THE EFFECT OF SERUM C-REACTIVE PROTEIN, SERUM LACTATE CLEARANCE, AND SERUM INTERLEUKIN-6 PREDICTING OUTCOMES OF EMERGENCY GASTROINTESTINAL SURGERGICAL

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"THE EFFECT OF SERUM C-REACTIVE PROTEIN, SERUM LACTATE CLEARANCE, AND SERUM INTERLEUKIN-6 IN PREDICTING OUTCOMES OF EMERGENCY GASTROINTESTINAL SURGERIES"

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LIST OF ABBREVIATIONS

CRP	**C Reactive protein**
IL-6	**Interleukin-6**
SIRS	**Systemic Inflammatory Response Syndrome**
AL	**Anastomotic Leak**
PF	**Peritoneal Fluid**
WBC	**White Blood Cells**
I-FABP	**Intestinal Fatty Acid Binding Protein**
IFN	**Interferon**
AMI	**Acute Mesenteric Ischemia**
SBO	**Small Bowel Obstruction**
POD	**Post-Operative Day**
LDH	**Lactate Dehydrogenase**
CK	**Creatine Kinase**
GOT	**Glutamic Oxaloacetic Transaminase**
PAMP	**Pathogen-Associated Molecular Patterns**
TLR	**Toll-Like Receptors**
PRR	**Pattern Recognition Receptors**
YAP	**Yes Associated Protein**
Mg	**Milligram**
Pg	**Picogram**
dL	**Decilitre**
MMOL/L	**Millimole/Litre**

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ABSTRACT

Background:

Acute abdomen is a major concern for a surgeon following surgery. Many methods have been devised to avoid the dreaded postoperative complications. Acute abdomen is often associated with a significant amount of mortality and morbidity. Timely intervention can help reduce the complications and help in better outcomes for the patient.

AIM:

To study the effect of Preoperative Serum C Reactive Protein, Serum Lactate clearance, and Serum Interleukin-6 levels on assessing the outcomes in patients undergoing emergency gastrointestinal surgeries.

OBJECTIVES:

The study was taken up with regard to

1. Surgical site infections.
2. Wound Dehiscence, and Anastomotic leak.
3. Duration of hospital stay, and paralytic ileus.
4. Mortality.

Methods:

From JANUARY 2021 to JUNE 2022, a prospective study was conducted at a tertiary care hospital to study the effect of Serum CRP, Serum Lactate clearance & Serum Interleukin-6 levels on assessing the outcomes in patients undergoing emergency gastrointestinal surgeries..

The study included 79 subjects in whom the post-surgical complications mentioned above and the biochemical markers under study were studied and evaluated.

Results:

A Total of 78 patients were studied. 57 among them were males and 21 females.20 patients had wound dehiscence, 6 patients had anastomotic leak, 48 patients had surgical site infections, 7 patients expired and the mean duration of stay was 15.045 days and paralytic ileus was seen in 37 patients. We observed that Interleukin 6 and CRP are better predictors with statistical significance in diagnosing surgical site infections and lactate clearance < 10% resulted in most of the complications included in the study and were statistically significant. It was also observed that patients with high initial lactate of > 4 mmol/L had high risk of morbidity and mortality

Conclusion:

In Patients diagnosed with acute abdomen and planned for emergency gastrointestinal surgeries The values of the markers CRP, Lactate Clearance and Interleukin-6 were useful in predicting the complications - surgical site infections, wound dehiscence, paralytic ileus and mortality. When combined with the clinical assessment and radiological investigations the biochemical investigations performed better as predictors of untoward outcomes. Abnormal/increased values on examination demand a focussed, intensive care and management of the patient which will help in avoiding the complications.

KEYWORDS –

acute abdomen, emergency laparotomy, Serum C Reactive protein, Serum Lactate clearance, Serum Interleukin – 6, Surgical site infection, Wound dehiscence, Anastomotic leak, Paralytic ileus, Mortality

INTRODUCTION

The first acute phase protein to be identified as a systemically sensitive marker of inflammation and tissue damage is C-Reactive Protein (CRP). It was first discovered in 1930 at Rockefeller University by William Tillett and Francis. After tissue damage, CRP levels normally increase from two to six hours before starting to decline by the third day. [(1)].

Interleukin-6 (IL-6), a proinflammatory cytokine generated by macrophages and T cells that stimulates appropriate immunological responses to tissue injury. The mobilisation of energy precursors from fat tissues and muscle, which raises core body temperature, is one of the most well-studied effects of IL-6. Elevated serum levels may result from sepsis and SIRS.. [(2)]

On-admission lactate level, pH and base deficit are examples of traditional laboratory indicators whose predictive relevance for several objectives, such as sepsis, organ failure, and death, has been well researched.[(2)]

The raised lactate levels in the blood are an early sign of tissue hypoxia. Serum lactate levels had been shown to increase in acute abdominal conditions like appendicitis and mesenteric ischemia and can be used as a marker for mesenteric ischemia and appendicitis. Huckabee and Cohen first described lactic acidosis during 1970-1980. Blood lactate levels have proven to be a better predictor of outcome than oxygen-derived factors like oxygen uptake or oxygen delivery. In patients who are not yet hypotensive but are at risk for septic shock, measuring a patient's lactate level is crucial in detecting tissue hypoperfusion. [(3)]

In a patient presenting with acute abdomen clinical assessment continues to be the primary step in evaluation, diagnosis and in planning the further course of treatment accordingly. Morbidity and mortality associated with the acute abdomen significantly increases with a delay in diagnosis which further effects the course in hospital.[4]

A definitive diagnosis of acute intestinal ischemia can typically be made only after a laparotomy, which is still the gold standard therapeutic and diagnostic procedure. The conventional diagnostic approach to acute intestinal ischemia usually involves a preliminary assessment of signs and symptoms, followed by laboratory and radiological investigations.[5]

Hence we intend to study the effect of readily available biochemical investigations CRP, Serum lactate clearance and Interleukin 6 to assess the patient clinically and plan further course of management for a best and desired outcome by predicting the morbidity and mortality

NEED FOR STUDY

- To determine whether there is a relationship between IL-6 levels and 24 hour lactate clearance. Elevated Interleukin-6 (IL-6) and lactate levels were demonstrated to correlate with death and multiple organ dysfunction in severely traumatised patients., and the development of infectious complications in patients undergoing emergency gastrointestinal surgeries [2,3].

- The majority of patients undergoing major abdominal surgery suffer from postoperative complications, including wound infection, sepsis, anastomotic dehiscence, pneumonia, cardiovascular or respiratory events, and mortality [8,9].

- While the choice may not be necessary for elective patients who are nutritionally adequate and do not have risk factors for dehiscence and who are well prepared for surgery, but the tests may prove crucial in emergency patients who often have multiple risk factors for developing post-surgical complications.

- Some studies have been conducted to determine if blood lactate, IL-6, and CRP measurements taken together can accurately estimate the severity of acute abdomen and its prognosis. This study aims to investigate this potential.

  Thus, there is a need for a study to predict the outcomes in patients who undergo emergency gastrointestinal surgeries to reduce the incidence of postoperative complications and mortality.

AIMS AND OBJECTIVE OF THE STUDY

To study the effect of Preoperative Serum CRP, Serum Lactate clearance & Interleukin-6 levels on assessing the outcomes in patients undergoing emergency gastrointestinal surgeries.

Objectives: -

The study was taken up with regards to

1. Surgical site infections.
2. Wound Dehiscence, and Anastomotic leak.
3. Duration of hospital stay, and paralytic ileus.
4. Mortality.

REVIEW OF LITERATURE

In 2007 Salem TA et al conducted a study in patients with acute abdomen and significance of CRP in them and concluded that CRP alone was not able to predict who will be treated operatively or conservatively. CRP value should be considered only in conjunction with other clinical and biochemical parameters where the combination with other tests serves better to reach a correct diagnosis. (1)

In 2009 Billeter A et al conducted a study and it was found increased early procalcitonin and IL-6 levels as well as insufficient 24-hour lactate clearance are helpful predictors of septic infections in severely traumatised individuals. This helps identify trauma patients who experience both septic and non-septic infectious sequelae. (2)

In 2011 Green J P et al Conducted an observational cohort study on the subject- Serum lactate as a better predictor of short-term mortality when conjuncted by C-reactive protein in adult patients hospitalized for a suspected infection and concluded that patients with both increased CRP level and hyperlactatemia had a higher mortality rate than patients with abnormalities of either laboratory test in isolation. (3)

In 2013 Scepanovic M S et al. conducted a prospective study on the subject of early anastomotic leakage prediction with C-reactive protein in elective abdominal surgery and concluded that patients who have greater CRP levels and no postoperative drop in serum CRP must stay in the hospital for longer and have a thorough investigation of any infectious problems, especially A.L. (4)

In 2014 Verma I conducted a study to determine the predictive value of lactate levels in the peritoneal fluid (P.F.) and blood of patients with acute abdomen and came to the conclusion that the cut off values for P.F. lactate, difference, and ratio of P.F. and blood lactate are at a very high degree of sensitivity, increasing its diagnostic value. Therefore, lactate estimation is a time- and money-efficient, sensitive, non-invasive, non-invasive marker for acute abdominal illnesses that may be helpful to the surgeon in making decisions. (5)

In 2015 Bhat S et al conducted a Retrospective Cohort study on the subject-Lactate Clearance predicted survival among patients with severe sepsis and concluded that Patients who do not clear their lactate have significantly higher mortality than those with decreasing lactate levels. (6)

In 2016 Rettig T C et al conducted a study that after elective major abdominal surgery, high IL-6 level on day one can be associated with postoperative complications, and levels of IL-6 would help distinguish between patients at low and increased risk for complications before changes in CRP levels, according to a study titled Postoperative Interleukin-6 Level and Early Detection of Complications.. (7)

IN 2011 Ravishankar et al concluded that it is possible to diagnose an acute abdomen and a septic condition at the same time in emergency scenarios. This will help to start intense treatment right away. We anticipate the rapid development of an IL-6 test for everyday usage in emergency scenarios. It will need more clinical research with a larger, more dependable sample of acute pancreatitis patients to verify these initial, encouraging findings. (10)

In 2020 Tahir S et al observer that On evaluating ROC, a cut-off value of CRP levels >88.0 mg/dl was predicted to be 100.0% sensitive and 84.8% specific with positive and negative predictive values of 47.4% & 100.0% respectively. Overall accuracy of model at this cut-off was 86.7%. On evaluating ROC, a cut-off value of Serum lactate >36.85 mg/dl was predicted to be 77.8% sensitive and 72.7% specific with positive and negative predictive values of 28.0% & 96.0%. Overall accuracy of model at this cut-off was 73.3%. and concluded that CRP and Lactate levels can be used as possible markers for predicting strangulation as well as mortality among cases of acute abdomen [(11).]

In 2019 Breidthardt. T et.al observed that the diagnostic accuracy of interleukin-6 was significantly superior to initial clinical judgment, procalcitonin, and the open-label routine blood parameters WBC and CRP. interleukin-6, but not procalcitonin, provided incremental diagnostic value to both initial and final clinical judgment and significantly increased the diagnostic accuracy and concluded that Interleukin-6 significantly improves the early diagnosis of Urgent Abdomen Pain in the Emergency Department.[(12)]

In a study "*Biochemical markers of acute intestinal ischemia: possibilities and limitation's* by Martina Montagnana et al, D-lactate may originate from various types of bacteria that are often found in the large intestine. D-lactate, IMA, and I-FABP are possibly the most promising markers for intestinal ischemia because they have the best sensitivity and specificity, early kinetics, and can be measured with assays specific for

intestinal ischemia. On the other hand, intestinal ischemia may impair mucosal integrity, which is a plausible explanation for an elevated blood D-lactate concentration. [13]

In 2021 Yan Y and others in their article "*The predictive prognostic values of serum interleukin-2, interleukin-6, interleukin-8, tumour necrosis factor-α, and procalcitonin in surgical intensive care unit patients*" with maximum youden index as the critical value cut off value for IL- 6 at 44.1 pg/mL and sensitivity of 71.43 % specificity 61.75% and concluded that high IL-6 values in post operative patients has a high predictive value as biomarker for mortality.[14]

In 2020 Hajong R et.al in their study "*Role of serum C-reactive protein and interleukin-6 as a predictor of intra-abdominal and surgical site infections after elective abdominal surgery*" observed in patients who experienced postoperative wound infections compared to those who did not, the mean increase in CRP and IL 6 levels was significantly larger. After surgery, serum IL 6 rises proportionately and is correlated with the degree of tissue damage, surgical site infections, surgical technique, and the complexity of the operative procedures, researchers determined. Both CRP and IL 6 can be utilised alone or in combination as biological markers in postoperative patients and have good correlations with postoperative surgical site infections. In patients with normal CRP or IL 6, the risk of developing wound infections after surgery is quite low, and they can leave the hospital sooner. [15].

