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Relationship between C-Reactive Protein (CRP) and Erythrocyte Sedimentation Rate (ESR) with gall bladder adhesion on cholecystectomy at Abdul Wahab Sjahranie Hospital, Samarinda

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ABSTRACT

Background: The conversion from laparoscopic cholecystectomy to open cholecystectomy often results from pericholecystic Adhesion. Pericholecystic Adhesion is a result of cholecystitis in the case of cholelithiasis. C-Reactive Protein (CRP) and Erythrocyte Sedimentation Rate (ESR) can be increased in cholecystitis and used as a predictive factor for the degree of difficulty in laparoscopic cholecystectomy. This study aims to determine the relationship between CRP and ESR with gall bladder adhesion on cholecystectomy at Abdul Wahab Sjahranie Hospital, Samarinda.

Method: A cross-sectional study was conducted among 61 respondents who underwent a cholecystectomy surgery at Abdul Wahab Sjahranie Hospital Samarinda during July-September 2019. Parameters assessed in this study were Gender, diagnosis, CRP, ESR, age, hemoglobin, leukocytes count, platelet count, and the relationship between CRP and ESR value with the pericholecystic adhesions. Data were analyzed by SPSS version 22 for Windows.

Results: Most of respondents were female (70.5%), followed by cholelithiasis (73.8%) as primary diagnosis, no Pericholecystic Adhesions found (68.9%), CRP level < 23 mg/dl (77.0%), and ESR level ≥ 11 mm/hour (78.7%). In addition, the average age of respondents was 48.44±10.85 years old, followed by the hemoglobin level (12.43±1.77 g/dL), leukocytes counts (9,439.67±3,719.37/µl), and platelet counts (319,295.08 ± 90,587.59/ µl). CRP level had a significant relationship to the occurrence of pericholecystic Adhesion (OR: 75.400; 95%CI: 7.991-711.441; p=0.000).

Conclusion: It can be concluded that there was a relationship between CRP and ESR with the occurrence of pericholecystic Adhesion. However, based on multivariate analysis, CRP was more significant compared to ESR on the occurrence of pericholecystic Adhesion.

Keywords: CRP, ESR, Pericholecystic Adhesion, Cholelithiasis, Cholecystectomy

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INTRODUCTION

Cholelithiasis is one of the most common diseases that bring patients to the emergency department with abdominal disorders such as epigastric pain, nausea, vomiting, and anorexia.[1] Although the mortality rate of cholelithiasis is low, the economic burden and the impact of health on it is very significant for health care systems around the world due to high morbidity.[1,2]

The prevalence of cholelithiasis data in Indonesia is still limited. However, some studies have been carried out in several hospitals in Indonesia to determine the prevalence of cholelithiasis.[3-6] A previous study was conducted at Santa Elisabeth Hospital in Medan found that the number of cholelithiasis in 2010 was 57 cases and 44 cases in 2011.[3] In addition, a study from Dr. Kariadi Hospital Semarang found that the number of cholelithiasis reached 102 cases in 2012.[4] In Surakarta Hospital, the number of cholelithiasis reached 242 cases, counting from May 2014 to May 2015.[5] Also, a study in Fatmawati Hospital Jakarta found that 200 cases of cholelithiasis were obtained in 2015 - 2016.[6]

About 20% of people with cholelithiasis experience symptoms and can cause complications, such as cholecystitis, cholangitis, obstructive jaundice, and pancreatitis.[2] Cholecystitis is inflammation of the gallbladder whereas 90% of cholecystitis patients are caused by cholelithiasis.[7] A previous study in Surabaya suggested that 97.8% of cholelithiasis cause complications in the form of cholecystitis and 75.6% of patients with cholelithiasis had pericholecystic adhesions.[8]

Ultrasonography (USG) is a critical first step and examination for the diagnosis of acute cholecystitis, with a sensitivity of 80-100% and a specificity of 60-100%.[9] Besides that, leukocyte levels, C-Reactive Protein (CRP), and erythrocyte sedimentation rate (ESR) are also used as laboratory findings to support the diagnosis of acute cholecystitis.[10]

CRP is an acute-phase reactant that increases when inflammation occurs.[11] CRP levels begin to rise after 6-8 hours, depending on the severity of inflammation, and often used in estimating the severity of inflammation, especially intraabdominal.[11] Based on the 2018 Tokyo Guidelines, one of the criteria for the diagnosis of acute cholecystitis is increased CRP levels.[12]

Erythrocyte sedimentation rate (ESR) is a general hematology test, where red blood cells settle in a standard tube within one hour.[13] ESR levels are increased in cases of inflammation, pregnancy, anemia, autoimmune disorders (rheumatoid arthritis and lupus).[13] ESR can also be increased in cases of acute cholecystitis and is used as a predictive factor for the difficulty of laparoscopic cholecystectomy.[13] Based on those mentioned above, this study aims to evaluate the relationship between CRP and ESR with gall bladder adhesion on cholecystectomy at Abdul Wahab Sjahranie Hospital, Samarinda.

