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A STUDY ON CRP AND D-DIMER VALUES TAKEN PREOPERATIVELY AND POSTOPERATIVELY IN PATIENTS WITH ACUTE ABDOMEN TO PREDICT THE PROGNOSTIC OUTCOME OF THE PATIENT

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ABSTRACT

Background: An acute abdomen is a serious surgical emergency requiring prompt diagnosis and immediate treatment. Prognostication can be aided by biomarkers that have shown effectiveness in assessing inflammation and coagulation, such as C-reactive protein (CRP) and D-Dimer. **Aim:** To evaluate the prognostic utility of CRP and D-Dimer levels measured preoperatively and postoperatively in patients presenting with acute abdomen.

MaterialS and Methods: This prospective cohort study was conducted in the Department of General Surgery at Government Mohan Kumaramangalam Medical College and Hospital, Salem, between January 2023 and January 2025. A total of 150 patients diagnosed with acute abdomen and requiring surgical management were included in the study. Socio-demographic data, clinical presentation, laboratory parameters, and postoperative outcomes were recorded using a pretested data collection proforma. Serum CRP and D-Dimer levels were measured preoperatively and postoperatively.

Results: The mean preoperative CRP level was 79.91 mg/L and the mean preoperative D-Dimer level was 1516.32 ng/mL. After surgical intervention, both biomarkers showed a statistically significant reduction, with postoperative CRP decreasing to 59.13 mg/L and D-Dimer to 1301.85 ng/mL ($p < 0.05$). Patients who developed postoperative complications, required intensive care unit admission, or experienced mortality had significantly higher postoperative CRP and D-Dimer levels compared with those who recovered without complications.

Conclusion: CRP and D-Dimer are useful biomarkers for assessing prognosis in patients with acute abdomen. Serial perioperative measurement of these markers can aid in early risk stratification, monitoring of postoperative recovery, and timely identification of complications, thereby improving clinical decision-making in emergency surgical practice.

Keywords: Acute Abdomen, C-Reactive Protein, D-Dimer, Prognostic Biomarkers, Postoperative Outcomes.

INTRODUCTION

Acute abdomen remains one of the most important and challenging surgical emergencies encountered in clinical practice. It represents a spectrum of non-traumatic intra-abdominal conditions characterized by sudden onset abdominal pain, frequently associated with vomiting, fever, abdominal distension, guarding, rigidity, or features of systemic toxicity. The underlying causes are diverse and include acute appendicitis, acute pancreatitis, hollow viscus perforation, intestinal obstruction, mesenteric ischemia, cholecystitis, diverticulitis, and intra-

