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ASSOCIATION OF C-REACTIVE PROTEIN (CRP) TEST RESULTS WITH THE DECISION ON CYTOLOGICAL EXAMINATION OF PLEURAL EFFUSION FLUID

Novia Hanifa[1], Restu Farizki[1], James P. Simanjuntak [1], Agraini[1]
[1]Medical Laboratory Technology Dept, Health Polytechnic of Jambi, Indonesia
Corresponding author: james.p.simanjuntak@poltekkesjambi.ac.id

ABSTRACT

Background: Pleural effusion is an abnormal collection of fluid within the pleural lining resulting from a disturbance in the balance affecting the inflow and outflow from the area. Pleural fluid is associated with various medical diseases such as heart failure, pneumonia, and malignancy. Rapid and accurate diagnosis remains a major clinical challenge in patients with suspected pleural infection. As clinical data may be elusive, measurement of biomarkers in pleural fluid can estimate the likelihood of infection, and C-reactive protein (CRP) is the biomarker of choice for detecting inflammatory states.
Method: The research method used in this study is descriptive research. This study was conducted at the anatomical pathology laboratory of Siloam Jambi Hospital in March - June 2023. The population in this study was 57 patients with pleural effusion. The samples in this study were all pleural effusion patients who performed Cytology and CRP examinations at Siloam Jambi Hospital from March-June 2023 at the Anatomical Pathology Laboratory Unit of Siloam Jambi Hospital.
Result: The CRP test results in the group with cytology examination decision which were categorized in the inflammation group had an average of 6.6 ± 1.83 mg/L. CRP continued to increase in adenocarcinoma group (46 ± 19.03 mg/L) and metastatic carcinoma group (105.6 ± 48.68 mg/L). There was a very significant increase in the CRP test results along with an increase in the decision of the results of the pleural fluid cytology examination (p-value <0.01).
Conclusion: CRP test results show potential in predicting cytology examination decisions in patients with pleural effusion.

Keywords: Pleural effusion, Cytology, CRP

INTRODUCTION

The lungs are located in the chest cavity, in the form of a cone whose tip is above the first rib and its base is on the diaphragm. The lungs are wrapped by a membrane called the pleura and between the membrane and the lungs there is a pleural cavity which in normal conditions contains about 10 - 20 ml of fluid which functions as a lubricant so that the lungs can move freely when breathing. The fluid is called pleural fluid (Taeyun, 2014). Pleural effusion is an abnormal accumulation of pleural fluid caused by the formation of pleural fluid faster than the absorption process. Pleural effusion is an abnormal accumulation of fluid in the pleural cavum caused by homeostatic disturbances in the form of excessive fluid production or due to decreased fluid absorption. Diseases that can cause pleural effusion are tuberculosis, non-tuberculous lung infections, malignancy, liver cirrhosis, and congestive heart failure. In developed countries, pleural effusion is mainly caused by congestive heart failure, liver cirrhosis, malignancy and bacterial pneumonia while in developing countries, it is commonly caused by tuberculosis infection and malignancy.

Pleural effusion is an abnormal collection of fluid within the pleural lining resulting from a disturbance in the balance affecting the inflow and outflow from the area. Pleural fluid collection is associated with various medical conditions such as heart failure, pneumonia, and malignancy (Stathopoulos GT, 2012). Rapid and accurate diagnosis remains a major clinical challenge in patients with suspected pleural infection. As clinical data may be elusive, measurement

of biomarkers in pleural fluid may provide a reliable tool to estimate the likelihood of infection (Christ-Crain M, 2007). Currently, various studies are being carried out to prove the potential of biomarkers from many laboratory tests that use simple techniques to expensive and complicated automated techniques (Sakdiah et al. 2022; Simanjuntak, Dhea, and Nursyahbani 2022; Sitanggang et al. 2022). In general, C-reactive protein (CRP) is considered the biomarker of choice for detecting inflammatory states, whether triggered by infection or not.

C-reactive protein (CRP) is an acute phase reactant produced mainly by hepatocytes, its production is stimulated by systemic inflammation of infectious or non-infectious origin. Cytokines released during inflammation are the main stimulants of acute phase reactants. From the above data exposure, it can be seen that the causes of pleural effusion are malignancy (non-infectious) and pulmonary TB (infectious), both of which can be diagnosed by cytological examination of pleural fluid performed in the Anatomical Pathology laboratory. The advantages of diagnostic cytology are that it is non-invasive, the procedure is simple, helps in rapid reporting, relatively inexpensive, accepted by the community. However, cytology is not the standard of examination of the disease where histopathology techniques remain the gold standard technique in diagnostic pathology (Khristian and Inderiati, 2017).