In 1994 Patel.R.T and others in their study titled "*Interleukin 6 is a prognostic indicator of outcome in severe intra-abdominal sepsis*" observed that the level of IL-6 in non-survivors did not drop as sharply as it did in survivors over the course of 7 days, as was previously reported. In fact, higher IL6 detection in the non-survivors may signify ongoing tissue damage and degeneration following sepsis. Continued endothelial

damage and increased IL6 and IFN- secretion may result from persistent sepsis. Levels of plasma lactate and plasma IL-6 were significantly correlated in all samples that were taken at the same time.[16]

In 2009 Arnold R C and others in a "*Multicentre study of early lactate clearance as a determinant of survival in patients with presumed sepsis"* comparing the survivor vs non survivors observed that Lactate non clearance (initial lactate level less than 4.0 mmol/l and lactate clearance $\geq$ 10 % considered normal) was one of the significant factor for mortality.[18]

In 2002 Suzana M et.al in their study "*C-Reactive Protein Levels Correlate With Mortality and Organ Failure in Critically Ill Patients"* observed that the majority of patients who experienced at least one organ failure while in the ICU had considerably higher CRP levels at admission than the other patients (27% who did not experience organ failure; p 0.05) The severity and pattern of multiple organ dysfunction in ICU patients were detailed in connection to CRP concentrations and the number of organs failing during the ICU stay increased with rising CRP concentrations, both at ICU admission and at 48 h..[19]

In 2011 Demir E I and others in their study "*Beyond Lactate: Is There a Role for Serum Lactate Measurement in Diagnosing Acute Mesenteric Ischemia?"* compared various studies targeting mesenteric ischemia diagnosis by serum markers and said that that serum lactate does not represent the initial, decisive stage of intestinal injury and is only a general indicator of tissue hypoperfusion. [20]

In 2012 Meyer C Z and others in a case report of three cases about the value of C-reactive protein and lactate in the acute abdomen in the emergency department came to the conclusion that in patients with acute abdominal pain, lactate concentrations

and CRP levels should only be utilised in conjunction with the history and clinical symptoms, and possibly with a CT scan as well.. [21]

In 2018 Isfordink C J and others in a study "*Clinical value of serum lactate measurement in diagnosing acute mesenteric ischaemia*" studied various articles relating Lactate to acute mesenteric ischemia and comparing D & L-lactate levels observed that an increased serum L-lactate appears to be an unfavourable prognostic sign rather than a marker of diagnosis for Acute Mesenteric Ischemia (AMI) and D-lactate appears to be a little bit more reliable than L-lactate as a diagnostic marker for AMI, its performance in the current literature is still not good enough to be used in daily practice.[23]

In 2013 Andersen W L and others in the topic "*Aetiology and Therapeutic Approach to Elevated Lactate Levels"* Elevated lactate concentrations have been linked to higher fatality rates in a number of conditions, including sepsis, trauma, and cardiac arrest. Reduced lactate clearance has been linked to higher mortality rates in a number of situations, including sepsis, post-cardiac arrest, trauma, and burns. The use of lactate clearance as an end point of resuscitation might prove beneficial and Despite its imperfect sensitivity and specificity, the lactate assay remains a clinically useful test that can alert a clinician to underlying hypoperfusion in need of immediate treatment or an aetiology not readily apparent on initial evaluation. [24]

INTESTINAL OBSTRUCTION

- Acute abdomen is one of the most common presentation often requiring surgical interventions in the form of laparotomies. One among such emergencies is the intestinal obstruction [25,26]- The "functional or mechanical stoppage of the normal transit of contents via the gastrointestinal system" is what is meant by the definition. The distinctive aftereffects include an accumulation of gas and air in the colon that causes the intestinal wall to expand. This causes fluid to accumulate in the lumen, straining the intestinal wall and jeopardising its ability to receive blood flow.
- Either the small or the big intestines may be the location. It is known as SBO in the small intestine, where it is more typical (Small Bowel Obstruction).
- Different types of mechanical obstruction can be categorised. [27]

1. Depending on where the aetiology is located in the intestinal wall, it can:

- When the obstruction-causing agent is in the intestinal lumen, the obstruction is Luminal.
- When it is in the bowel wall, the obstruction is Mural.
- The obstruction-causing agent is Extramural if it is present outside the gut wall.

2. Based on the communication with the rest of the lumen of the bowel, it can be;

a) Closed Loop

- Proximal (When the site of the obstruction is high)
- Distal (when the site of obstruction is low) - In a closed loop obstruction, there are two locations of blockage in the intestine's lumen, which causes the obstruction and

the rest of the bowel to become disconnected. The bowel's contents do not move retrogradely or prograde.

- b) **Open-ended**-One point of occlusion in the intestine's lumen causes only one side of the bowel to be disconnected from the obstructed portion in an open-ended obstruction. The motion of the bowel's contents is either prograde or retrograde..

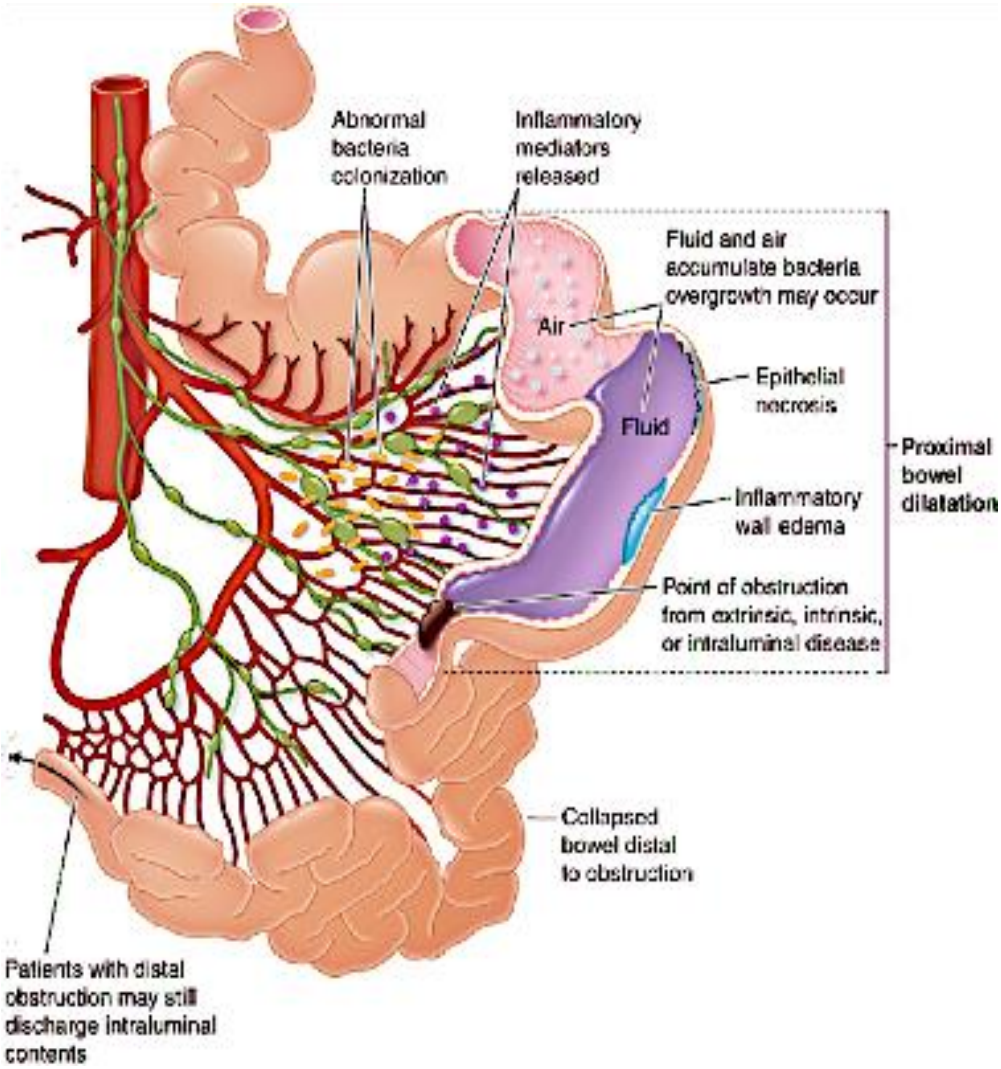

FIGURE 1-INTESTINAL OBSTRUCTION

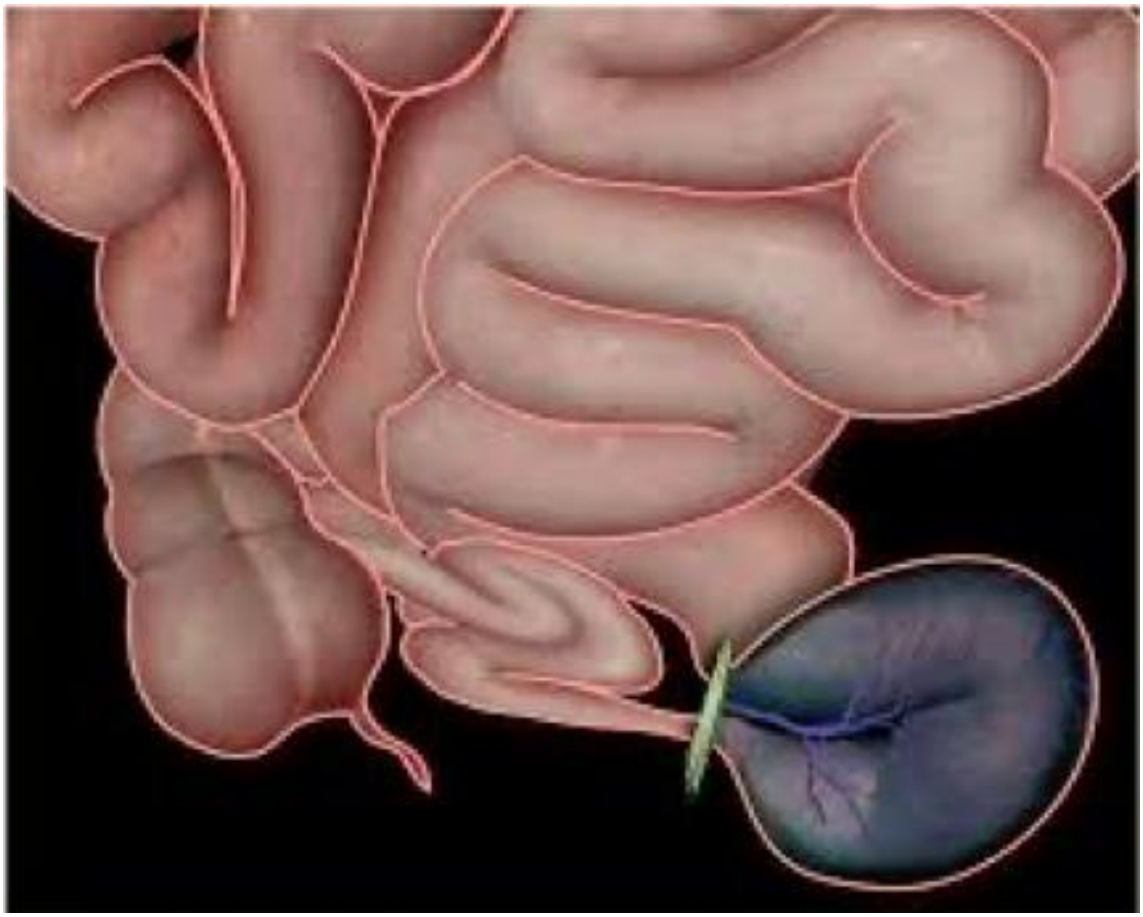

FIGURE 2- CLOSED LOOP OBSTRUCTION

1. **Based on the completeness of the obstruction of the bowel, it can be classified as;**

a) Partial -Some contents like liquid and gas may pass from the site of obstruction to the other side

b) Complete -No content can pass from the site of obstruction to the other side

2. **Based on the severity and prognosis, it can be;**

a) Simple - it is simple when there is no residual or resultant sequelae, resolves easily and has good prognosis

b) Complicated - when there are sequelae like ischemia, infarction and perforation. This is due to the loss of blood flow to the parts of the bowel due to the circulation compromise.

• Since intestinal obstruction is a dangerous ailment, it needs to be found, diagnosed, and treated right away [28,29]. The inability to distinguish between simple and serious acute intestinal obstruction is one of the difficulties associated with acute bowel obstruction. This is crucial to determine whether or not non-operative techniques can suffice in place of an emergency surgery [30,31]

• Various clinical, analytical, and radiographic characteristics should be considered when deciding how to treat acute intestinal obstruction. [32]

TABLE 1- MOST COMMON CAUSE OF INTESTINAL OBSTRUCTION

Adhesive disease (60 percent)
Neoplasm (20 percent)
Herniation (10 percent)
Inflammatory bowel disease (5 percent)
Intussusception (< 5 percent)
Volvulus (< 5 percent)
Other (< 5 percent)