abdominal sepsis. Because many of these conditions can rapidly progress to perforation, sepsis, multiorgan dysfunction, and death, early diagnosis and timely surgical intervention are essential for reducing morbidity and mortality. At the same time, the heterogeneous presentation of acute abdomen often makes assessment difficult, particularly when symptoms overlap between medical and surgical conditions. For this reason, clinicians increasingly rely not only on careful history taking, physical examination, and imaging, but also on laboratory biomarkers that may help assess inflammation, disease severity, and postoperative recovery.[1] The evaluation of acute abdomen is often time-sensitive, and delay in decision-making can adversely affect outcome. Although radiological modalities such as ultrasonography and computed tomography have improved diagnostic precision, they may not always be immediately available, affordable, or conclusive in all settings. Moreover, imaging provides an anatomical diagnosis but may not fully reflect the biological severity of the ongoing inflammatory or ischemic process. Biomarkers therefore offer an attractive adjunct because they are objective, measurable, reproducible, and can be repeated serially during the perioperative period. In the emergency surgical setting, an ideal biomarker should help identify serious pathology at presentation, stratify the risk of complications, guide the urgency of intervention, and indicate response after surgery. Among the commonly available laboratory markers, C-reactive protein (CRP) and D-dimer have received increasing attention because they reflect two major components of acute abdominal pathology: inflammation and activation of coagulation-fibrinolysis.[2] CRP is a well-established acute phase reactant synthesized primarily by hepatocytes in response to interleukin-6 and other pro-inflammatory cytokines. Its concentration rises rapidly within hours of tissue injury, bacterial infection, or inflammation, making it one of the most widely used biomarkers in emergency and surgical practice. Elevated CRP levels have been associated with acute appendicitis, complicated intra-abdominal infection, acute diverticulitis, bowel ischemia, pancreatitis, and postoperative septic complications. The major advantage of CRP lies in its simplicity, wide availability, and ability to reflect the intensity of systemic inflammation. Persistently elevated or rising CRP values after surgery may indicate ongoing infection, inadequate source control, anastomotic leak, or unresolved inflammatory stress. Conversely, falling postoperative CRP levels usually suggest adequate treatment response and recovery. Nevertheless, CRP is not disease-specific, and its prognostic value may be enhanced when interpreted serially rather than as a single isolated measurement.[3,4] D-dimer, on the other hand, is a degradation product of cross-linked fibrin and serves as an indicator of activation of coagulation and fibrinolysis. Although traditionally used in the evaluation of venous thromboembolism, its role has expanded into several acute inflammatory and critical care conditions. In acute abdominal disorders, tissue injury, ischemia, infection, endothelial activation, and sepsis may trigger coagulation pathways, leading to fibrin deposition and secondary fibrinolysis with an increase in circulating D-dimer levels. This is especially relevant in conditions such as bowel ischemia, perforation, severe pancreatitis, intra-abdominal sepsis, and major abdominal surgery. Elevated D-dimer may therefore reflect not only thrombotic activity but also the severity of systemic illness. Importantly, failure of D-dimer levels to decline after operative treatment may indicate ongoing inflammatory-thrombotic activation and a higher risk of adverse outcomes such as ICU admission, postoperative complications, or death. The biological rationale for studying CRP and D-dimer together in acute abdomen is strong. Acute abdominal emergencies often involve a close interaction between inflammation, endothelial injury, coagulation activation, tissue hypoperfusion, and organ dysfunction. CRP reflects the inflammatory cascade, whereas D-dimer reflects fibrin turnover and the coagulation response to tissue injury and sepsis. When assessed together, these two biomarkers may provide a broader picture of disease burden than either marker alone. This combined approach is particularly relevant in emergency surgery, where clinical status may change rapidly before and after operation. Preoperative values may help identify patients with advanced disease or systemic involvement, while postoperative trends may indicate whether the underlying pathology has been adequately controlled or whether complications are developing. Serial measurement may therefore be more clinically informative than a single preoperative laboratory value.[5] Several studies have highlighted the usefulness of inflammatory biomarkers in abdominal emergencies, especially in appendicitis and pancreatitis, where CRP has been linked with severity and complication risk. In acute pancreatitis, CRP remains one of the most widely studied markers for assessing disease severity, particularly after the first 48 hours. Likewise, abnormal D-dimer levels have been associated with more severe inflammatory states, microvascular dysfunction, and poorer clinical outcomes in critically ill surgical patients. However, despite growing evidence supporting these biomarkers individually, there is still limited clinical literature evaluating both CRP and D-dimer together in a mixed cohort of acute abdomen patients, particularly with serial preoperative and postoperative assessment. Many studies focus on a single diagnosis or a single time point, which may not adequately capture the dynamic biological response surrounding emergency surgery.[6]

MATERIALS AND METHODS

This prospective cohort study was conducted in the Department of General Surgery at Government

Mohan Kumaramangalam Medical College and Hospital (GMKMC), Salem. The study included patients presenting with clinical features suggestive of acute abdomen who were admitted to the General Surgery outpatient department and surgical wards. The study was carried out over a period of two years from January 2023 to January 2025. A total of 150 patients diagnosed with acute abdomen and meeting the eligibility criteria were included in the study.

Study Population and Selection Criteria

The study population consisted of patients diagnosed with acute abdomen conditions requiring surgical evaluation and management. The inclusion criteria comprised patients diagnosed with acute pancreatitis, acute appendicitis, hollow viscus perforation, intestinal obstruction, and liver abscess. Patients with chronic abdominal conditions, gastrointestinal malignancies, and those with systemic illnesses such as renal failure, hepatic failure, heart failure, or coagulopathy were excluded from the study to avoid confounding factors that could influence inflammatory and coagulation biomarkers.

