



C- REACTIVE PROTEIN (CRP) AS CLINICAL UTILITY FOR THE DIAGNOSIS OF EARLY COMPLICATIONS OF GENERAL SURGERIES IN A TEACHING HOSPITAL OF SEMI URBAN SETUP.

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Abstract

Approximately 20% of patients who undergo major surgeries are affected by serious complications. Whereas some complications resolve quickly with negligible consequences, more serious complications may necessitate invasive re-interventions and are associated with lasting morbidity and even mortality. Clinical diagnosis of infections, inflammatory diseases, and response monitoring can be done by C- reactive protein (CRP) testing which is an acute phase protein produced by liver. CRP measurement in the perioperative period was studied, and patterns of change were analyzed, for elective general surgical patients. Study aimed to test the efficacy of C-reactive protein as a predictor for surgical stress and diagnostic accuracy to detect early postoperative complications due to infection. Objective of this study was to estimate perioperative serum C-reactive protein level in patients undergoing elective surgeries to find out the relation between serum C-reactive protein values and severity of surgical stress and also to find out the diagnostic accuracy of C-reactive protein to detect early postoperative complications due to infection.

Key Words: C-reactive protein, Surgical procedures, post operative complications, Laparoscopic, Surgical Site Infection (SSI).

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INTRODUCTION

Approximately 20% of patients who undergo major surgeries are affected by serious complications¹. Some complications resolve quickly with negligible complications, more serious complications may necessitate reoperations and are associated with lasting morbidity and mortality. Postoperative complications are known to delay hospital discharge with increase health care costs²⁻⁴. In addition to an impaired physical recovery, postoperative complications are associated with a decreased quality of life⁵. Timely diagnosis and treatment of major complications are associated with improved outcomes⁶. CRP can be useful as a screening test to detect an inflammatory response early in its course during post operative period and also for monitoring disease activity and response to therapy in conditions where CRP is raised.

The current study was designed to assess CRP after various standard general surgical procedures. CRP can be used as a routine and reliable clinical indicator for the degree of surgical trauma incurred after standard general surgical procedures and its elevated values which may be useful for the diagnosis of postoperative infectious complications in the practice of general surgery⁷. Discovered by Tillet and Francis in 1930 it was initially thought that CRP might be a pathogenic secretion since it was elevated in a variety of illnesses, including cancer⁸. The later discovery of hepatic synthesis (made in the liver) demonstrated that it is a native protein⁹⁻¹². C-reactive protein (CRP) is an annular (ring-shaped) pentameric protein found in blood plasma, whose circulating concentrations rise in response to inflammation. CRP is an acute-phase protein produced by liver that increases following interleukin-6 secretion by macrophages and T cells. Its physiological role is to bind to lysophosphatidylcholine expressed on the surface of dead or dying cells (and some types of bacteria) in order to activate the complement system via C1q¹³. CRP was so named because it was first identified as a

substance in the serum of patients with acute inflammation that reacted with the cell wall polysaccharide (C-polysaccharide) of pneumococcus¹⁴.

The current study was designed to assess CRP kinetics after various standard general surgical procedures. More precisely, this study aims to determine whether CRP can be used as a reliable clinical indicator for the degree of surgical trauma incurred after standard general surgical procedures and to determine if further evaluation would be required in detecting postoperative infectious complications in the practice of general surgery.

PATIENTS AND METHODS

The data of each patient was collected on a proforma specially designed for this study containing demographic details, clinical features, past medical history, operation details along with post operative complications if any from the surgical units of a tertiary care hospital of semi urban setup.

The blood samples of patient were collected 24hrs prior to surgery. Post operatively the blood samples were collected after 24 Hrs, second and third day for estimation of CRP.

Post operative clinical findings like pulse rate, temperature, local signs of inflammation and laboratory parameters such as CRP, ESR, total blood counts in case of raise in CRP. The pre operative and post operative laboratory values analyzed for the statistical significance and correlation.