LABORATORY AND RADIOLOGICAL FINDINGS

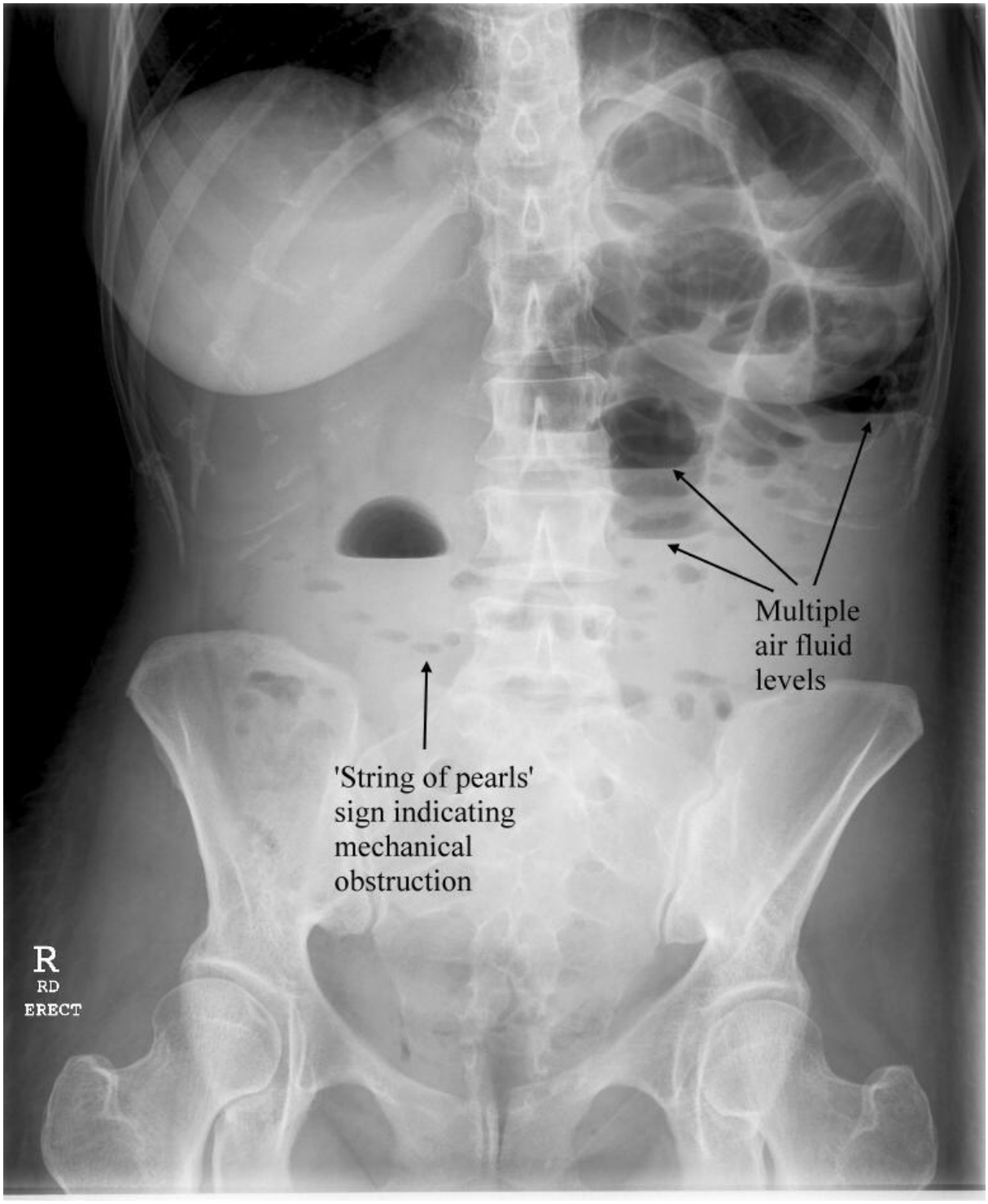

FIGURE 3 - X-ray : String of Pearls Sign

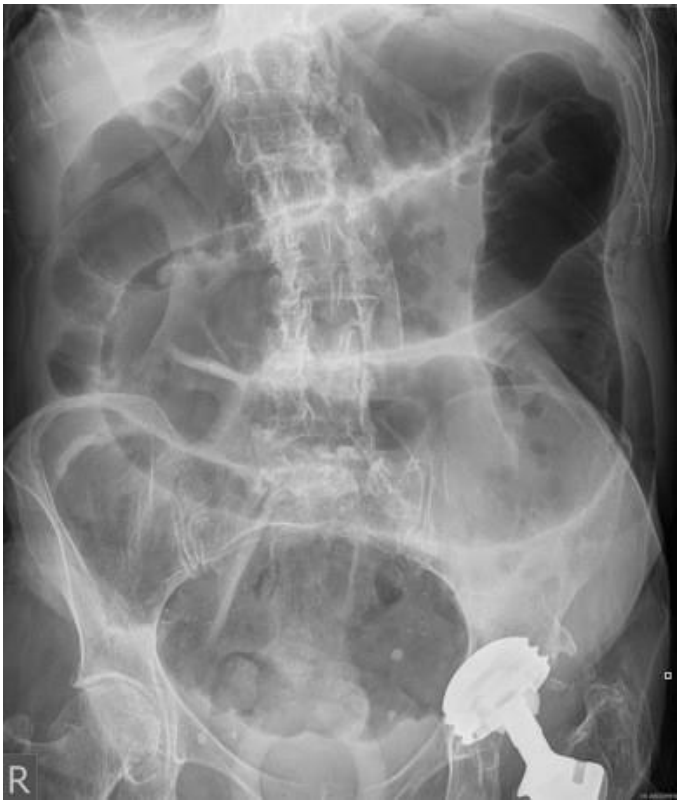

FIGURE 4 - X RAY LARGE BOWEL OBSTRUCTION

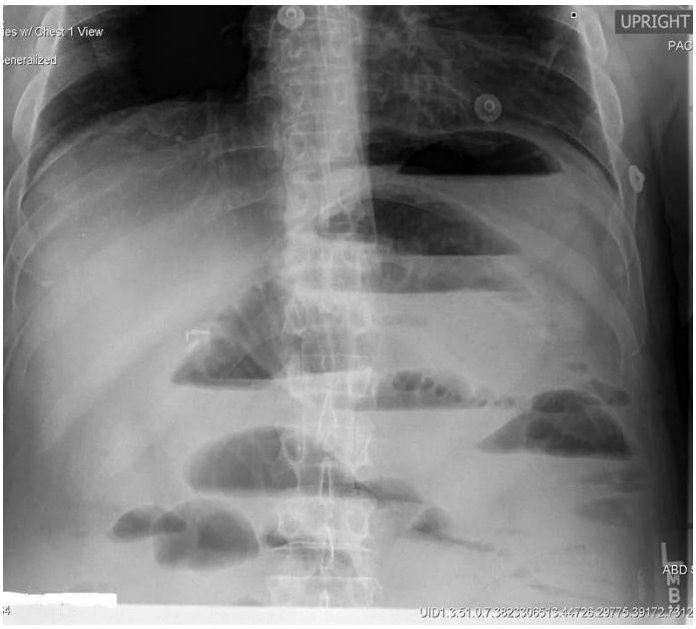

FIGURE 5- X RAY - STEP LADDER PATTERN

GASTROINTESTINAL PERFORATION

Intestinal perforation is the outcome of damage or injury to the bowel wall's mucosa brought on by a breach in the closed system. Inflammation, infection, obstruction, trauma, or invasive procedures are just a few of the many secondary causes of bowel perforation. [33]

Based on their anatomical sites, bowel perforations can be distinguished, but there are numerous overlapping causes..

- ***Small bowel****:* Iatrogenic, medication- or radiation-related, duodenal ulcer-related, tumour-, infection-, or abscess-related, hernia with strangulation, Meckel diverticulum, foreign body, blockage, and blunt or piercing abdominal trauma
- ***Large bowel****:* Abdominal tumours, diverticulitis, infections, abscesses, colitis, foreign bodies, obstructions, volvulus, iatrogenic abdominal injuries [34]

Bowel perforation in children is most likely to occur after abdominal trauma. Bowel perforation occurs between 1% and 7% of the time in paediatric trauma victims. The most frequent cause of bowel perforation in adults is ulcerative illness, with duodenal ulcers producing 2- to 3-times as many perforations as stomach ulcers. Up to 15% of patients have diverticular disease-related perforation. The most frequent cause of perforation in the elderly population is perforated appendicitis. Around 2% has been reported as the average incidence of colonoscopy-related perforation, with greater rates during colonoscopy necessitating therapeutic measures. [35]

Bowel perforation is caused by a breach in the intestinal tract's mucosal layers, which allows air and digestive fluids to leak into the peritoneal cavity. These contents can range from faeces from a more distal location of perforation to

extremely acidic gastric contents in more proximal bowel perforation. Over time, partial erosion might progress to full-thickness tears, or a particular lesion can prompt a spontaneous rupture. This means that while pain may come on suddenly or gradually, its severity typically increases. There may be feelings of abdominal distension and symptoms of peritonitis, such as rigidity of the abdominal muscles. [36]

Differential Diagnosis of Bowel perforation

- Acute Cholecystitis and Biliary colic
- Acute gastritis
- Acute pancreatitis
- Appendicitis
- Constipation
- Crohn's disease
- Endometriosis
- Fallopian tube disorders
- Inflammatory bowel disease
- Meckel diverticulum surgery

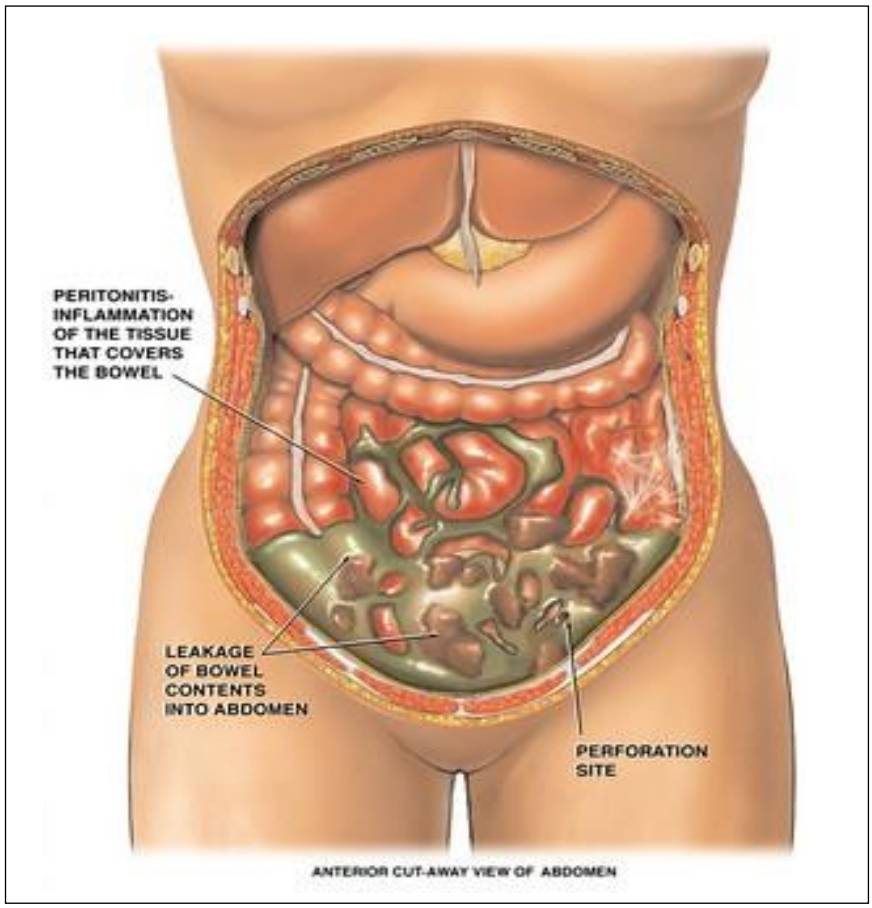

FIGURE 6 – PERFORATION PERITONITIS

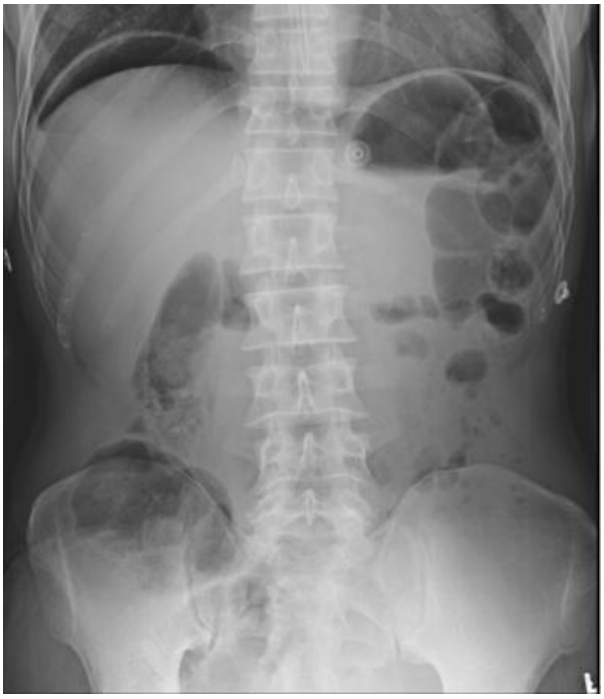

FIGURE 7 – X RAY PNEUMOPERITONEUM (AIR UNDER DIAPHRAGM)