Methodology

Data were collected using a pretested and predesigned questionnaire. Information regarding socio-demographic characteristics, presenting complaints, clinical history, past medical history, treatment history, and associated comorbidities was recorded. All patients underwent routine clinical examination and necessary laboratory investigations as part of their standard management. For the purpose of the study, serum C-reactive protein (CRP) and D-dimer levels were measured preoperatively and postoperatively. These biomarkers were analyzed to assess their association with the clinical course and prognostic outcomes in patients presenting with acute abdomen.

Statistical Analysis

The primary outcome of the study was to evaluate the prognostic significance of CRP and D-dimer levels in patients with acute abdomen by comparing their values before and after surgical intervention. Ethical approval was obtained prior to the commencement of the study, and informed written consent was obtained from all participants. Participants were informed that their involvement was voluntary, no incentives would be provided, and they had the right to refuse participation or withdraw from the study at any time without affecting their medical care. The collected data were entered into Microsoft Excel and analyzed using SPSS software. Descriptive statistics were used to summarize socio-demographic and clinical variables. Paired t-test or Wilcoxon signed-rank test was applied to compare preoperative and postoperative biomarker values. Independent t-test was used to compare values between outcome groups. Correlation analysis was performed using linear correlation for continuous variables and logistic regression for categorical variables. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Table 1 shows the baseline demographic and clinical characteristics of the study population. Among the 150 patients included in the study, the age distribution was fairly broad, indicating that acute abdomen affected individuals across all adult age groups. The highest proportion of patients belonged to the age group less than 30 years (19.3%), followed closely by those above 71 years (18.0%) and those between 61–70 years (17.3%). Patients aged 31–40 years accounted for 16.7%, while those aged 41–50 years and 51–60 years constituted 15.3% and 13.3%, respectively. This distribution suggests that acute abdominal conditions were encountered in both younger and older populations, with no single age group showing overwhelming predominance. With regard to gender, males formed a slightly higher proportion of the study population, accounting for 54.7%, whereas females constituted 45.3%. Assessment of comorbidities revealed that nearly half of the patients (46.7%) had no associated comorbid illness. Among the existing comorbid conditions, hypertension was the most common, seen in 30.0% of patients, followed by diabetes alone in 12.0% and combined diabetes with hypertension in 11.3%.

Table 2 describes the presenting symptoms, duration of complaints before presentation, and final diagnoses of the study participants. Fever was the most common presenting symptom, observed in 49.3% of patients, highlighting the inflammatory and infectious nature of many acute abdominal conditions. Abdominal distension was the next most frequent symptom, present in 31.3% of cases, followed by vomiting in 28.0%. Epigastric pain was noted in 18.0% of patients, while obstipation was present in 17.3%, suggesting the contribution of obstructive pathologies in a considerable proportion of cases. Sudden severe abdominal pain was reported in 14.0%, nausea in 12.7%, right lower quadrant pain in 10.7%, chills in 10.0%, and right upper quadrant pain in 8.7% of patients. With regard to duration of complaints before presentation, most patients presented early, with 24.0% seeking care within 1 day and 21.3% within 2 days. Another 16.7% presented after 3 days, 20.0% after 4 days, and 18.0% after 5 days. This indicates that the majority of patients reached medical attention within the first few days of symptom onset. Final diagnosis showed that acute pancreatitis was the most common diagnosis, accounting for 24.7% of cases. Hollow viscus perforation and intestinal obstruction each contributed 22.7%, while acute appendicitis comprised 16.0% and liver abscess 14.0% of the total cases.