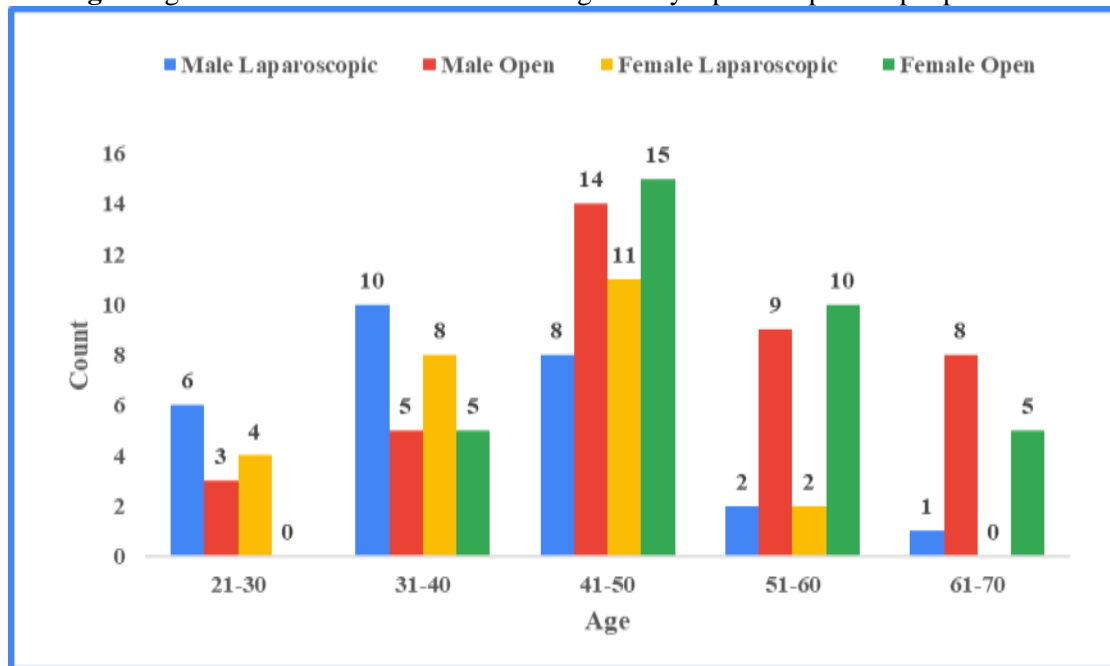
RESULTS

A total of 126 patients were admitted for elective general surgical operations from January 2022 to December and included in the present study. Patients with elevated C-reactive protein at the time of admission were excluded from the analysis. The mean age of our study population was 43.33±13.116 years; range: 21-70 years (Table 1). Out of which, the study included 66 males and 60 females with a male: female ration of 1.1: 1.

Table 1 : Age and Sex wise distribution of Surgeries by Open / Laparoscopic procedures

Age	Male (66)		Female (60)	
	Laparoscopic	Open	Laparoscopic	Open
21-30	06	3	4	0
31-40	10	5	8	5
41-50	08	14	11	15
51-60	02	9	2	10
61-70	01	8	0	5
Total	27	39	25	35

Fig-1: Age and Sex wise distribution of Surgeries by Open / Laparoscopic procedures



Open surgeries were performed in 74 (58.73%) patients, and 52 (33.3%) underwent laparoscopic procedures .(Table 2)

Table 2: Open / Laparoscopic procedures performed

Type of Surgery	No. (%)
Open	74 (58.73)
Laposcopic	52 (41.27)
Total	126 (100)

The mean CRP in the preoperative period was 2.39 ± 1.286 , and the CRP significantly raised at 24hrs (32.12 ± 36.41 mg/dl) up to 72hrs (44 ± 61.86 mg/dl) with a p-value of . (TABLE 3)

Fig-2: Open / Laparoscopic procedures performed

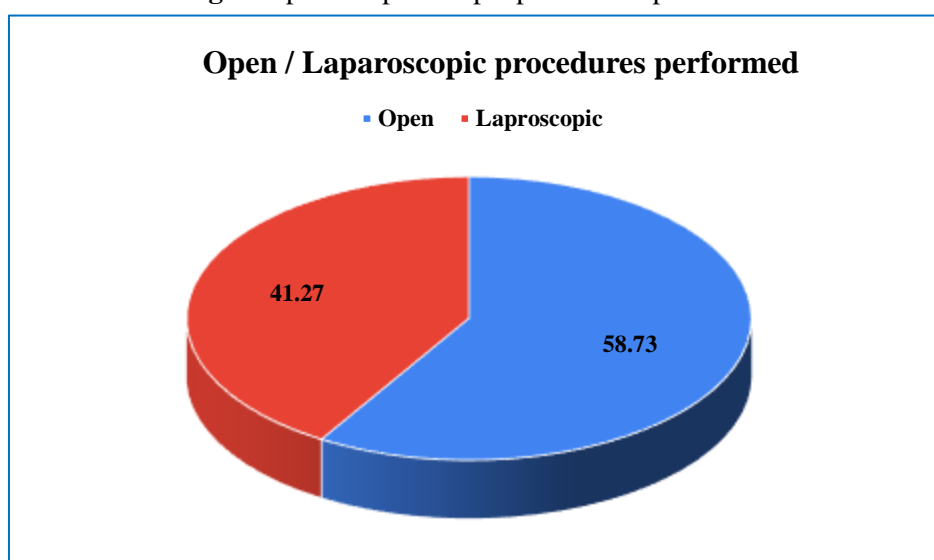


Table 3: Post operative CRP Levels

Levels of CRP	After 24Hrs		After 48Hrs		After 72Hrs	
	Number	Percent	Number	Percent	Number	Percent
Raised	48	38.09	62	49.20	74	58.73
Not Raised	78	61.91	64	50.80	52	41.27
Total	126	100.00	126.00	100.00	126	100.00