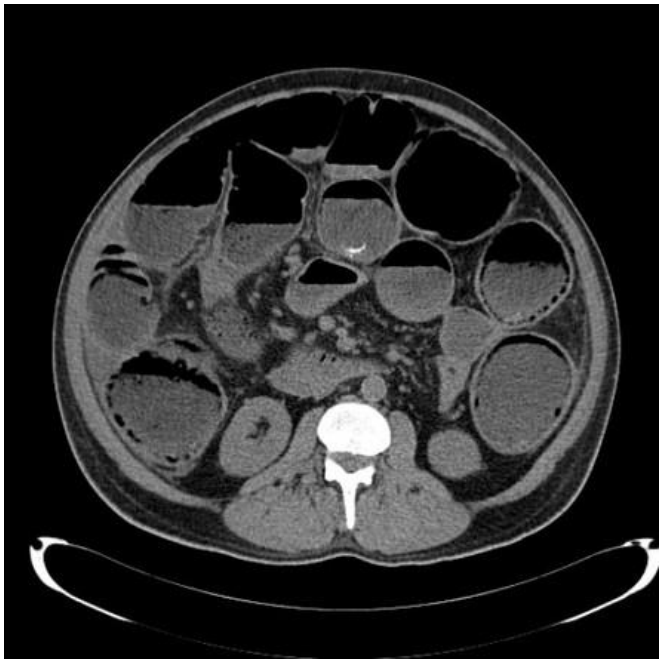

FIGURE 8 – C.T-LARGE BOWEL OBSTRUCTION WITH PERFORATION

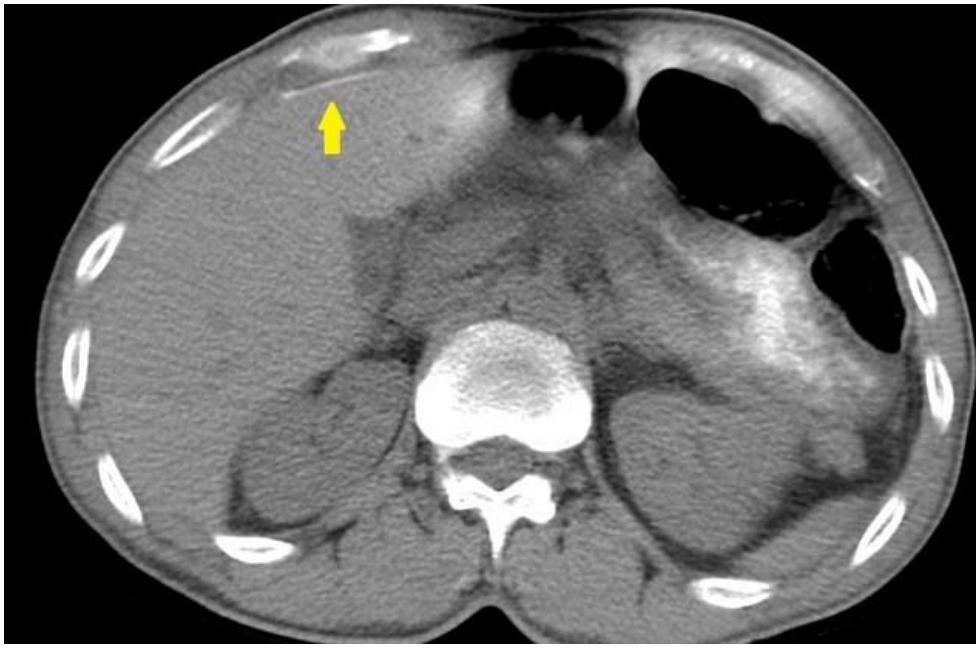

FIGURE 9 – C.T.PERFORATED DUODENAL ULCER

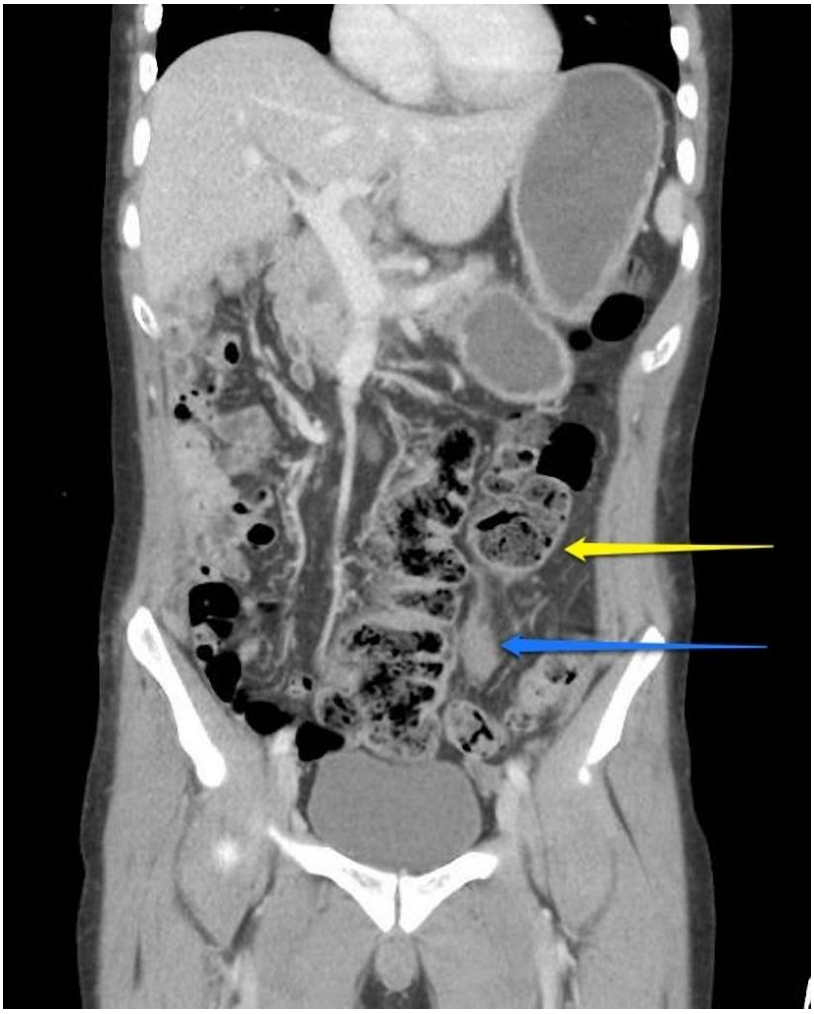

FIGURE 10- C.T.COLONIC INJURY WITH MESENTERIC HEMATOMA

SURGICAL SITE INFECTION

Surgical site infection is an infection that arises within 30 days of surgery without a prosthesis or within a year of surgery with a prosthesis. Following a laparotomy, surgical site infection is one of the most common postoperative consequences, affecting at least 5% of all patients undergoing surgery and 30-40% of patients receiving abdominal surgery, depending on the extent of the contamination.[37,38]

Surgical-site infection occurs at substantially greater rates after surgeries for peritonitis because the incidence of the infection increases with the degree of contamination. SSIs currently account for around 40% of all hospital-acquired infections. [39]

Surgical site infections[40-42] are a significant concern and a leading cause of postoperative morbidity, extending the length of stay. "It can lead to deep sepsis and possibly death" if "uncontrolled." It is responsible for 45 percent of hospital-acquired infections in postoperative patients. The surgical wound encompasses the complete surgical wound, including both interior and external areas of the body

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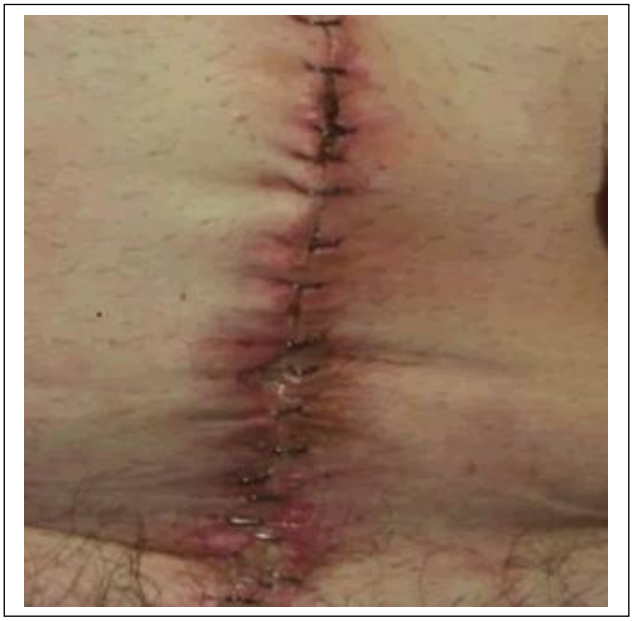


FIGURE 11 – SURGICAL SITE INFECTION

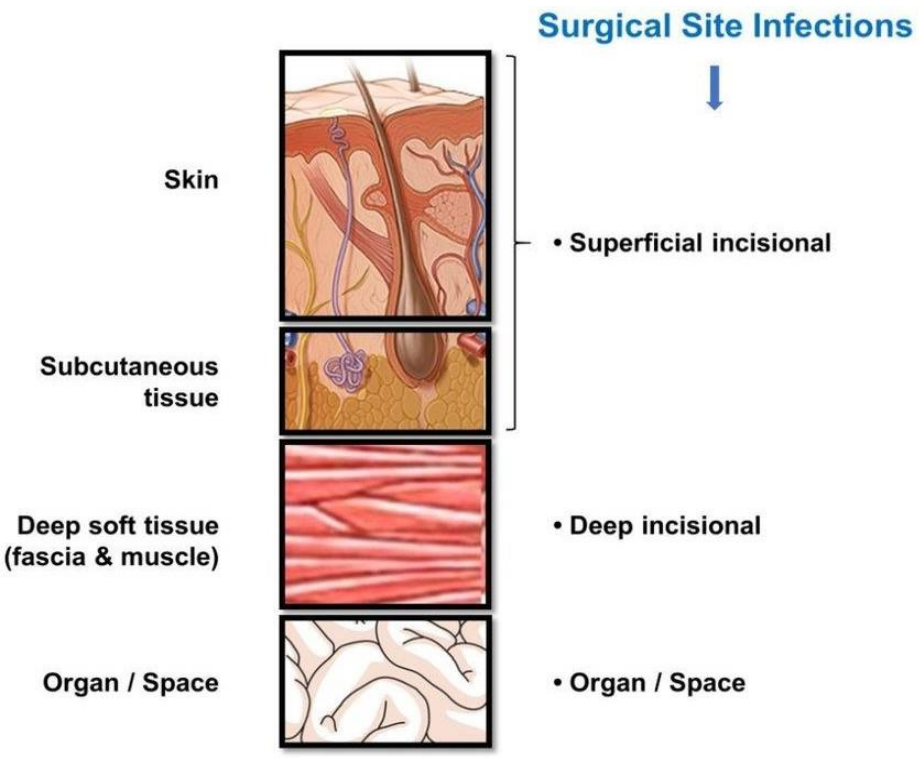


FIGURE 12: CATEGORIES OF SURGICAL SITE INFECTION

WOUND DEHISCENCE

Wound dehiscence [43] or acute wound failure are terms used to describe the postoperative separation of the abdominal musculoaponeurotic layers.

- It has the potential to cause-
    - Evisceration,
    - Separation of wound
    - SSI
    - It has the potential to develop into an incisional hernia in the future.

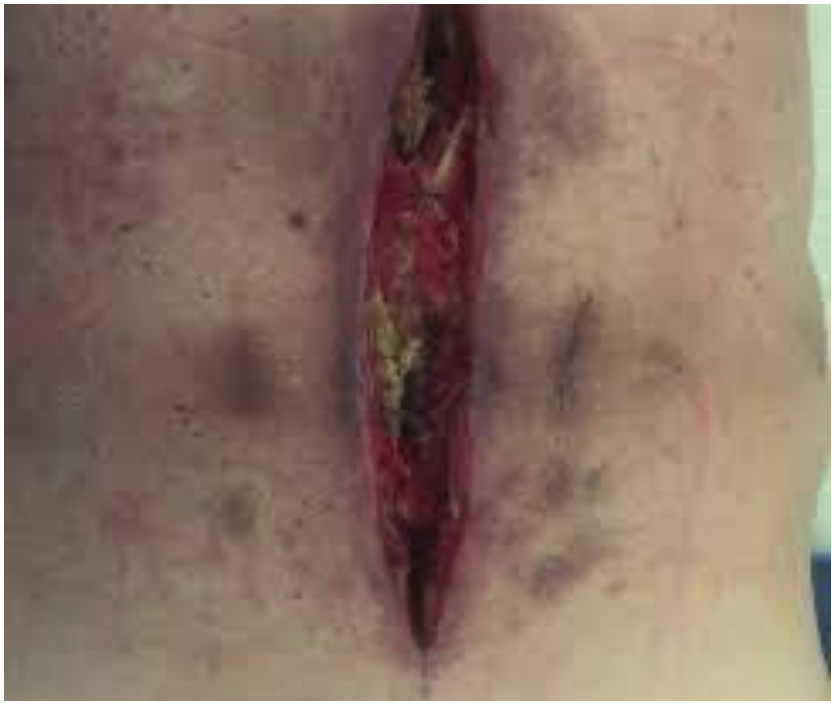


FIGURE 13 – WOUND DEHISCENCE IN A LAPOROTOMY SCAR

- In emergency abdominal operations, the incidence is 1-3 percent. It happens in 7-10 days (POD)
- Wound dehiscence is caused by several reasons.
    - Immediate surgery
    - Inflammation of the intestines
    - Obesity
    - Infection of the wound
    - Hematoma
    - Seroma
    - The syndrome of compartments
    - Long-term corticosteroid usage
    - If there has been a previous wound dehiscence

- Malnutrition
- Chemotherapy and radiation therapy

Wound dehiscence is treated conservatively at first with an abdominal binder and saline-soaked gauze. Generally, a healthy wound may be closed. Infected wounds may require debridement and closure.

PARALYTIC ILEUS

- It is a chronic motility disease called primary intestinal pseudo-obstruction mimics mechanical obstruction. Surgery should be avoided in situations where the use of narcotics may cause abrupt exacerbations.

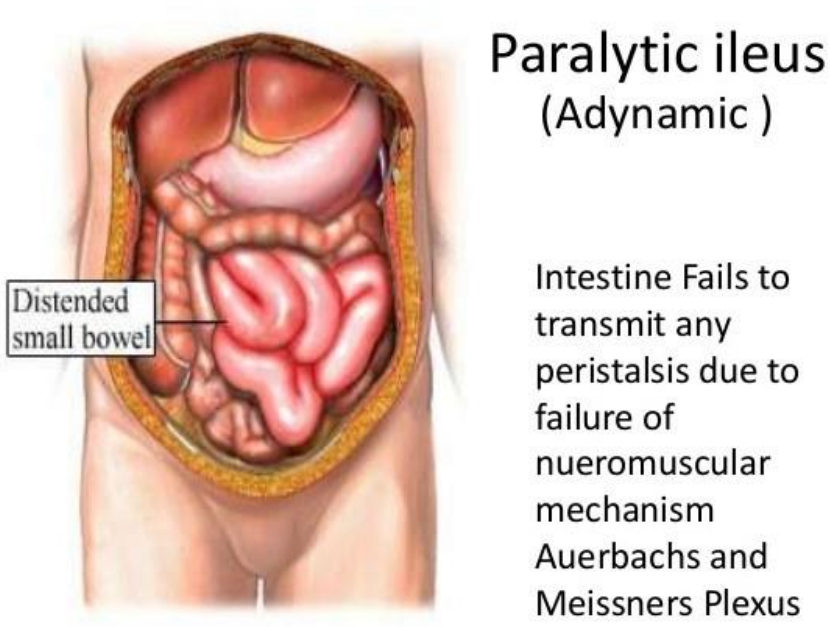


FIGURE 14 – PARALYTIC ILEUS

Paralytic ileus is commonly due to immobilization of patient following surgery and electrolyte imbalance which occurs following a major abdominal surgery and hence it can be prevented by mobilization of the patient and maintaining the electrolyte balance in the body.