Table 3 presents the descriptive statistics of age, complaint duration, hospital stay, and selected routine laboratory parameters. The mean age of the patients was 49.51 years, with a median of 49.00 years, indicating that the study population was predominantly middle-aged. The standard deviation

of 19.025 suggests a wide variation in age distribution. The mean duration of complaints before presentation was 2.87 days, with a median of 3.00 days, reflecting relatively early hospital presentation in most patients. Hospital stay had a mean duration of 10.59 days and a median of 11.00 days, suggesting that patients generally required prolonged inpatient management. The white blood cell count had a mean of 11.370, which indicates leukocytosis in many patients and supports the presence of acute inflammation or infection. Serum creatinine showed a mean value of 1.3009, while serum lactate had a mean of 1.9576, both of which may reflect the physiological stress and possible metabolic derangements associated with acute abdominal emergencies. The haemoglobin and platelet count values were shown as constant in the dataset, with no variation, which may indicate either a uniform recorded value or data limitation.

Table 4 compares the preoperative and postoperative category distribution of CRP and D-dimer levels. For CRP, only 0.7% of patients had normal preoperative values, while the majority had elevated levels, with 70.0% showing moderate elevation and 28.0% showing high elevation. This indicates that most patients had significant inflammatory activity before surgery. Postoperatively, there was a marked shift toward lower CRP categories. The proportion of patients with normal CRP increased to 13.3%, and those with mild elevation increased substantially to 56.0%. At the same time, the proportion with moderate elevation decreased to 24.0%, and those with high elevation decreased sharply to 6.7%. This reduction in CRP levels after surgery was statistically significant ($p < 0.05$), indicating an improvement in inflammatory status following operative management. A similar trend was observed for D-dimer. Preoperatively, only 4.7% of patients had normal D-dimer values, while 95.3% were positive, reflecting extensive activation of coagulation and fibrinolysis in acute abdomen. Postoperatively, normal D-dimer values increased markedly to 72.0%, while positive values decreased to 28.0%. This change was also statistically significant ($p < 0.05$).

Table 5 shows the biomarker levels according to gender, diagnosis, and outcome status. When compared by gender, both males and females had almost similar preoperative CRP values, with females showing a mean of 80.2043 and males 79.6668. Postoperative CRP values decreased in both groups, measuring 29.0700 in females and 27.1713 in males. Similarly, females had a lower mean preoperative D-dimer level (1436.7878) than males (1582.2782), while postoperative values declined in both sexes to 325.4165 and 282.3152, respectively.

Analysis across diagnostic categories revealed that preoperative CRP levels were elevated in all disease groups, ranging from 75.0941 in intestinal obstruction to 81.9500 in liver abscess. Postoperatively, CRP values decreased in all categories, with the lowest postoperative mean seen in acute appendicitis (17.0300). D-dimer values were also elevated preoperatively across all diagnoses, with the highest mean in hollow viscus perforation (1585.0679) and the lowest in liver abscess (1338.4624). Postoperative D-dimer levels decreased in every diagnostic category, though the extent of decline varied. Hollow viscus perforation and appendicitis showed relatively lower postoperative D-dimer levels, while liver abscess and intestinal obstruction retained comparatively higher postoperative values.

When biomarker values were compared according to outcome status, important differences were observed. Patients who recovered had the lowest postoperative CRP and D-dimer values, with means of 8.6248 and 87.4236, respectively, indicating marked normalization of biomarkers after successful treatment. In contrast, patients with complications, ICU admission, or death had persistently elevated postoperative values. Those with complications had a postoperative CRP of 67.6334 and D-dimer of 422.7341. Patients admitted to ICU had even higher postoperative D-dimer values of 1301.5676 and CRP of 53.5214. Patients who died had the highest preoperative CRP value of 96.3875 and a markedly elevated postoperative D-dimer level of 1030.3738.

Table 6 presents the pattern of postoperative complications. The majority of patients, 61.3%, had no postoperative complications, which indicates that most patients had a favorable postoperative course. Among those who developed complications, sepsis was the most common, occurring in 7.3% of patients, followed by deep vein thrombosis in 6.0% and acute respiratory distress syndrome in 5.3%. Pneumonia and wound infection were each seen in 4.0% of patients, while shock occurred in 3.3%. Multi-organ failure was noted in 2.7%, and anastomotic leak, cardiac arrest, and prolonged ileus each occurred in 2.0% of cases.

