

## OVERVIEW OF MONOCYTE TO HDL CHOLESTEROL RATIO (MHR) IN PATIENTS WITH CORONARY HEART DISEASE (CHD)

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### ABSTRACT

**Background:** Coronary Heart Disease (CHD) is a disease caused by plaque that accumulates in the coronary arteries, causing narrowing or blockage of blood flow that supplies oxygen (O<sub>2</sub>) to the heart muscle. Monocytes accumulate in myocardial tissue experiencing hypoxia and play a role in the formation of atherosclerotic plaque. On the other hand, High-Density Lipoprotein (HDL) is known to reduce the accumulation of macrophages and prevent oxidized cholesterol from entering the artery walls. In the process of healing CHD, the number of monocytes decreases and HDL-cholesterol increases. This study aims to show the potential of the monocyte to HDL Cholesterol ratio as a marker for the prognosis of CHD patients.

**Method:** This study used a case-control research design with a research sample of 50 CHD patients and 50 MCU patients at Bhayangkara Hospital, Jambi City.

**Result:** From the results of the examination, the average monocyte cell count was 461.5 cells/ $\mu$ L, HDL-Cholesterol= 48.1 mg/dL and MHR value= 9.6. Meanwhile, in MCU patients, monocytes were 398 cells/ $\mu$ L, HDL-Cholesterol= 50.4 mg/dL and MHR value= 8.1.

**Conclusion:** The MHR value of CHD patients was significantly higher than that of MCU patients. MHR appears to have good potential in the prognosis of CHD patients.

**Keywords:** Monocytes, HDL, Coronary Heart Disease Patients

### INTRODUCTION

Coronary Heart Disease (CHD) is one of the cardiovascular diseases that causes disruptions in the functioning of the heart and blood vessels. This disease is caused by the accumulation of plaque within the coronary arteries, leading to narrowing or blockage of the blood flow supplying oxygen (O<sub>2</sub>) to the heart muscle (Smeltzer, S.C. & Bare, B.G, 2015). Cardiovascular diseases result in more deaths worldwide than any other disease, making them a leading global cause of mortality, with Coronary Heart Disease (CHD) being one of its types. CHD is a cardiovascular disease that obstructs blood flow to the heart muscle due to blockage of blood vessels resulting from atherosclerosis, spasms, or a combination of both (Ma'rufi, 2014).

Cardiovascular diseases are a major global cause of death. In 2019, it was estimated that 17.9 million people died from cardiovascular diseases. The leading cause of death among cardiovascular diseases worldwide is heart disease, responsible for 16% of total global deaths. In the year 2000, there was an increase in cardiovascular disease-related deaths, reaching over 2 million compared to 8.9 million in 2019 according to WHO (2021).

The pathophysiology of coronary heart disease (CHD), also known as ischemic heart disease (IHD), is characterized by a decrease in blood flow in the coronary vessels as a result of thrombus formation inside the coronary blood vessels (Kumar V, 2014; Albakri, 2018). An key contributor to the development of coronary artery disease is dyslipidemia. Low-Density

Lipoprotein (LDL) and cardiovascular disease have been linked in a number of studies, however the functions of triglycerides and HDL are still debatable. Chest pain or a tightness for longer than 20 minutes during physical activity or during rest are the common indications and symptoms of CHD, along with symptoms like cold sweats, weakness, nausea, and dizziness (Ministry of Health, Republic of Indonesia, 2020). CHD may lead to functional impairment for patients. Individuals with CHD often experience characteristic chest pain that radiates to the neck, jaw, arms, wrists, shoulder blades, abdomen, and back (Wihastuti, T. A., Andarini, S., & Heriansyah, 2016).

According to a study by Lou et al. (2020), it is stated that high levels of the Low-Density Lipoprotein (LDL) to High-Density Lipoprotein (HDL) cholesterol ratio can significantly increase the thickening of the carotid intima-media. The LDL/HDL cholesterol ratio profile is a better predictor of showing the progression of carotid artery intima-media thickness compared to single lipid parameter measurements. In cases where patients have low HDL levels, this reduces the protective effect against atherosclerosis, leading to an increased risk of vascular disorders (van de Woestijne et al., 2013) (Ndrepepa, 2021). This is supported by research conducted by the Multi-Ethnic Study of Atherosclerosis (MESA), which found that patients with low HDL levels have a higher risk of developing Coronary Heart Disease (CHD) compared to patients with an optimal lipid profile (Ahmed et al., 2016).

One of the pathogenic factors in atherosclerosis is the inflammatory process. The pro-inflammatory effects of monocytes and the anti-inflammatory effects of HDL can be used as markers of the body's inflammatory status. Currently, Monocyte-to-HDL Ratio (MHR) can be used as a novel predictive and prognostic marker in cardiovascular diseases (Uslu, 2018; Sirin,

2020). Both of these tests are readily available in laboratories and are routinely performed on CHD patients. Based on data from Bhayangkara Hospital Jambi, where there has been an increase in patients with a history of Coronary Heart Disease (CHD) in 2021, totaling 55 patients, and this number has increased to 70 patients diagnosed with CHD in 2023, based on the background mentioned above, the researcher aims to investigate "The Monocyte-to-HDL Cholesterol Ratio in Coronary Heart Disease (CHD) patients at Bhayangkara Hospital Jambi in 2023".