ANASTOMOTIC LEAK

After gastrointestinal tract resection and repair, anastomotic leakage (AL) is a significant consequence. Reports of AL prevalence range from 1 to 39%. These patients have greater rates of morbidity, death, and expenses, and their hospital stays are longer. Individuals with AL experienced a significantly greater mortality rate following elective large bowel resection than patients without AL (13 vs. 1%). Since AL has no early, distinct signs or symptoms, it is typically discovered late in the healing process, when patients are showing signs and symptoms of sepsis and peritonitis, as well as systemic problems. Early diagnosis of this complication is crucial due to the global trend toward a quicker release of surgical patients.[(4)]

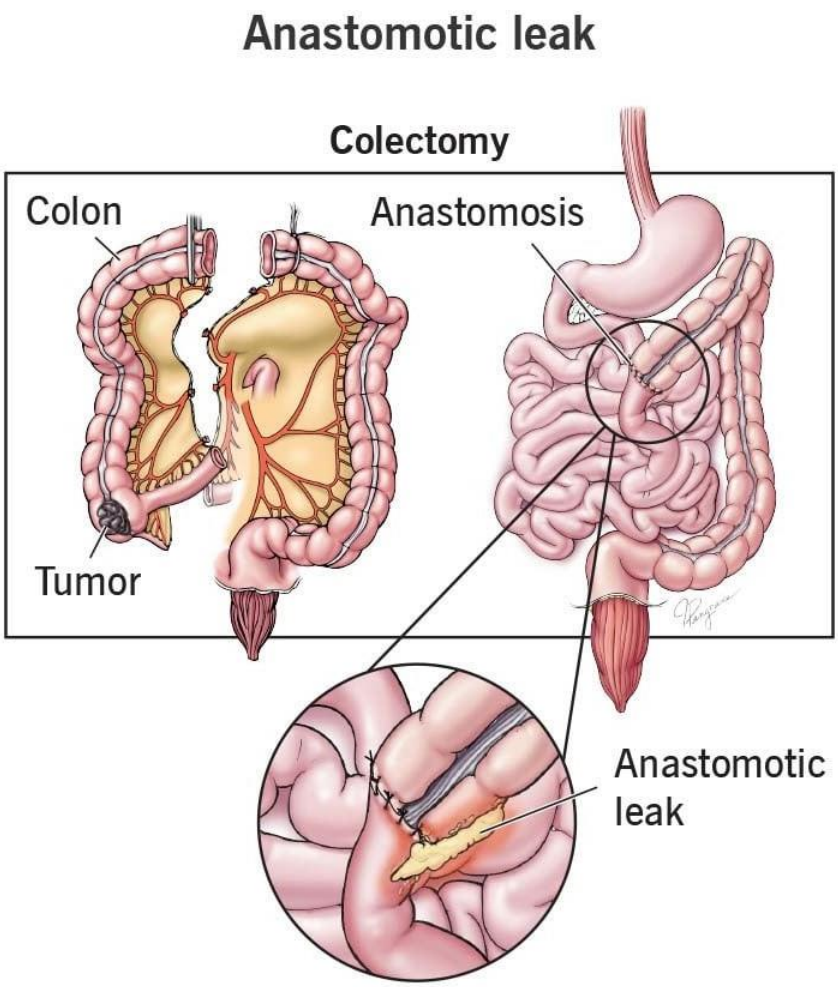


FIGURE 15 – ANASTOMOTIC LEAK AT ILEO-TRANSVERSE ANASTOMOSIS SITE

Table 2. Differential Diagnosis of Abdominal Pain, Distension, Nausea, and Cessation of Flatus and Bowel Movements

Alternate diagnosis	*Clues*
Ascites	Acute liver failure, history of hepatitis or alcoholism
Medications (e.g., tricyclic antidepressants, narcotics)	Review of medications; diagnosis of exclusion
Mesenteric ischemia	History of peripheral vascular disease, hypercoagulable state, or postprandial abdominal angina; recent use of vasopressors
Perforated viscus/intra-abdominal sepsis	Fever, leukocytosis, acute abdomen, free air on imaging
Postoperative paralytic ileus	Recent abdominal surgery with no postoperative flatus or bowel movement
Pseudo-obstruction (Ogilvie syndrome)	Acutely dilated large intestine, history of intestinal dysmotility, diabetes mellitus, scleroderma

BIOCHEMICAL MARKERS AND THEIR ROLE

To determine if any particular biochemical marker could serve as a useful and accurate diagnostic for intestinal blockage, its role has been investigated. Among the indicators examined are;

1. Serum TNF alpha (tumour necrosis factor).
2. CRP- C reactive protein
3. Interleukin 6.
4. Serum lactate.
5. D-dimer.
6. Alpha glutathione S-transferase.
7. Intestinal fatty acid binding protein (I-FABP).
8. Creatine kinase B.
9. Iso enzymes of lactate dehydrogenase.
10. Procalcitonin.
11. Alkaline liver phosphatase.
12. Urinary phosphate

The term "acute phase response" refers to the distinctive pattern of changes in plasma protein concentration that follow a variety of infections, inflammations, and tissue injuries. Increased levels of acute phase proteins are a vital part of the body's overall reaction to localised or widespread injury. [17]

C-REACTIVE PROTEIN

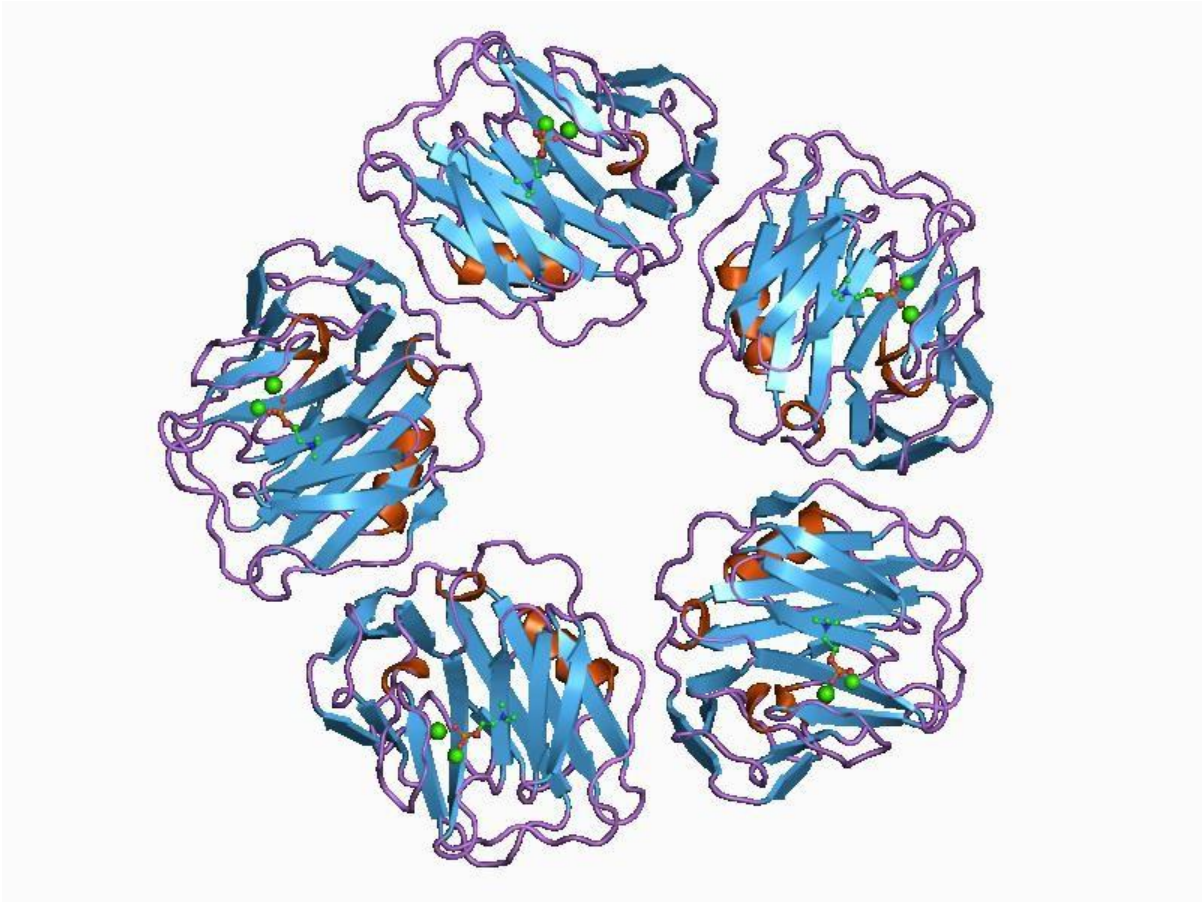


FIGURE 16 – C REACTIVE PROTEIN PENTAMERIC STRUCTURE

- The calcium-dependent reactivity of C-reactive protein with pneumococcal C-polysaccharide (CPS) gives it its name (Abernethy and Avery, 1941). According to Hurlimann et al. (1966) and Kushner and Feldmann (1978), hepatocytes are the only cell type known to produce CRP. Following any acute stimulus, CRP production begins in the periportal region and then diffuses to encompass all cells throughout the hepatic lobule.[17]

- The powerful stimulator of the classical complement pathway that human CRP is appears to be essential for its in vivo action. Human CRP is equally effective as IgG antibody at activating the classical complement system through Clq and C1 activation.[17]
- Human CRP binds to damaged or altered cell or artificial phospholipid membranes, activating complement in the process. Human CRP does not attach to intact membranes of healthy living cells or to artificial membranes that replicate their composition and structure. to detect damaged cells and their products in situ, activate complement to produce the chemotactic and opsonic activities necessary to promote phagocytosis, and finally result in the resolution and healing of the lesion. [17]

- Blood contains this, and inflammation is positively connected with blood levels of this substance. In reaction to the pro-inflammatory chemicals generated by adipocytes, the liver produces CRP, an acute-phase protein.
- Due to its pentagonal shape, it is a member of the Pentaxin protein family..
- The CRP levels are elevated in :

    a) Inflammation

    b) Infection

    c) Trauma

    d) Tissue Necrosis

    e) Malignancies

    f) Auto-immune disorders

SERUM LACTATE

- Lactic Acid, which has two optical isomers, L-lactate and D-lactate, is the by-product of the breakdown of glucose in the tissues.
- When there are acute injuries to the intestinal mucosa, the ischemia of the mesenteric arteries causes an aberrant growth of the bacterial flora of the intestine, which is not present in the human body under normal

  circumstances

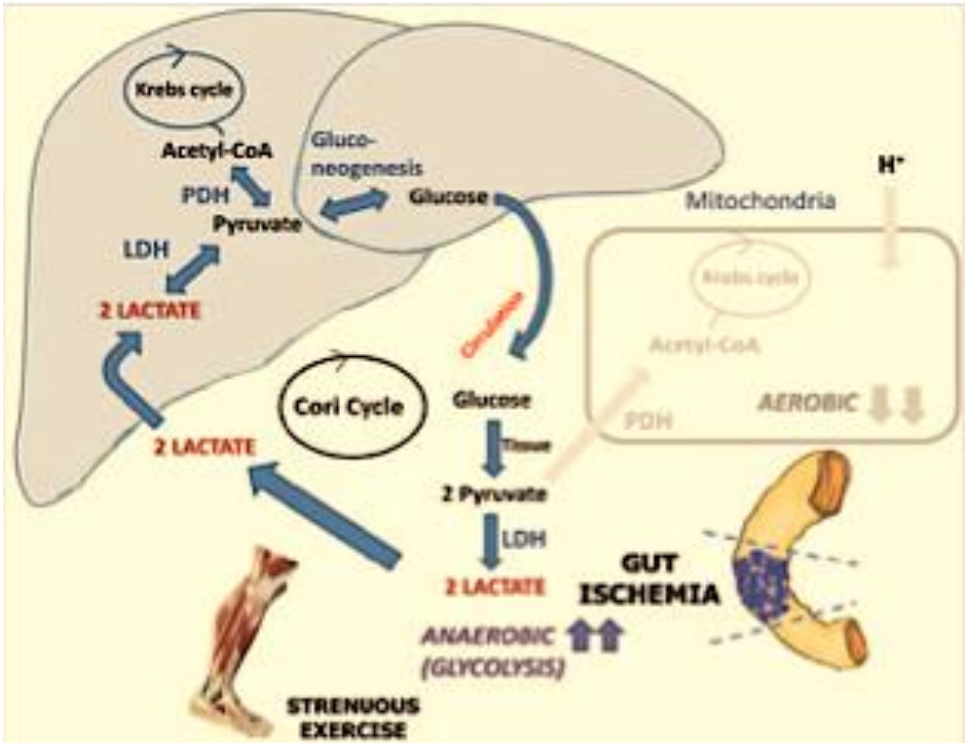


FIGURE 17 - OVERVIEW OF LACTATE METABOLISM – CORI CYCLE

- Lactate the end product of anaerobic glycolysis is converted from pyruvate by lactate dehydrogenase (LDH). Upon its release from peripheral tissues, cause of acidosis is not serum lactate . Rather, an acidotic state results from the diminished recruitment of

H^+ ions into the mitochondria during states of suppressed oxidative phosphorylation (e.g. hypoxia). A anaerobic metabolism is assumed to take place in the ischemic gut during hypoxic states , which would result in increased lactate release from the gut into the portal vein. However, for the serum lactate in the general circulation to be elevated, the amount of released lactate from the ischemic gut must exceed the conversion capacity of the liver. Therefore, increased serum lactate is rather a marker of anaerobic metabolism and can undergo elevation during hepatic failure but also other nonhypoxic states which affect lactate conversion rates, such as diabetes, malignancies or congenital disorders of lactate metabolism.