There was a substantial increase in CRP levels immediate postoperative period in 38% of the patients and increased in 57% upto 72 hrs and CRP levels showed a downward trend on 4th. day onwards, but 12.7% of the patients (16) had persistent increases in CRP due to complications. (TABLE 4)

Fig-3: Post operative CRP Levels

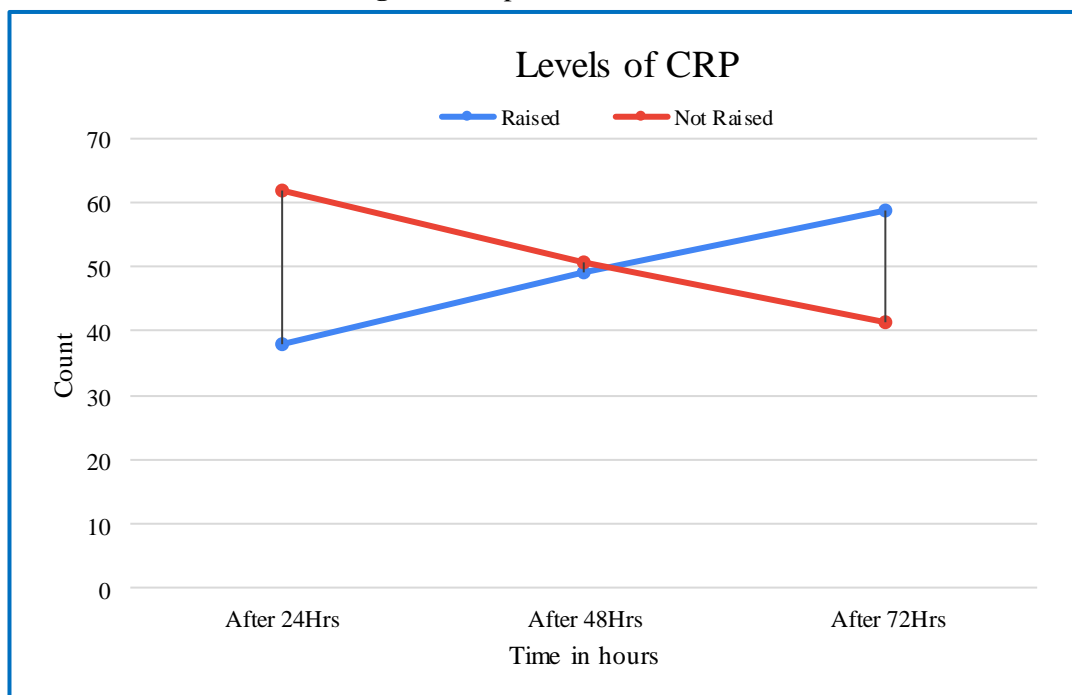
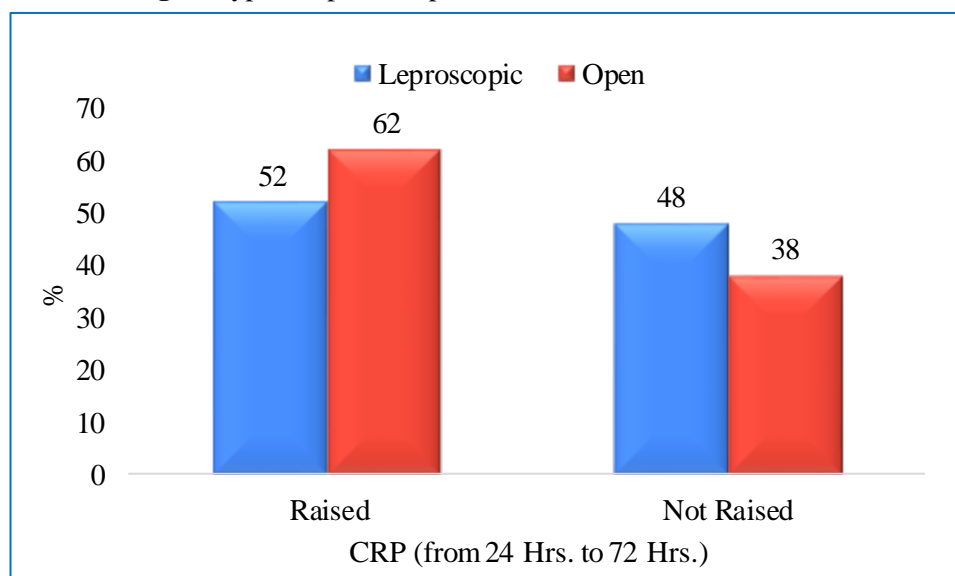


Table 4: Type of operative procedure and Raise of CRP Values

Type of Surgery	CRP (from 24 Hrs. to 72 Hrs.)				Total
	Raised		Not Raised		
	Count	%	Count	%	
Leprosopic	27	52	25	48	52
Open	46	62	28	38	74
P=0.25					

Fig-4: Type of operative procedure and Raise of CRP Values



Type of surgery had no significant difference in CRP level.