Table 7 summarizes the sensitivity and specificity of CRP and D-dimer in predicting prognosis using ROC curve-derived cut-off values. Preoperative CRP at a cut-off of 85.52 mg/L had a sensitivity of 55.2% and specificity of 61.9%, suggesting only modest ability to discriminate outcomes before surgery. Preoperative D-dimer at a cut-off of 1081.07 ng/mL showed a higher sensitivity of 77.6% but poor specificity of 28.3%, indicating that although it identified many patients at risk, it was less accurate in excluding those without adverse outcomes. In contrast, postoperative biomarkers performed much better. Postoperative CRP at a cut-off of 16.64 mg/L had a sensitivity of 86.2% and specificity of 91.3%, demonstrating strong predictive value. Most notably, postoperative D-dimer at a cut-off of 192.68 ng/mL achieved 100% sensitivity and 100% specificity, making it the best prognostic marker among all the biomarkers assessed.

Table 1: Baseline Demographic and Clinical Characteristics of the Study Population

Variable	Category	Frequency	Percent
Age category	<30 Yrs	29	19.3
	31–40 Yrs	25	16.7
	41–50 Yrs	23	15.3
	51–60 Yrs	20	13.3
	61–70 Yrs	26	17.3
	>71 Yrs	27	18.0
	Total	**150**	**100.0**
Gender	Female	68	45.3
	Male	82	54.7
	Total	**150**	**100.0**
Comorbidities	Diabetes	18	12.0
	Diabetes & HTN	17	11.3
	Hypertension	45	30.0
	None	70	46.7
	Total	**150**	**100.0**

Table 2: Presenting Symptoms, Duration of Complaints, and Final Diagnosis

Variable	Category	Frequency	Percent
Clinical presentation	Abdominal distension	47	31.3
	Chills	15	10.0
	Epigastric pain	27	18.0
	Fever	74	49.3
	Nausea	19	12.7
	Obstipation	26	17.3
	Right lower quadrant pain	16	10.7
	Right upper quadrant pain	13	8.7
	Sudden severe abdominal pain	21	14.0
	Vomiting	42	28.0
	Total	**150**	**100.0**
Duration of complaints before presentation	1 day	36	24.0
	2 days	32	21.3
	3 days	25	16.7
	4 days	30	20.0
	5 days	27	18.0
	Total	**150**	**100.0**
Final diagnosis	Acute Appendicitis	24	16.0
	Acute Pancreatitis	37	24.7
	Hollow Viscus Perforation	34	22.7
	Intestinal Obstruction	34	22.7
	Liver Abscess	21	14.0
	Total	**150**	**100.0**

Table 3: Descriptive Statistics and Routine Laboratory Parameters

Variable	Mean	Median	Mode	Std. Deviation	Minimum	Maximum
Age	49.51	49.00	77	19.025	18	79
Complaint Duration (Days)	2.87	3.00	1	1.446	1	5
Hospital Stay	10.59	11.00	13	3.794	3	20
WBC Count	11.370	11.400	12.5a	3.0340	2.7	18.5
Haemoglobin	12.400	12.400	12.4	0.0000	12.4	12.4
Platelet Count	231.00	231.00	231	0.000	231	231
Serum Creatinine	1.3009	1.3100	.98	.35391	.31	2.08
Serum Lactate	1.9576	1.9450	1.93a	.36031	1.05	3.06

Table 4: Preoperative and Postoperative CRP and D-Dimer Levels with Category Distribution

Biomarker Category	Preoperative Frequency	Preoperative Percent	Postoperative Frequency	Postoperative Percent	p-value
CRP					<0.05
Normal	1	0.7	20	13.3	
Mild Elevation	2	1.3	84	56.0	
Moderate Elevation	105	70.0	36	24.0	
High Elevation	42	28.0	10	6.7	
Total	**150**	**100.0**	**150**	**100.0**	
D-Dimer					<0.05
Normal	7	4.7	108	72.0	
Positive	143	95.3	42	28.0	
Total	**150**	**100.0**	**150**	**100.0**	