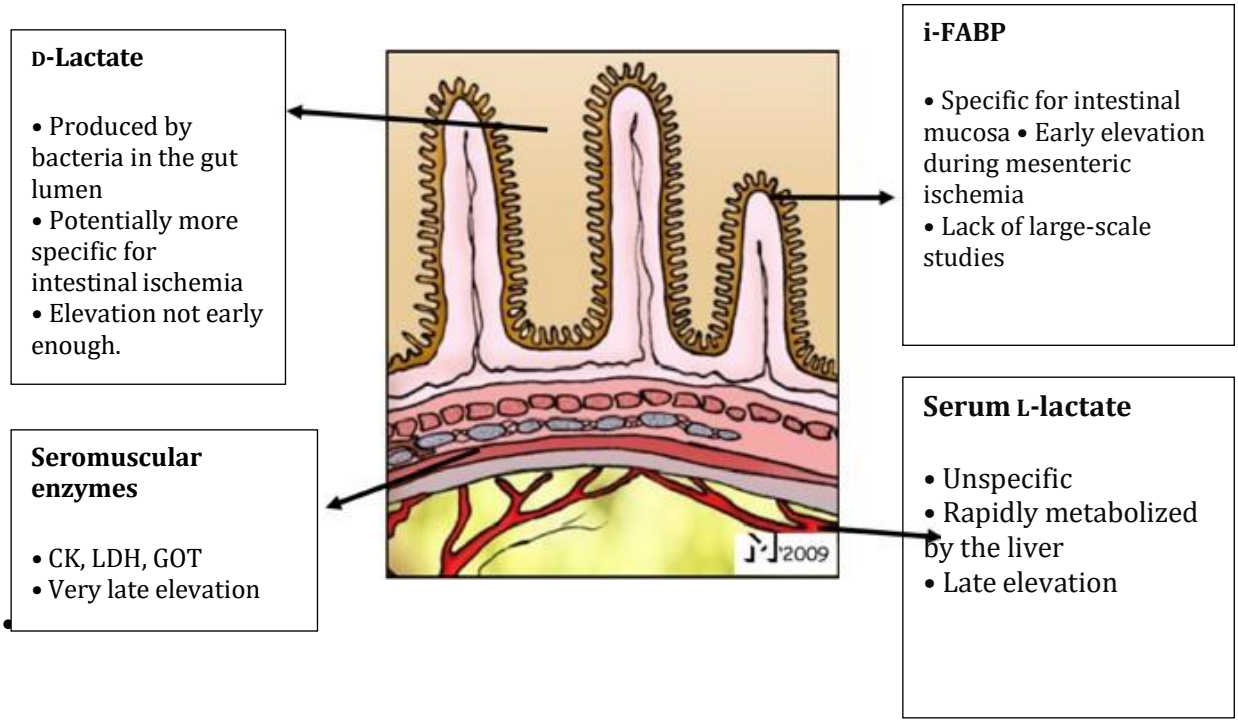


FIGURE 18 – INTESTINAL ISCHEMIA MARKERS

- The currently available serological markers of mesenteric ischemia can be divided into three groups, in addition to the traditional L-lactate:

  (1) seromuscular markers, such as creatine kinase (CK), LDH, and glutamic oxaloacetic transaminase (GOT)

  (2) gut lumen-derived markers, such as D-lactate; or

  (3) mucosa-derived markers, such as i-FABP.

Overall, none of these markers is enough to diagnose mesenteric ischemia on its own

INTERLEUKIN – 6

- In the early stages of inflammation, IL-6 plays a significant pro-inflammatory role. It encourages the development and activation of neutrophils during infection, the synthesis and secretion of acute phase proteins by a variety of cells, the proliferation and differentiation of B cells, the generation of immunoglobulins, and the proliferation and differentiation of T cells. In contrast to the extremely low levels of IL-6 found in healthy individuals—which typically do not surpass 7 pg/mL—sepsis patients have serum levels of IL-6 that rise quickly in the early stages of infection and can peak in as little as two hours.

- Pathogen-associated molecular patterns, which are unique microbial compounds, cause macrophages to produce IL-6 (PAMPs). These PAMPs bind to a crucial class of innate immune system detecting molecules known as pattern recognition receptors.

- Interleukin-6 (IL-6) is a pleiotropic cytokine with roles in immunity, tissue regeneration, and metabolism. Rapid production of IL-6 contributes to host defence during infection and tissue injury, but excessive synthesis of IL-6 and dysregulation of IL-6 receptor signalling is involved in disease pathology. [23]

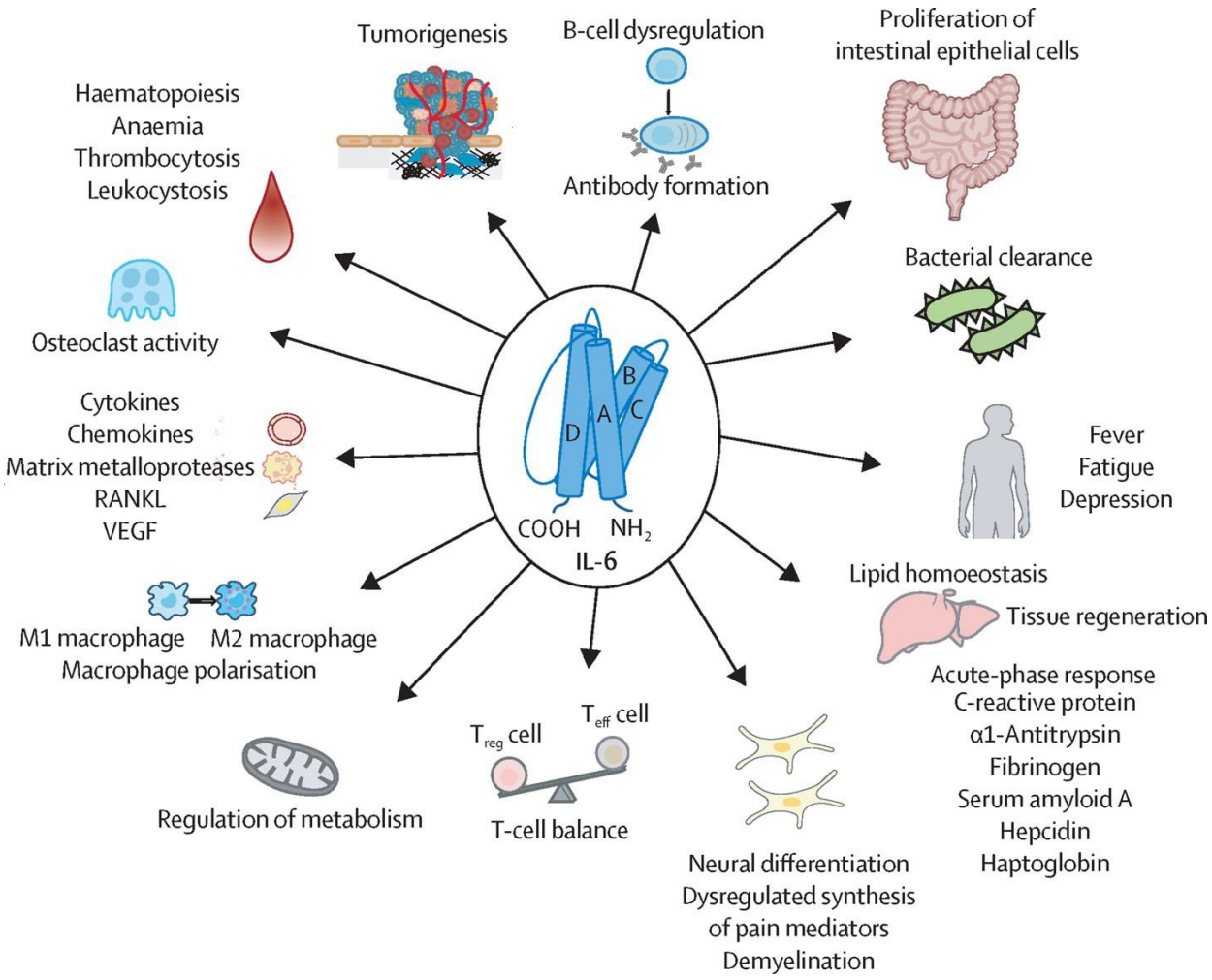


FIGURE 19 – INTERLEUKIN 6 FUNCTIONS

- "Through poorly understood mechanisms, inflammation encourages the regeneration of damaged tissues. Some of these mechanisms involve members of the interleukin (IL)-6 family, whose expression is increased in a variety of disorders, such as inflammatory bowel diseases and colorectal cancer. Here, we demonstrate in mouse and human cells that gp130, an IL-6 co-receptor, activates YAP and Notch, transcriptional regulators that regulate tissue growth and regeneration, independently of the gp130 effector STAT3. YAP and Notch are involved in the regulation of tissue growth and regeneration. Intestinal gp130 signalling promotes epithelial cell proliferation, leads to abnormal differentiation, and gives resistance to mucosal erosion via YAP and Notch. When a receptor is engaged, gp130 forms an association with the related tyrosine kinases Src and Yes, which are then activated to phosphorylate YAP and cause its stability and nuclear translocation. When mucosal damage occurs, this signalling module is highly engaged to promote healing and to maintain the barrier function. (16)

- Interleukin 6 (IL-6) was originally identified as a B-cell differentiation factor , but it is now known to be a multifunctional cytokine that regulates the immune response, hematopoiesis, the acute phase response, and inflammation(23)

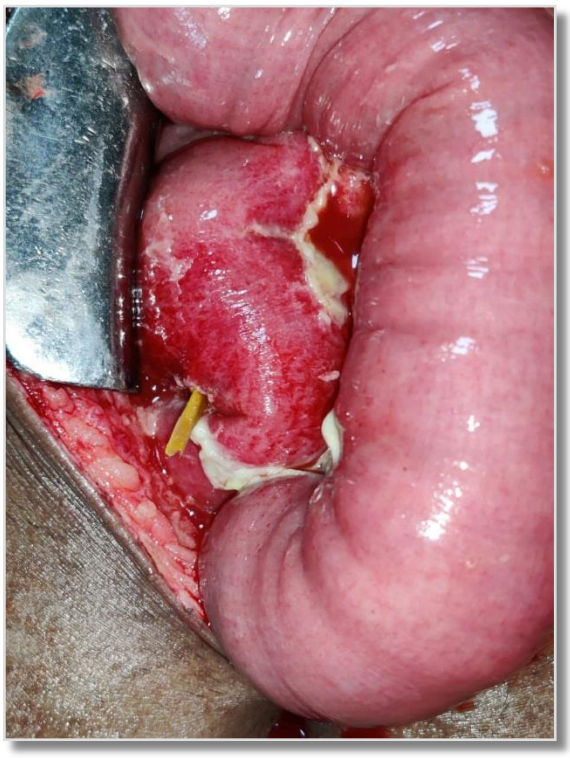


FIGURE 20 - FOREIGN BODY PERFORATION OF SMALL BOWEL

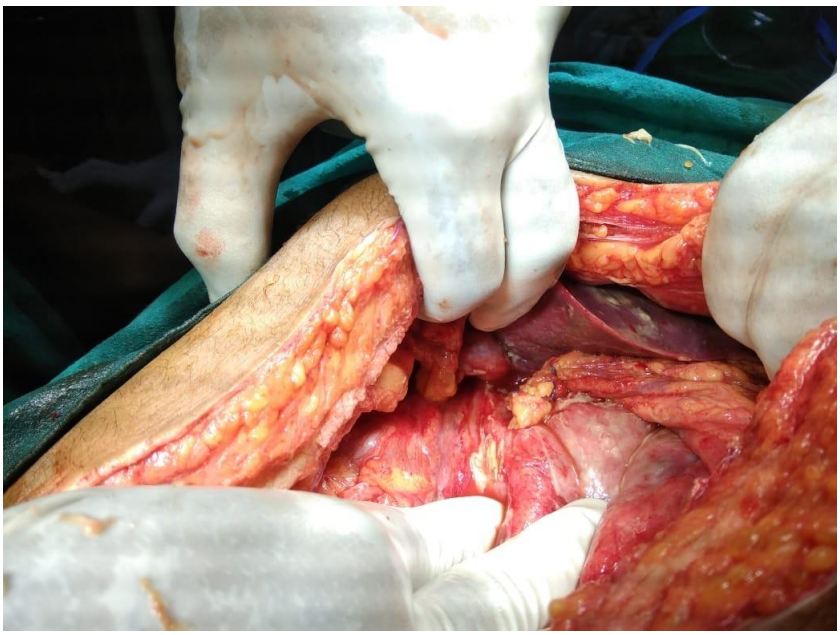


FIGURE 21 - PREPYLORIC GASTRIC PERFORATION

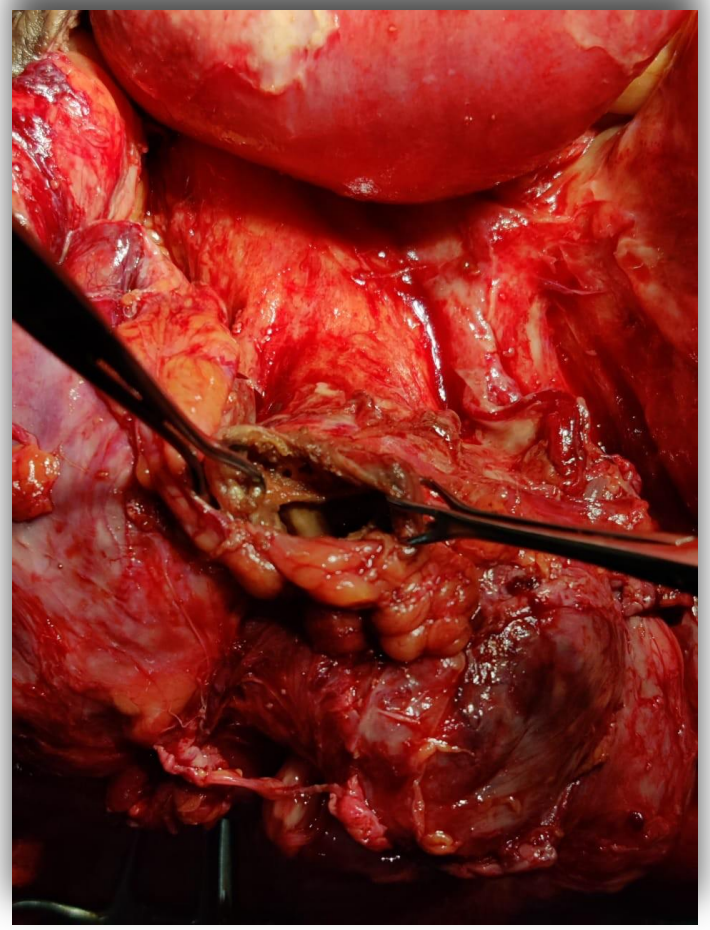


FIGURE 22 - LARGE BOWEL PERFORATION

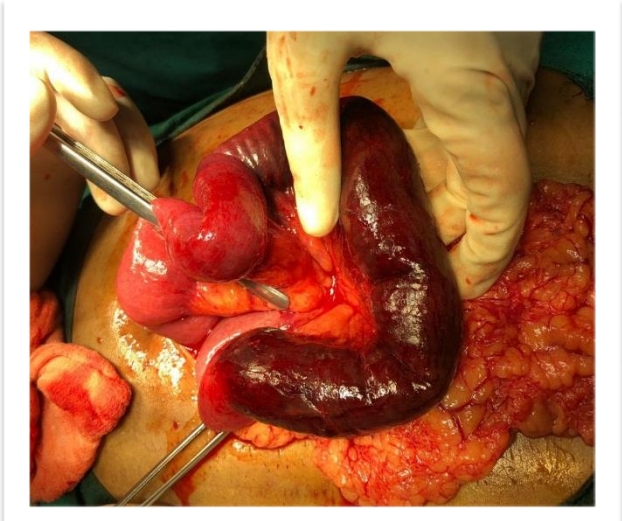


FIGURE 23 - SMALL BOWEL ISCHEMIA

METHODOLOGY

1. All Patients admitted to the surgical wards with an Acute Abdomen requiring emergency abdominal surgeries have been Preoperatively assessed using Serum. Lactate and C-Reactive protein as the principal tests.
2. Twenty-four hours postoperatively Serum Lactate and Serum Interleukin-6 was tested.
3. Lactate Clearance-

$$\mathbf{Lactate(initial)} - \frac{\mathbf{Lactate(post-op)}}{\mathbf{Lactate(initial)}} \times \mathbf{100}.$$