## METHOD

This study used quantitative research with a cross-sectional analytic study design, utilizing a case-control research design with a research sample consisting of 50 coronary heart patient and 50 MCU (Medical Check-Up) Patients at Bhayangkara Hosspot, Jambi City. The study was conducted from January to April 2023, and statistical analysis was performed using Independent T-test.

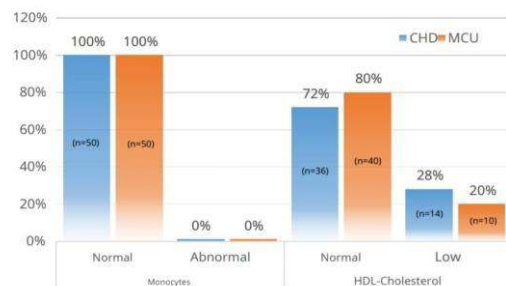
## RESULT AND DISCUSSION

In this research, the results are obtained from secondary data, all of which were obtained from the Hospital Information System (SIMRS) at Bhayangkara Hospital in Jambi City. The data were collected as planned in the research proposal, covering the period from January to April 2023. This dataset includes patients diagnosed with Coronary Heart Disease (CHD) and patients undergoing medical check-ups (MCU) during the research period. A total of 50 data points from CHD patients and 50 data points from MCU patients were analyzed in this study based on their laboratory test results recorded in their medical records. These laboratory tests include the monocyte count per uL (absolute value) obtained from Hematology-Analyzer equipment and serum

examination using a photometer for determining HDL-cholesterol levels.

### 1. The results of the monocyte count and HDL-cholesterol levels examination

Based on the data, it is evident that among the 50 patients diagnosed with Coronary Heart Disease (CHD), there were no findings of monocyte count results outside the normal range (120 – 1200 cells/uL). Similarly, for the same parameter results observed in patients undergoing Medical Check-Up (MCU) at Bhayangkara Hospital in Jambi City, all of them fell within the normal category. However, when it comes to the HDL-cholesterol parameter, although the majority of patients in both groups showed normal results, a relatively high percentage of patients had low HDL-cholesterol levels, exceeding 20%. The number of cases with low HDL-cholesterol was higher in the CHD patient group compared to the MCU group.



**Figure 1.** Graph of the monocyte counts and HDL-cholesterol levels

### 2. Distribution of monocyte count, HDL-cholesterol, and MHR examination results

Statistical tests performed on the frequency of abnormal results for both parameters in the two groups of patients showed no significant difference.

**Table 1.** Distribution of monocyte count, HDL-cholesterol, and MHR results

Parameter	Average	SD	Lowest	Highest	P value
Monocyte count (cells/ $\mu$ L)					
CHD patients	461.5	158.7	219	807	0.017*
MCU patients	398.0	129.3	113	666	
HDL-cholesterol (mg/dl)					
CHD patients	48.1	4.4	40	59	0.037*
MCU patients	50.4	7.5	33	69	
HDL-monocyte ratio					
CHD patients	9.6	3.3	4.7	18.0	0.008**
MCU patients	8.1	2.9	2.1	14.8	

\*) p-value <0.05 (significant); \*\*) p-value <0.01 (very significant)

In the distribution table displayed above, it is evident that patients diagnosed with Coronary Heart Disease (CHD) tend to have higher average results in the monocyte count and MHR parameters, while the results obtained for HDL-cholesterol levels in CHD patients tend to be lower on average. The assessment of monocyte count and HDL-cholesterol level parameters also successfully demonstrates significant differences (p-value < 0.05).

## CONCLUSION

Based on the results of the examinations conducted on 50 Coronary Heart Disease (CHD) patients and 50 MCU (Medical Check-Up) patients, randomly selected from the laboratory at Bhayangkara Hospital Polda Jambi, the following findings were obtained: From the 50 CHD patients, it was found that 10 or 20% had high monocyte levels, while 40 or 80% had normal monocyte levels. In contrast, among the 50 MCU patients, 7 or 14% had high monocyte levels, and 43 or 86% had normal monocyte levels. Regarding HDL Cholesterol levels, from the 50 CHD patients, 5 or 10% had low HDL levels, and 45 or 90% had normal HDL levels. Among the 50 MCU patients, 1 or 2% had low HDL levels, and 49 or 98% had normal HDL levels. After data processing using a t-test for these two samples, the resulting t-value was found to be 0.480, which is greater than 0.05. This means that there is no significant relationship between the monocyte-to-HDL cholesterol ratio in Coronary Heart Disease (CHD) patients.

## ACKNOWLEDGMENT

The author would like to thank to Mr. James P. Simanjuntak, S.Si, M.Si and Mrs. Fardiah Tilawati, S., SKM, M. Biomed who have helped, provide direction, guidance,

instructions and suggestions for the smooth running of this writing.

## CONFLICT OF INTEREST

The author declares that she has no conflict of interest.

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