Chronic inflammation due to certain infections and other causes has an influence on increasing the risk of certain cancers. Malignant cells secrete pro-inflammatory cytokines that in turn promote cancer progression. Nuclear factor-κB (NF-κB) appears to play an important role in cancer-related inflammation. Pathogenic microbes and tissue necrosis lead to activation of NF-κB and other transcription factors, furthermore this activation regulates the expression of pro-inflammatory cytokines, cyclooxygenase-2 enzyme and other molecules to promote tumor growth and progression. Thus, it is important to study the relationship between inflammatory markers and cancer risk. The most commonly studied inflammatory markers are hs-CRP and colorectal cancer. In patients undergoing surgery, higher CRP levels are associated with a higher risk of colorectal cancer recurrence and death (Allin KH, 2009).

In Indonesia based on 2012 data, lung cancer is the second cause of death after breast cancer, which is 15.9%. Lung cancer is the most common type of cancer that occurs in men, which is 18.2%, while in women lung cancer ranks fifth after breast cancer, cervical cancer, colorectal cancer and ovarian cancer (Ministry of Health, 2018). Some of the 100 hospitals in Jakarta show that lung cancer is the most common case in men and fourth in women. Several studies have shown that pleural fluid CRP levels can be used to differentiate between parapneumonic effusions and other types of exudative effusions. CRP levels <0.64 mg/dL tend to indicate pleural effusion from congestive heart failure, while levels ≥1.38 mg/dL indicate an infectious etiology (Shimon I, 2016). The results of Laura McDonald's research, (2019) show CRP is a prediagnostic marker for lung cancer, and when present with other symptoms can facilitate the investigation of high-risk individuals. Based on the background above, the authors are interested in conducting research with the topic "The Relationship between CRP Results and Pleural Fluid Cytology Examination Decisions at Siloam Jambi Hospital".

METHOD

The type of research used in this study was descriptive research with a *cross sectional* research design and in this study the data used is primary data with data collection techniques, namely purposive sampling. Thus it can be concluded that the primary data in

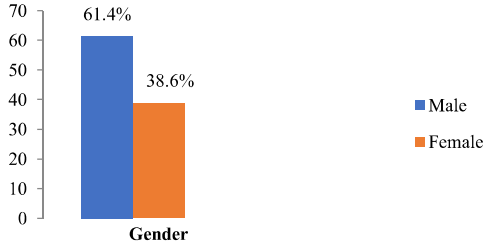
this study are data from observation or observation of the results of cytology examination and then record the necessary data in order to see the relationship between CRP results and pleural fluid cytology examination decisions., The population in this study was pleural fluid that had been registered and received from March - June 2023 at the Anatomical Pathology Laboratory Unit of Siloam Jambi Hospital.

The sample in this study were 57 pleural effusion patients who performed Cytology and CRP examinations at Siloam Jambi Hospital from March - June 2023 at the Anatomical Pathology Laboratory Unit of Siloam Jambi Hospital. The variable in the study is the decision of the results in cytology which is used as an indicator in determining the presence or absence of inflammation in the patient's body by comparing CRP results and this research has received research ethnic approval obtained from the ethnic committee of the Jambi Ministry of Health Polytechnic

Research materials from this sample examination are Pleural fluid from patients with pleural effusion and the tools used in this study are handscoon, mask, centrifuge tube, centrifuge, micro pipette, yellow tip, glass object, stirring rod, rotator. In the cytological examination, papanicolau staining was carried out, and qualitative and semi-quantitative CRP examination.

RESULT AND DISCUSSION

This study was conducted on 57 patients with pleural effusion who performed cytology examination at Siloam Jambi Hospital in the period March - June 2023. Then the results were obtained as follows.



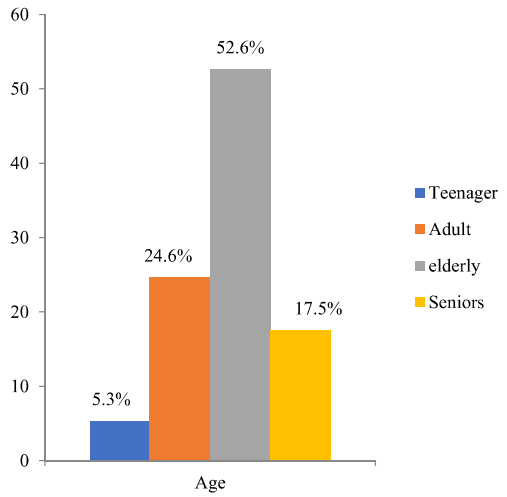


Figure 1. Characteristics of Respondents

From the graph that showed on Figure 1, it is known that the distribution of the number of male patients with pleural effusion is more than female patient. Based on the age, the number of patients that included ini elderly group was higher (52,6%) than any other groups that observed in this study, while the teenager showed the lowest percentage (5,3%).