4. Lactate clearance, Preoperative C-reactive protein, and Postoperative Interleukin-6 results were compared among the survivor and the mortality group

1. Effect of C-reactive protein studied by -
    - Patients with preoperative CRP levels $> 150\ \mathrm{mg/(dl.)}$.
    - [Normal = 0 - 10 mg/dl]

2. Effect of Lactate clearance studied by -
    - Patients with 24-hour lactate clearance > 10%.
    - [Normal ≤ 2 mmol/L (18.2 mg/dl)]

3. Effect of Interleukin-6 studied by
    - Patients with postoperative interleukin level > 150 pg/ml.
    - [Normal ≤ 2.5 pg/ml]

RESEARCH HYPOTHESIS

- Using C-Reactive Protein, Serum Lactate Clearance, and Serum Interleukin-6 levels can help in assessing the outcome in emergency gastrointestinal procedures and help in better management of the cases Postoperatively.

DATA COLLECTION

SOURCE OF DATA

- All the patients admitted to the Surgical wards of the Department of general surgery Shri.B.M.Patil Medical College Hospital and Research Centre, Vijayapura requiring surgical interventions for emergency Gastrointestinal conditions in the Period -January 2021 TO July 2022.
- Variables for each patient included: age, gender, diagnosis, C-reactive protein, Serum lactate on admission, 24 HOURS postoperatively Serum Lactate and Interleukin-6 values ,surgical site infection (SSI), wound dehiscence, anastomotic leak if any, paralytic ileus, duration of stay and mortality.
- The patients will be explained in detail about the procedure.

INCLUSION CRITERIA

- All patients of age above 18 years undergoing emergency Gastrointestinal surgeries.

EXCLUSION CRITERIA

1. Patients undergoing elective abdominal procedures.
2. Immunocompromised patients.
3. Patients on steroid therapy.
4. Patients with Malignancies.
5. Patients Undergoing Radiotherapy.
6. Patients with Chronic Liver Disease

SAMPLE SIZE

1. With the anticipated Proportion of Wound discharge in patients undergoing emergency abdominal surgeries 26% [8], the study will require a sample size of **74** patients with a 95% level of confidence and 10% absolute precision.

2. Formula used

$$n=\frac{z^2 p*q}{d^2}$$

Where Z= Z statistic at α level of significance.

D^2 = Absolute error.

P= Proportion rate.

q= 100-p.

STATISTICAL ANALYSIS

Data was entered in the excel spread sheet. SPSS version 20. was used to perform the statistical analysis. Descriptive statistics of the explanatory and outcome variables were calculated by mean, standard deviation for quantitative variables, frequency and proportions for qualitative variables. Chi square was applied to test the statistical association between qualitative variables. Unpaired t test was applied to test the mean difference of quantitative variables between two groups. Paired t test was used to test the mean difference of serum lactate of the same individual at different time intervals. ANOVA test was applied to test the mean difference of quantitative data for more than 2 groups. The level of significance was set at 5%..

- Results will be presented as Mean (Median) ±SD, counts and percentages, and diagrams.

- Categorical variables will be compared using the Chi-square test.

- P<0.05 will be regarded as statistically significant. All statistical tests will perform two-tailed

INVESTIGATIONS/INTERVENTIONS:

Investigations or Interventions required in this study are routine, standardized procedures. There are no animal experiments involved in this study

1. Complete Blood Counts.
2. Urine Routine.
3. Random Blood Sugar.
4. HIV, HBsAg, HCV.
5. Liver Function Test.
6. Renal Function Test.
7. C-Reactive protein.
8. Serum Interleukin-6
9. Arterial Blood Gas Analysis.
10. Serum Lactate on admission and 24 hours after surgery.
11. Ultrasonography of Abdomen and Pelvis.
12. C.T. Abdomen and Pelvis as and when needed.
13. Any other investigations as and when required.

RESULTS

A total of 78 patients were included in this study who underwent emergency gastrointestinal surgeries.

TABLE NO 3 - THE AGE WISE DISTRIBUTION OF PATIENTS

AGE GROUP	NO FO PATIENTS
< 20	4
	5.1%
21-30	19
	24.4%
31-40	12
	15.4%
41-50	7
	9.0%
51-60	17
	21.8%
61-70	14
	17.9%
71-80	5
	6.4%
Total	**78**
	100.0%

This table shows the age wise categorical distribution of the patients included in the study.

TABLE NO – 4 – SEX DISTRIBUTION OF THE PATIENTS IN THE STUDY

SEX	TOTAL
Male	57 (73.1%)
Female	21 (26.9%)
Total	78 (100%)

In the total patient population a total of 57 (73.1%) were males and 21 (26.9%) patient were females.

TABLE NO 5 :Incidence of wound dehiscence among the study subjects and their relation to CRP values

CRP	WOUND DEHISCENCE		Total
	Yes	No	
<150 mg/dL	6	19	25
	30.0%	35.2%	33.8%
>150 mg/dL	14	35	49
	70.0%	64.8%	66.2%
Total	20	54	74
	100.0%	100.0%	100.0%
p value - 0.675			

- This table shows the incidence of wound dehiscence among the study subjects and their relation to CRP values
- Among the 20 patients who developed wound dehiscence , 6 (30%) of them had CRP value of <150mg/dL and 14 (70%) of them had CRP value >150mg/dL
- Among the 54 patients who didn't develop wound dehiscence 19 (35.2%) of them had CRP value of <150mg/dL and 35 (64.8%) of them had CRP value of >150mg/dL
- This comparison had p value of 0.675 which is more than 0.05 , thus showing **no statistical significance** .

TABLE NO 6 : Incidence of wound dehiscence among the study subjects and their relation to lactate clearance

LACTATE CLEARANCE	WOUND DEHISCENCE		Total
	Yes	No	
<10%	3	10	13
	15.0%	18.5%	17.6%
>10 %	14	19	33
	70.0%	35.2%	44.6%
NORMAL	3	25	28
	15.0%	46.3%	37.8%
Total	20	54	74
	100.0%	100.0%	100.0%
p value - 0.020			

- This table shows the incidence of wound dehiscence among the study subjects and their relation to lactate clearance
- Among the 20 patients who developed wound dehiscence , 3 (15%) of them had lactate clearance of <10 %, 14 of them (70%) had lactate clearance of >10% and 3 (15%) of them had normal lactate clearance .
- Among the 54 patients who didn't develop wound dehiscence, 10 (18.5%) of them had lactate clearance of <10% , 19 of them (35.2%) had lactate clearance of >10% and 25 of them (46.3%) of them had normal lactate clearance
- This comparison had p value of 0.020 which is less than 0.05, thus showing **statistical significance**.

GRAPH NO 1 : Bar diagram showing the incidence of wound dehiscence and its relation to lactate clearance

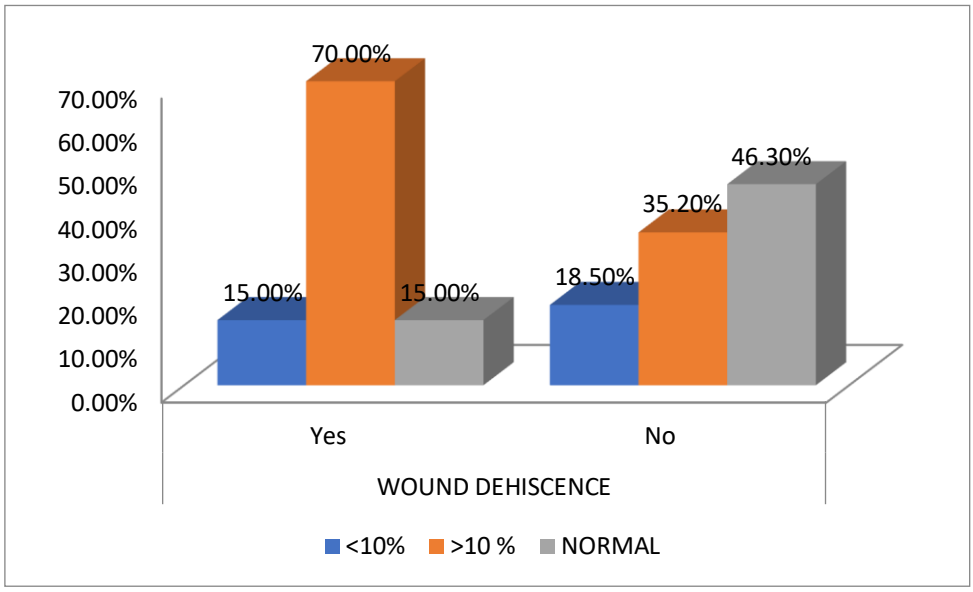


TABLE NO 7 : Incidence of wound dehiscence among the study subjects and their relation to IL-6 status

IL-6 STATS	WOUND DEHISCENCE		Total
	Yes	No	
<150 pg/mL	6	32	38
	30.0%	59.3%	51.4%
>150 pg/mL	14	22	36
	70.0%	40.7%	48.6%
Total	20	54	74
	100.0%	100.0%	100.0%
p value - 0.025			

- This table shows the incidence of wound dehiscence among the study subjects and their relation to IL-6 levels
- Among the 20 patients who developed wound dehiscence , 6 (30%) of them had IL-6 value of <150 pg/mL and 14 (70%) of them had IL-6 value of >150 pg/mL
- Among the 54 patients who didn't develop wound dehiscence , 32 (59.3%) of them had IL-6 value of <150pg/mL and 22 (40.7%) of them had IL-6 value of >150pg/mL
- This comparison had p value of 0.025 which is less than 0.05 , thus showing **statistical significance** .

GRAPH NO 2 : Bar diagram showing the incidence of wound dehiscence and its relation to IL-6 status

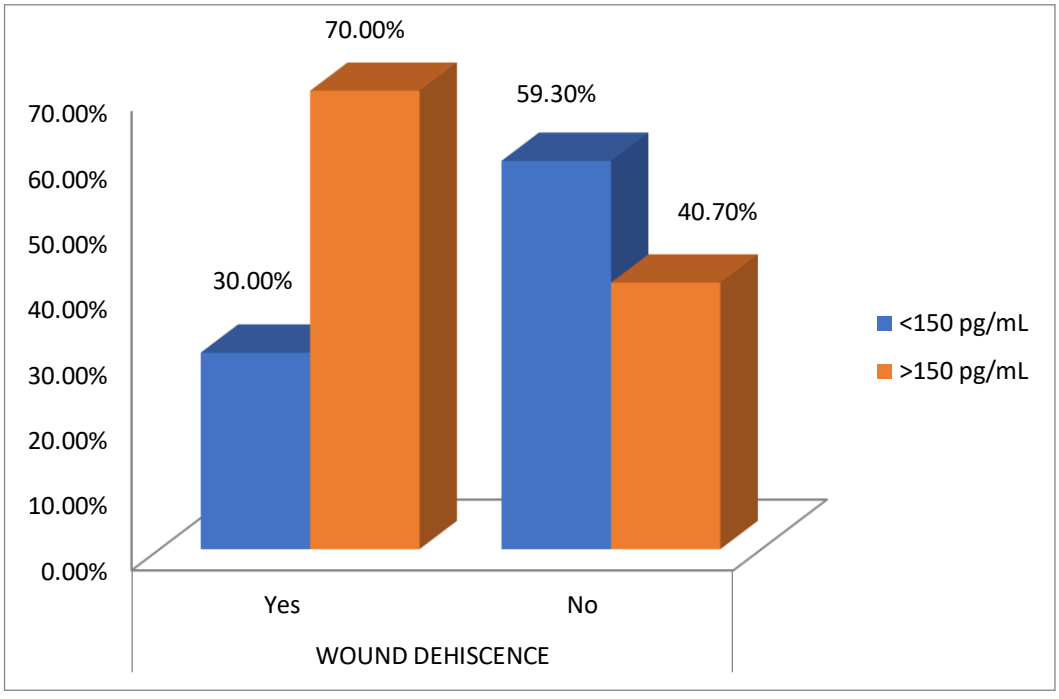


TABLE NO 8 : Incidence of Anastomotic Leak among the study subjects and their relation to CRP values

CRP	ANASTOMOTIC LEAK		Total
	Yes	No	
<150 mg/dL	2	23	25
	33.3%	33.8%	33.8%
>150 mg/dL	4	45	49
	66.7%	66.2%	66.2%
Total	6	68	74
	100.0%	100.0%	100.0%
p value - 0.981			

This table shows the incidence of Anastomotic Leak among the study subjects and their relation to CRP values

Among the 6 patients who developed anastomotic leak , 2 (33.3%) of them had CRP value of <150 mg/dL and 4 (66.7%) of them had CRP value of >150 mg/dL

Among the 68 patients who didn't develop anastomotic leak , 23 (33.8%) of them had CRP value of <150% mg/dL and 45 (66.2%) of them had CRP value of >150 mg/dL

This comparison had p value of 0.981 which is more than 0.05 , thus showing **no statistical significance**.

