggestions, and moral support, which greatly contributed to the successful completion of this writing process.

## CONFLICT OF INTEREST

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

## REFERENCES

Aipassa, I., AP, P., & Limijadi, I. E. K. S. (2023). Hubungan Jumlah Leukosit, Rasio Neutrofil Limfosit Dan Rasio Monosit Limfosit Dengan Derajat Stenosis Koroner Pada Penyakit Jantung Koroner. *Medika Alkhairaat : Jurnal Penelitian Kedokteran Dan Kesehatan*, *5*(3), 172–178. https://doi.org/10.31970/ma.v5i3.144

Aufa, J., Woelansari, E. D., & Suhariyandi. (2021). Analisis Nilai Rasio Neutrofil Limfosit Terhadap Kadar High-Sensitivity C-Reactive Protein Pada Pasien Penyakit Jantung. *Poltekkes Kemenkes Surabaya, Teknologi Laboratorium Medis*.

Linda, O., & Rahayu, L. S. (2021). Prevensi awal dan lanjutan penyakit Degeneratif untuk usia dewasa dimasa pandemi covid-19. *Jurnal Arsip Pengabdian Masyarakat*, *2*(1), 107–115.

Nugraha, G. (2017). *LIPID klasifikasi, metabolisme, aterosklerosis dan analisis laboratorium* (Edisi Pert). CV.Trans Info Media.

Saesarwati, D., & Satyabakti, P. (2017). Analisis Faktor Risiko Yang Dapat Dikendalikan Pada Kejadian Pjk Usia Produktif. *Jurnal PROMKES*, *4*(1), 22. https://doi.org/10.20473/jpk.v4.i1.2016.22-33

Sharma, K., Patel, A. K., Shah, K. H., & Konat, A. (2017). Is Neutrophil-to-Lymphocyte Ratio a Predictor of Coronary Artery Disease in Western Indians? *International Journal of Inflammation*, *2017*. https://doi.org/10.1155/2017/4136126

Kemenkes RI. (2021). *Yuk kenali apa itu penyakit jantung koroner PJK*. https://p2ptm.kemkes.go.id/infographic/yuk-kenali-apa-itu-penyakit-jantung-koroner-pjk

Drechsler, M., Megens, R. T. A., Zandvoort, M. Van, Weber, C., & Soehnlein, O. (2010). *Early Atherosclerosis*. https://doi.org/10.1161/CIRCULATIONAHA.110.961714