Laparoscopic surgeries included in the surgery were laparoscopic cholecystectomy, laparoscopic appendectomy. In open surgeries most common procedures done were herniotomy, hernioplasty, herniorrhaphy, mastectomy, thyroidectomy, appendectomy, gastrectomy, gastrojejunostomy, anorectal surgery, colectomy, colostomy, ileostomy and intestinal resection and anastomosis.

There was no statistically significant correlation between CRP and features of postoperative complication like raise in temperature, increase pulse rate, signs of local inflammation, altered blood counts, elevated ESR and transudate from the wound.

Persistent in elevation of CRP was observed even after 3rd. day in 16 (12.7%) (Open appendectomy-6, Laparoscopic appendectomy – 1, Open Herniorrhaphy -3, Open Cholecystectomy -2, Mastectomy -1, Gastrectomy-1, Colonal anastomosis -2) patients had post operative complication such as surgical site infection (SSI) and required further management.

DISCUSSION

C-Reactive Protein testing is not a routine practice in the preoperative assessment of elective general surgeries, however in the present study CRP was estimated for all patients admitted. Patients with preoperative value of CRP <4mg/dl were included in the study. The mean CRP in the preoperative period was 2.39 ± 1.286 . In a patient with persistently elevated CRP levels after 24hrs of surgery, we studied the following variables,

such as body temperature for fever, examination of the local surgical site for signs of local inflammation, blood investigations to look for raise in total counts, ESR elevation and transudates from the wound. Only 12.7% of the patients (16) had persistent increases in CRP due to complications. It can therefore be suggested that preoperative CRP measurement may be useful to risk-stratify elective general surgery patients¹⁵. Studies are required to assess if reducing inflammatory status and an elevated CRP in chronic inflammation will make a difference in the outcome of surgical procedures. It would be advisable to do CRP measurement prior to surgery so as to take adequate measures to prevent postoperative complications without delaying the scheduled operation. CRP is known to rise following surgical trauma and peaks at 48h postoperatively¹⁶. Brewster et al. have noted a link between the peak postoperative CRP response and degree of surgical trauma¹⁷. In our present study, we did not find such a correlation when assessing CRP response to different surgical procedures such as open procedures and laparoscopic surgeries. Among patients with elevated CRP values, Open surgeries contribute to 58.73% in comparison to 41.27% in patients who underwent laparoscopic procedures. In studies conducted by Grande et al. and Hildebrandt et al., comparing surgical stress following laparoscopic and open cholecystectomy and laparoscopic and open colonic resection, laparoscopic surgeries were associated with lower CRP responses^{18,19} though not all studies agree²⁰. CRP was measured at 24 hrs and 48hrs and 72 hrs in our study. The mean CRP in the preoperative period was 2.39 ± 1.286 , and the CRP significantly increased at 24hrs

(32.12±36.41mg/dl) up to 72hrs (44± 61.86mg/dl) with a p-value of 0.001. There was a substantial increase in CRP levels immediate postoperative period in 38% of the patients and increased in 57% upto 72 hrs and CRP levels showed a downward trend on 4th. day onwards, but 12.7% of the patients (16) had persistent increases in CRP due to complications. The findings of our study are confirmed by other studies, which assessed CRP levels after other procedures, and reported that CRP levels reflect the extent of surgical trauma^{21,22}. CRP measurement in the Preoperative period has been shown to be a prognostic indicator for both oesophageal and colorectal carcinoma^{23,24}. The secretion of CRP by the tumour itself could be the cause of increase and it was shown to be independent of the tumour stage. Study done by Takakura et al, suggest PCT, CRP and WBC as reliable biomarkers for predicting surgical site infections post colorectal cancer surgery²⁵. serum CRP has significant clinical value in helping to identify infectious complications that require intervention well before the current moment of diagnosis²⁶.

CONCLUSION

Testing of CRP pre-operatively is not a routine practice in elective surgeries. CRP levels rise in post operative period in most of the patients due to surgical stress. Persistently increasing CRP after 72 hrs postoperative day is worth evaluating and can be used to monitor for postoperative complications and response to treatment.

A peri-operative CRP measurement should be performed in all patients undergoing major surgeries, followed by further evaluation should only be requested if there is a clear clinical indication as the test is not costly and helps to provide a clue in case of postoperative complications.

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CONFLICTS OF INTEREST

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