Table 5: Biomarker Levels According to Gender, Diagnosis, and Outcome Status

Variable	Category	CRP Preop Mean ± SD	CRP Postop Mean ± SD	D-Dimer Preop Mean ± SD	D-Dimer Postop Mean ± SD	p-value
Gender	Female	80.2043 ± 35.77013	29.0700 ± 16.48615	1436.7878 ± 584.29742	325.4165 ± 51.40092	<0.05
	Male	79.6668 ± 31.71449	27.1713 ± 15.56622	1582.2782 ± 671.87013	282.3152 ± 39.99057	<0.05
	Total	79.9105 ± 33.49927	29.1254 ± 15.89941	1516.3225 ± 635.76337	301.8545 ± 43.77942	
Diagnosis	Acute Appendicitis	80.8096 ± 38.03990	17.0300 ± 14.05245	1449.8788 ± 606.81635	243.7733 ± 81.60360	<0.05
	Acute Pancreatitis	81.6357 ± 37.82613	27.8749 ± 17.84759	1575.2124 ± 611.19540	310.2232 ± 64.22572	<0.05
	Hollow Viscus Perforation	80.9550 ± 28.34500	26.7453 ± 16.68396	1585.0679 ± 779.66307	223.5182 ± 62.92759	<0.05
	Intestinal Obstruction	75.0941 ± 33.68540	27.9562 ± 16.37511	1540.2474 ± 626.45676	345.3759 ± 53.21435	<0.05
	Liver Abscess	81.9500 ± 29.50871	28.0414 ± 12.85595	1338.4624 ± 459.25661	409.8548 ± 56.82043	<0.05
	Total	79.9105 ± 33.49927	29.1254 ± 15.89941	1516.3225 ± 635.76337	301.8545 ± 43.77942	
Outcome Status	Complications	81.9452 ± 37.01296	67.6334 ± 25.45692	1451.1121 ± 707.11101	422.7341 ± 65.95594	<0.05
	Death	96.3875 ± 51.49848	48.7513 ± 29.59421	1572.5150 ± 709.62491	1030.3738 ± 415.58703	<0.05
	ICU	85.8981 ± 23.70168	53.5214 ± 17.14085	1554.2762 ± 535.11833	1301.5676 ± 632.62042	<0.05
	Recovered	76.4696 ± 32.29583	8.6248 ± 6.96170	1523.3284 ± 635.83073	87.4236 ± 22.50938	<0.05
	Total	79.9105 ± 33.49927	29.1254 ± 15.89941	1516.3225 ± 635.76337	301.8545 ± 43.77942	

Table 6: Complaint Duration, Postoperative Complications, and ROC Analysis of CRP and D-Dimer

Postoperative Complications	Frequency	Percent
Anastomotic Leak	3	2.0
ARDS	8	5.3
Cardiac Arrest	3	2.0
Deep Vein Thrombosis	9	6.0
Multi-organ failure	4	2.7
None	92	61.3
Pneumonia	6	4.0
Prolonged Ileus	3	2.0
Sepsis	11	7.3
Shock	5	3.3
Wound Infection	6	4.0
Total	**150**	**100.0**

Table 7: Sensitivity and specificity

Biomarker	Cut off Value	Sensitivity	Specificity
CRP Preop	85.52 mg/L	55.2%	61.9%
D-Dimer Preop	1081.07 ng/mL	77.6%	28.3%
CRP Postop	16.64 mg/L	86.2%	91.3%
D-Dimer Postop	192.68 ng/mL	100%	100%

DISCUSSION

In the present study, the mean age of the patients was 49.51 years, with the largest proportions seen in patients aged <30 years (19.3%) and >71 years (18.0%), and males constituted 54.7% of the cohort. This shows that acute abdomen in our series affected a wide adult age range with a slight male predominance. A comparable age pattern was reported by Cervellin et al. (2016), who analyzed 5,340 emergency department presentations for acute abdominal pain and found a mean age of 49 years, with appendicitis and renal colic being more common in younger patients and biliary disease and diverticulitis more frequent in older patients. Thus, our study mirrors the broad age distribution reported internationally, although our cohort included a higher proportion of elderly patients, likely because only admitted surgical patients were studied rather than all-comers with abdominal pain.[7]