METHODS

A cross-sectional study was conducted to determine the relationship between C-Reactive Protein (CRP) and Erythrocyte Sedimentation Rate (ESR) as a predictive factor for the degree of pericholecystic adhesions in cholecystectomy. There were 61 eligible subjects enrolled in this study through the consecutive technique at Abdul Wahab Sjahranie Hospital Samarinda.

The inclusion criteria used in this study were patients with cholelithiasis who underwent cholecystectomy at Abdul Wahab Sjahranie Hospital Samarinda during July-September 2019 period. Parameters used in this study include gender, diagnosis, the occurrence of pericholecystic adhesions, CRP, and ESR levels. All of the data were presented in mean, standard deviation, number, percentage, minimum, and maximum value.

Data analysis was performed using SPSS version 22. In analyzing CRP and ESR, if the data is normally distributed, the analysis is carried out with the Anova test and continued with the Posthoc test with the Tukey method. However, the difference analysis is carried out by the Kruskal-Wallis test. Data were determined as significant if the p-value less than 0.05

RESULTS

A total of 61 respondents were enrolled in this study from the Abdul Wahab Sjahranie Hospital Samarinda. Most of respondents were female (70.5%), cholelithiasis as primary diagnosis (73.8%), no pericholecystic adhesions (68.9%), CRP level < 23 mg/dl (77.0%), and ESR level ≥ 11 mm/hour (78.7%) (Table 1). Besides, the average age of the sample was 48.44±10.85 years old, with the oldest age was 73 years, and the youngest was 23 years (Table 1). Most of the respondents have the average hemoglobin level about 12.43±1.77 g/dl, followed by leukocyte counts (9,439.67±3,719.37/

Table 1. Baseline characteristics of respondents

Variable	Respondents (N=61)			
	n (%)	Mean±SD	Minimum	Maximum
Gender				
Male	18 (29.5)			
Female	43 (70.5)			
Diagnosis				
Cholelithiasis	45 (73.8)			
Multiple Cholelithiasis	15 (24.6)			
Cholecystitis Cholelithiasis	1 (1.6)			
Pericholecystic Adhesions				
Yes	19 (31.1)			
No	42 (68.9)			
C-Reactive Protein (CRP) (mg/dl)		-	<6	35
< 23 mg/dl	47 (77.0)			
≥ 23 mg/dl	14 (33.0)			
Erythrocyte Sedimentation Rates (ESR) (mm/hour)		19.69±11.83	8	37
< 11 mm/hour	13 (21.3)			
≥ 11 mm/hour	48 (78.7)			
Age (years)		48.44±10.85	23	73
Hemoglobin (g/dl)		12.43±1.77	8	16
Leukocytes (/µl)		9,439.67±3,719.37	4,600	25,500
Platelets (/µl)		319,295.08±90,587.59	148,000	528,000

µl), platelet counts (319,295.08±90,587.59/µl), and 19.69±11.83 mm/hour for ESR levels (Table 1).

Base on the risk analysis evaluation, the recent study found a statistically significant relationship between ESR (OR: 7.200; 95%CI: 0.862-60.107; p=0.047) and CRP (OR: 88.883; 95%CI: 9.774-807.362; p=0.000) levels to the pericholecystic Adhesion (Table 2). The odds ratio shows that the level of ESR ≥ 11 has the chance of Adhesion 7.200 times as well as CRP level ≥ 23 was likely to have adhesion of 88.883 times (Table 2).

Multivariate analysis found that the CRP variable has a significant relationship compared to the ESR variable on the occurrence of pericholecystic Adhesion (p<0.05). In addition, the odds ratio was also found higher compared with other variables as a risk of pericholecystic Adhesion on the CRP variable (≥ 23) (Table 3).

DISCUSSION

In this study, the total sample studied was 61 patients with a mean age of 48.44±10.85 years old with the oldest age of 73 years and the youngest of 23 years. The gender proportion between males (29.5%) and females (70.5%) shows more cases in women. In accordance with the literature states that females and old age are risk factors that cannot be modified.[14] Based on the pericholecystic adhesion, our study found that about 31.1% respondents were affect. This result is quite different from a study in Surabaya that received 75.6% pericholecystic adhesion.[8]

From this study, it was found that there was a significant relationship between CRP and ESR with pericholecystic adhesion (p<0.05) during cholecystectomy. The odds ratio shows that the level of ESR ≥ 11 has a chance of adhesion 7.2 times. Whereas in the CRP variable, there was a significant relationship between CRP and pericholecystic adhesion during cholecystectomy and showed that the CRP level ≥ 23 was likely to have adhesion of 88.8 times.