Table 1. Distribution of CRP in Pleural Effusion Patients

Cytology Decision	n	%	CRP	
			Positive	Negative
Inflamation	30	52.6%	3	27
Adenocarcinoma	12	21.1%	12	0
Metastasis Carcinoma	15	26.3%	15	0
Total	57	100%	30	27

Based on table 4.2, there is a higher number of metastatic carcinoma cytology decisions among inflammation and adenocarcinoma. While the difference between cytology decisions and CRP results is only 3.

Table 2. Measurement results of CRP based on Cytology Decisions

Cytology Decision	CRP (mg/L)			P-value
	Mean	SD	Range	
Inflammation	6,6	1,83	6 – 12	< 0,0001
Adenocarcinoma	46	19,03	24 – 96	
Metastasis Carcinoma	105,6	48,68	48 – 192	

Based on table 4.3 above, it is known that the results of cytology decisions with the highest average are Metastatic Carcinoma as much as 105.6 and the lowest is Inflammation

as much as 6.6. This increase with the anova test is very significant p value <0.0001.

Based on the results of CRP examination research with cytology decisions in pleural effusion patients at Siloam Jambi Hospital can be seen in graph 4.1 obtained the results of the characteristics of male respondents as many as 35 (61.4%), female respondents as many as 22 (38.6%). In the characteristics of respondents based on the age of the 57 samples obtained the results of pleural effusion patients as many as 3 (5.3%) respondents aged 12-25 years (adolescents), 14 (24.6%) respondents aged 26-25 years (adults), 30 (52.6%) respondents aged 46-65 years (elderly), and 10 (7.5%) respondents aged> 65 years. The results of this study found that age > 46 years suffered the most pleural effusion.Cases of pleural effusion caused by infectious processes, such as Tuberculosis infection, non-Tuberculosis infection, malignancy, liver cirrhosis and congestive heart failure. most are found in the middle age group because this age group is an active and productive age group for a person in carrying out daily activities, especially in terms of fulfilling life needs so that direct contact with Tuberculosis patients is more common (Hasna Dewi, 2020).

Based on the results of CRP examination in 57 respondents with pleural effusion at Siloam Jambi Hospital. Based on table 4.2, there are a number of each inflammatory cytology decision as many as 30, adenocarcinoma 12, metastatic carcinoma 15. It was found that the positive CRP examination results were 30 respondents greater than the negative CRP examination, namely 27 respondents.This shows that in patients with pleural effusion with metastatic carcinoma cytological examination results experienced the most positive CRP results among inflammatory cytology results and adenocarcinoma as many as 15 respondents. C-Reactive Protein is an acute phase protein produced by the liver. Elevated CRP levels indicate that there is inflammation in the body, so CRP is often used as a marker of inflammation (Tabassum R, et al, 2017).

Based on the results of the anova test analysis in table 4.3, the distribution found that there was a relationship between CRP results and cytology decisions with a p value <0.0001 smaller than 0.0005. This indicates a relationship between CRP results and cytology decisions in patients with pleural effusion. In general, C-reactive protein (CRP) is considered the biomarker of choice for detecting inflammatory states, whether triggered by infection or not.

Data analysis between CRP results and cytology examination decisions in pleural effusion patients at Siloam Jambi Hospital using the one way anova test in table 4.3 shows the results of CRP in inflammation with an average of 6.6 mg/L. The results of the CRP examination on adenocarcinoma with an average of 46 mg / L. The results of the CRP examination on metastatic carcinoma with an average of 105.6 mg / L. This increase with the one way anova test is very significant p value <0.0001. This shows that there is a relationship between CRP results and cytology decisions in patients with pleural effusion. The results of this study are in line with research conducted by (Shimon Izhakian) showing that CRP levels increase in pleural effusion patients due to chronic inflammation and according to research (Kassim) pleural fluid C-reactive protein titers can be used as an aid in distinguishing between some infectious causes of pleural effusion and malignant pleural effusion because there is a statistically significant difference between pleural fluid C-reactive protein titers of infectious pleural effusion and malignant pleural effusion.

CONCLUSION

It is known that the percentage of positive CRP results in pleural fluid based on variations in cytological decisions of

inflammation 3, adenocarcinoma 12, and metastatic carcinoma 15. and It is known that the average value of CRP titer from pleural fluid based on variations in cytological decisions of inflammation 6.6 mg / L. Adenocarcinama 46 mg/L and metastatic cacinoma 105.6mg/L. Then in the relationship between CRP results and cytology examination decisions in pleural effusion patients has a significant relationship with a Pvalue <0.0001.

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CONFLICT OF INTEREST

The author declares that she has no conflict of interest.

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