With regard to the clinical profile, fever was the most common presenting symptom in our study (49.3%), followed by abdominal distension (31.3%) and vomiting (28.0%), and most patients presented within the first 1–2 days of symptom onset (45.3%). The most frequent diagnoses in our series were acute pancreatitis (24.7%), hollow viscus perforation (22.7%), and intestinal obstruction (22.7%), while

acute appendicitis accounted for 16.0%. Grundmann et al. (2010) reviewed the epidemiology of acute abdomen and reported that acute appendicitis usually accounts for 15.9%–28.1% of cases, whereas bowel obstruction and diverticulitis become more frequent in elderly patients. Our appendicitis proportion of 16.0% lies at the lower end of that range, while the relatively high proportions of perforation, obstruction, and pancreatitis suggest that our hospital-based cohort represented a more severe surgical subset than the mixed emergency cohorts described in the literature.[8]

The routine laboratory profile in our study also reflected a substantially inflamed and physiologically stressed population. The mean WBC count was $11.37\times10^3/mm^3$, mean serum creatinine was 1.3009 mg/dL, mean serum lactate was 1.9576 mmol/L, and the average hospital stay was 10.59 days. These data indicate that many of our patients had active inflammation and required prolonged inpatient care. Meyer et al. (2012), while discussing patients with acute abdominal pain in the emergency department, emphasized that CRP and lactate may be abnormal in seriously ill patients but should be interpreted only as adjuncts to clinical assessment because they are not disease-specific. Our findings support that view: the raised WBC count, creatinine, and lactate values in the present series were useful in indicating illness severity, but they gained greater prognostic meaning only when interpreted together with serial CRP and D-dimer trends and clinical outcomes.[9]

A major finding of the present study was the significant perioperative reduction in inflammatory burden. Preoperatively, only 0.7% of patients had normal CRP, whereas 70.0% had moderate elevation and 28.0% had high elevation; postoperatively, normal CRP increased to 13.3% and mild elevation to 56.0%, while high elevation declined to 6.7% ($p<0.05$). This pattern is in keeping with the work of Salem et al. (2007), who prospectively evaluated 211 patients with acute abdomen and found a median CRP of 16 mg/L in non-specific abdominal pain, 75 mg/L in surgically treated non-operative conditions, and 111 mg/L in operative surgical disease. Our preoperative mean CRP of 79.91 mg/L lies between the surgical non-operative and operative groups described by Salem et al., which is expected in a mixed acute abdomen cohort. The marked postoperative fall in our study further suggests that serial CRP assessment may be more informative for monitoring resolution than for establishing a single baseline diagnosis.[10]

The coagulation-fibrinolytic response showed a similar and clinically important trend. In our study, D-dimer was positive in 95.3% of patients preoperatively and normalized in 72.0% postoperatively ($p<0.05$), indicating that acute abdominal emergencies are associated with pronounced activation of coagulation and fibrinolysis, which tends to subside after surgical control of the pathology. Akyildiz et al. (2008) studied 93 patients with unclear non-traumatic acute abdomen and reported that a D-dimer level >4.7 µg FEU/mL predicted pathology requiring laparotomy with 97.6% sensitivity and 61.5% specificity. Although our study evaluated prognosis rather than the immediate need for laparotomy, the consistently high preoperative D-dimer values observed here support the same concept that elevated D-dimer reflects serious intra-abdominal pathology, while the postoperative decline in our patients indicates its additional value in follow-up and recovery assessment.[11]

When analyzed across diagnostic categories, CRP remained elevated in all groups preoperatively, ranging from 75.09 mg/L in intestinal obstruction to 81.95 mg/L in liver abscess, and the lowest postoperative CRP was observed in acute appendicitis (17.03 mg/L). This suggests that appendicitis in our cohort responded particularly well to definitive treatment. Amalesh et al. (2004), in a prospective double-blind study of 192 children undergoing appendectomy, found that CRP had a sensitivity of 91% but a specificity of only 42% for acute appendicitis, concluding that CRP alone was not sufficient for diagnosis. Our results agree with that interpretation: although appendicitis patients in our study had clearly elevated preoperative CRP (80.81 mg/L), the main utility of CRP appeared not in making the diagnosis by itself, but in demonstrating postoperative resolution, as reflected by the fall to 17.03 mg/L after treatment.[12]