CRP variable has a significant effect compared to the ESR variable on the occurrence of pericholecystic Adhesion. Then the odds ratio was found to be a greater chance of pericholecystic Adhesion to the CRP variable (≥ 23), which is 75.4 times. CRP is an acute-phase protein with a half-life of 19 hours.[15] CRP is synthesized and released by the liver in response to Interleukine-6 and other proinflammatory cytokines.[16] CRP activates the classic cascade complement and stimulates phagocytosis.[17] Increased concentrations of CRP in serum can occur in infections, inflammation, trauma, malignancies, and tissue infarction. not specific for certain diseases.[15]

One of the first studies evaluating CRP as a predictor of the severity of inflammation in cholecystectomy (both open and laparoscopic) with OR=0.979 (95% CI: 0.969-0.989).[18] A previous study by Jessica Mok KW et al., evaluated the CRP values in a retrospective cohort as parameters that predict difficult laparoscopic cholecystectomy or conversion and also illustrate CRP cut-off points to predict conversion.[19] They found that patients with CRP ≤ 220 (3.2%) had far less risk of conversion compared to CRP> 220 (61.9%) (P <. 001).[19] In a multiple logistic regression analysis to predict the level of difficult dissection operations, it was found that the OR value of CRP was 1,007 (95% CI: 1,001-1,012).[19]

Significantly higher CRP, with a CRP level > 200 mg/dL, has a sensitivity of 50% positive and 100% negative as a predictive value for gangrene cholecystitis.[19] In another study, absolute values (CRP> 190 mg/dL) were predictive factors for difficult cholecystectomy laparoscopy; even changes in the CRP interval (increasing> 90 mg/dL) at 48 hours from hospitalization can predict the possibility of pancreatitis, as a complication.[20]

ESR is a general hematology test, where red blood cells settle in a standard tube within one hour.[13] ESR levels are increased in cases of inflammation, pregnancy, anemia, autoimmune disorders (rheumatoid arthritis and lupus).[13] With ESR results >65 mm/hour (specific 66%, sensitivity 70%) found to be statistically significant in laparoscopic cholecystectomy operations which underwent conversion.[21,22]

Table 2. The ESR and CRP variables are related to Pericholecystic Adhesion

Variable	Pericholecystic Adhesion		p	OR	95% CI
	Yes (n=61)	No (N=61)			
ESR, n (%)					
≥ 11	18 (29.5)	30 (49.2)	0.047*	7.200	0.862 – 60.107
< 11	1 (1.6)	12 (19.7)			
CRP, n (%)					
≥ 23	13 (21.3)	1 (1.6)	0.000*	88.883	9.774 – 807.362
< 23	6 (9.8)	41 (67.2)			

*Fisher's Exact Test (p < 0,05); OR: odds-ratio; ESR: Erythrocyte Sedimentation Rates; CRP: C-Reactive Protein

Table 3. The multivariate analysis of several variables to the risk of pericholecystic Adhesion

Variable	p	OR	95% C.I.for EXP(B)	
			Lower	Upper
ESR (≥ 11)	0.527	2.069	0.218	19.629
CRP (≥ 23)	0.000*	75.400	7.991	711.441

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CONCLUSION

From this study, it can be concluded that there is a relationship between CRP and ESR with the occurrence of pericholecystic Adhesion. It can also be concluded that CRP has more influence on the occurrence of pericholecystic Adhesion. By using CRP and ESR laboratory results, it is hoped that the surgeon can estimate the presence or absence of pericholecystic Adhesion in cholelithiasis patients. A surgeon can use the results of the CRP and ESR to predicting the difficulty level of laparoscopic cholecystectomy so that the surgeon can consider the choice of management modality according to his capabilities. By predicting the degree of difficulty in cholecystectomy laparoscopic surgery, a surgeon can educate patients about the difficulty of the operation and the possibility of conversion.

CONFLICT OF INTEREST

There is no competing interest regarding the manuscript

ETHICS CONSIDERATION

This study has been obtained ethics approval by the Ethics Committee of Faculty of Medicine, Universitas Hasanuddin, Makassar, Indonesia, prior to the study being conducted.

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AUTHOR CONTRIBUTIONS

NDM, SS, BS, and AS are responsible for the study from the conceptual framework, data gathering, data analysis until reporting the results of study through publication.

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