The diagnosis-wise behavior of D-dimer in our study was also noteworthy, especially in acute pancreatitis. Preoperative D-dimer was highest in hollow viscus perforation (1585.07 ng/mL) and acute pancreatitis (1575.21 ng/mL), while postoperative values fell across all groups, though they remained relatively higher in liver abscess and intestinal obstruction. In the pancreatitis subgroup, postoperative D-dimer averaged 310.22 ng/mL, substantially lower than the preoperative level. Gomercic et al. (2016) reported in 71 patients with acute pancreatitis that a D-dimer threshold >1474 ng/mL at 48 hours predicted complications with an AUC of 0.76, and combining D-dimer with CRP improved the AUC to 0.83. Our preoperative pancreatitis mean of 1575.21 ng/mL is strikingly close to their predictive threshold, reinforcing that elevated D-dimer is closely linked with complicated inflammatory abdominal pathology and may be particularly valuable in pancreatitis-related prognostication.[13]

Outcome-wise comparisons in our study strongly support the prognostic significance of both biomarkers. Patients who recovered had very low postoperative CRP and D-dimer values (8.62 mg/L and 87.42 ng/mL, respectively), whereas patients with complications had higher postoperative values (67.63 mg/L and 422.73 ng/mL), ICU patients had persistently elevated CRP and very high D-dimer (53.52 mg/L and 1301.57 ng/mL), and those who died had the highest preoperative CRP (96.39 mg/L) and markedly elevated postoperative D-dimer (1030.37 ng/mL). This pattern closely parallels the

findings of Rodelo et al. (2012), who studied 684 patients with suspected infection or sepsis and found median D-dimer values of 1475 ng/mL in survivors versus 2489 ng/mL in non-survivors, with D-dimer showing better discrimination for mortality than CRP. The persistence of high postoperative D-dimer in our ICU and death groups similarly indicates that ongoing coagulation activation is a marker of poor prognosis and systemic deterioration.[14]

Postoperative complications in our series occurred in 38.7% of patients overall, with sepsis (7.3%), deep vein thrombosis (6.0%), ARDS (5.3%), wound infection (4.0%), and anastomotic leak (2.0%) being the major adverse outcomes. On ROC analysis, preoperative CRP and D-dimer showed only modest predictive ability, whereas postoperative CRP at a cut-off of 16.64 mg/L yielded 86.2% sensitivity and 91.3% specificity, and postoperative D-dimer at 192.68 ng/mL achieved 100% sensitivity and 100% specificity. These findings are consistent with the meta-analysis by Singh et al. (2014), which included 2,483 colorectal surgery patients and found that postoperative CRP had a pooled AUC of 0.81 for anastomotic leak, with cut-offs of 172 mg/L on postoperative day 3, 124 mg/L on day 4, and 144 mg/L on day 5, along with a negative predictive value of 97%. Compared with that literature, our postoperative CRP also demonstrated strong predictive accuracy, while postoperative D-dimer in our study appeared even more discriminative, suggesting that combined perioperative inflammatory and fibrinolytic monitoring may offer superior prognostic stratification in acute abdomen patients.[15]

CONCLUSION

The present study demonstrates that both CRP and D-dimer levels are significantly elevated in patients presenting with acute abdomen and show a marked decline following surgical intervention. Serial measurement of these biomarkers provides valuable information regarding the inflammatory and coagulation status of patients in the perioperative period. Persistently elevated postoperative CRP and D-dimer levels were associated with complications, ICU admission, and mortality, indicating their usefulness in predicting adverse outcomes. Among the two markers, postoperative D-dimer showed the highest prognostic accuracy. Therefore, routine perioperative assessment of CRP and D-dimer may aid in early risk stratification and improved clinical management of patients with acute abdomen.

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