TABLE NO 9 : Incidence of Anastomotic Leak among the study subjects and their relation to lactate clearance

LACTATE CLEARANCE	ANASTOMOTIC LEAK		Total
	Yes	No	
<10%	1	12	13
	16.7%	17.6%	17.6%
>10 %	4	29	33
	66.7%	42.6%	44.6%
NORMAL	1	27	28
	16.7%	39.7%	37.8%
Total	6	68	74
	100.0%	100.0%	100.0%
p value - 0.475			

This table shows the incidence of Anastomotic Leak among the study subjects and their relation to lactate clearance

Among the 6 patients who developed anastomotic leak, 1 (16.7%) of them had lactate clearance of <10%, 4 (66.7%) of them had lactate clearance of >10% and 1 (16.7%) had normal lactate clearance.

Among the 68 patients who didn't develop anastomotic leak, 12 (17.6%) had lactate clearance of <10%, 29 of them (42.6%) had lactate clearance of >10% and 27 of them (39.7%) had normal lactate clearance .

This comparison had p value of 0.475 which is more than 0.05, thus showing **no statistical significance**

TABLE NO 10: Incidence of Anastomotic Leak among the study subjects and their relation to IL-6 status

IL-6 STATS	ANASTOMOTIC LEAK		Total
	Yes	No	
<150 pg/mL	1	37	38
	16.7%	54.4%	51.4%
>150 pg/mL	5	31	36
	83.3%	45.6%	48.6%
Total	6	68	74
	100.0%	100.0%	100.0%
p value - 0.076			

This table shows the incidence of Anastomotic Leak among the study subjects and their relation to IL-6 value

Among 6 patients who developed anastomotic leak , 1 (16.7%) of them had IL-6 value of <150pg/mL and 5 of them (83.3%) had IL-6 value of >150 pg/mL

Among the 68 patients who didn't develop anastomotic leak , 37 (54.4%) of them had IL-6 value of <150pg/mL and 31 (45.6%) of them had IL-6 value of >150pg/mL

This comparison had p value of 0.076 which is more than 0.05 , thus showing **no statistical significance**.

TABLE NO 11: Incidence of SSI among the study subjects and their relation to CRP levels

CRP	SURGICAL SITE INFECTION		Total
	Yes	No	
<150 mg/dL	10	15	25
	20.8%	57.7%	33.8%
>150 mg/dL	38	11	49
	79.2%	42.3%	66.2%
Total	48	26	74
	100.0%	100.0%	100.0%
p value - 0.001			

This table shows the incidence of SSI among the study subjects and their relation to CRP value

Among the 48 patients who developed SSI , 10 (20.8%) of them had CRP value of <150mg/dL and 38 (79.2%) of them had CRP value of >150mg/dL

Among the 26 patients who didn't develop SSI , 15 (57.7%) of them had CRP value of <150mg/dL and 11 (42.3%) of them had CRP value of >150 mg/dL

This comparison had a p value of 0.001 which is less than 0.05 , thus showing high **statistical significance** .

GRAPH NO 3 : Bar diagram showing the incidence of SSI among the study subjects and their relation to CRP values

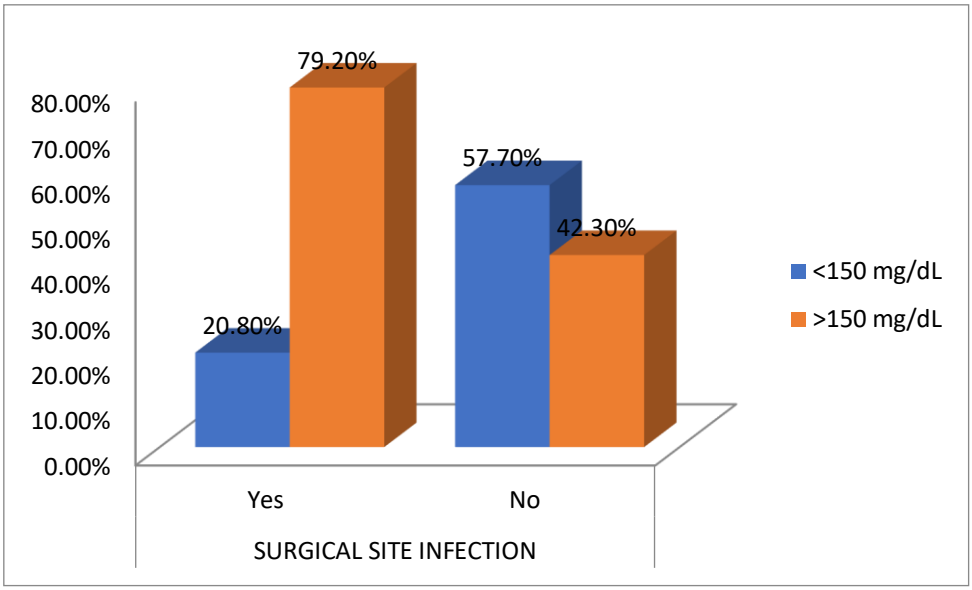


TABLE NO 12 : Incidence of SSI among the study subjects and their relation to lactate clearance

LACTATE CLEARANCE	SURGICAL SITE INFECTION		Total
	Yes	No	
<10%	11	2	13
	22.9%	7.7%	17.6%
>10 %	24	9	33
	50.0%	34.6%	44.6%
NORMAL	13	15	28
	27.1%	57.7%	37.8%
Total	48	26	74
	100.0%	100.0%	100.0%
p value - 0.026			

This table shows the incidence of SSI among the study subjects and their relation to lactate clearance

Among the 48 patients who developed SSI ,11 (22.9%) of them had lactate clearance of <10% , 24 of them (50%) had lactate clearance of >10% and 13 (27.1%) of them had normal lactate clearance .

Among the 26 patients who didn't develop SSI , 2 (7.7%) of the had lactate clearance of <10% , 9 of them (34.6%) had lactate clearance of >10% and 15 (57.7%) of them had normal lactate clearance

This comparison had p value of 0.026 which is less than 0.05 , thus showing **statistical significance**

GRAPH NO 4 : Bar diagram showing the incidence of SSI among the study subjects and their relation to lactate clearance

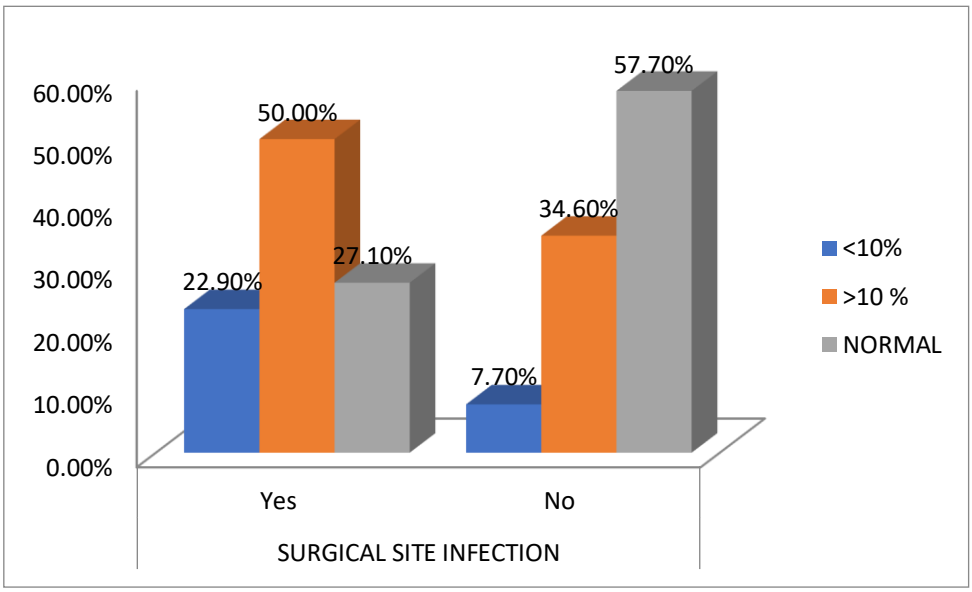


TABLE NO 13 : Incidence of surgical site infection among the study subjects and their relation to IL -6 status

IL-6 STATS	SURGICAL SITE INFECTION		Total
	Yes	No	
<150 pg/mL	16	22	38
	33.3%	84.6%	51.4%
>150 pg/mL	32	4	36
	66.7%	15.4%	48.6%
Total	48	26	74
	100.0%	100.0%	100.0%
p value - 0.001			

This table shows the incidence of surgical site infection among the study subjects and its relation to IL-6 status

Among the 48 patients who developed SSI , 16 (33.3%) of them had IL-6 value of <150pg/mL and 32 (66.7%) of them had IL-6 value of >150pg/mL

Among the 26 patients who didn't develop SSI , 22 (84.6%) of them had IL-6 value of <150pg/mL and 4 (15.4%) of them had IL-6 value of >150pg/mL

This comparison had p value of 0.001 which is less than 0.05 , thus showing **high statistical significance**.

GRAPH NO 05 : Bar diagram showing the incidence of SSI among the study subjects and their relation to IL-6 status

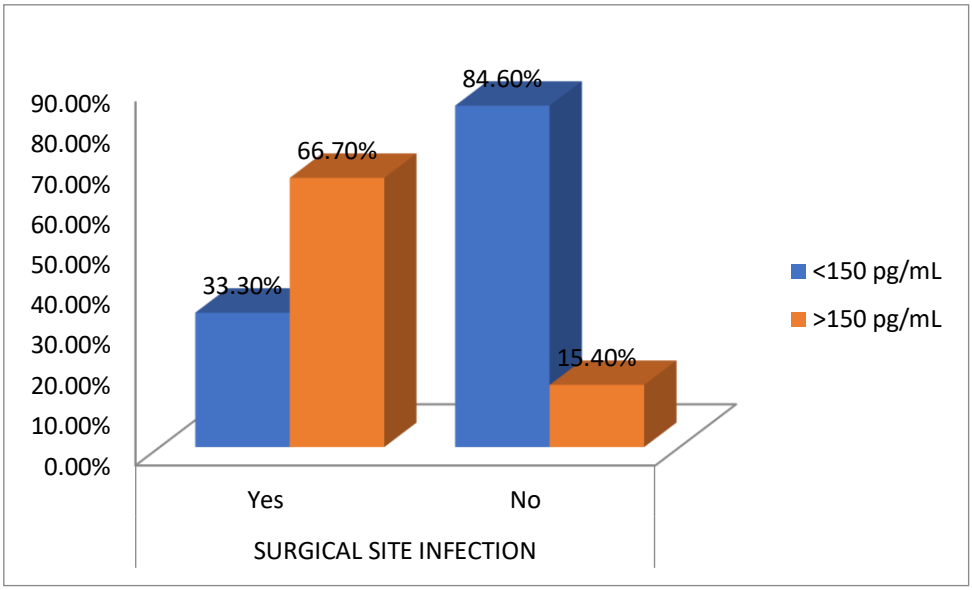


TABLE NO 14 : Various modes of injury among the study subjects and its relation to CRP levels

CRP	MODE OF INJURY				Total
	MESENTERIC ISCHEMIA	OBSTRUCTION	PERFORATION	TRAUMATIC PERFORATION	
<150 mg/dL	0	6	16	3	25
	0.0%	46.2%	32.7%	42.9%	33.8%
>150 mg/dL	5	7	33	4	49
	100.0%	53.8%	67.3%	57.1%	66.2%
Total	5	13	49	7	74
	100.0%	100.0%	100.0%	100.0%	100.0%
p value –0.293					

This table shows the various modes of injury among the study subjects and its relation to CRP levels

Among the 5 patients who had mesenteric ischemia, 5 of them (100%) had CRP level of >150mg/dL

Among the 13 patients who had obstruction, 6 (46.2%) of them had CRP value of <150mg/dL and 7 (53.8%) of them had CRP value of >150mg/dL

Among the 49 patients who had perforation16 (32.7%) had CRP value of <150mg/dL and 33 (67.3%) of them had CRP value of >150mg/dL

Among the 7 patients who had traumatic perforation 3(42.9%) of them had CRP value of <150mg/dL and 4 (57.1%) of them had CRP value of >150mg/dL

This comparison had p value of 0.293 which is more than 0.05 , thus showing **no statistical significance** .

TABLE NO 15 : Various modes of injury among the study subjects and its relation to lactate clearance

LACTATE CLEARANCE	MODE OF INJURY				Total
	MESENTERIC ISCHEMIA	OBSTRUCTION	PERFORATION	TRAUMATIC PERFORATION	
<10%	3	2	7	1	13
	60.0%	15.4%	14.3%	14.3%	17.6%
>10 %	0	5	27	1	33
	0.0%	38.5%	55.1%	14.3%	44.6%
NORMAL	2	6	15	5	28
	40.0%	46.2%	30.6%	71.4%	37.8%
Total	5	13	49	7	74
	100.0%	100.0%	100.0%	100.0%	100.0%
p value - 0.036					

This table shows the various modes of injury among the study subjects and its relation to lactate clearance

Among the 5 patients who had mesenteric ischemia , 3 (60%) of them had lactate clearance of <10% and 2 (40%) of them had normal lactate clearance .

Among the 13 patients who had obstruction , 2 (15.4%) of them had lactate clearance of <10% , 5 of them (38.5%) had lactate clearance of >10% 6 of them (46.2%) had normal lactate clearance.

Among the 49 patients who had perforation , 7 of them (14.3%) had lactate clearance of <10% , 27 (55.1%) of them had lactate clearance of >10% , 15 (30.6%) of them had normal lactate clearance .

Among the 7 patients who had traumatic perforation , 1 (14.3%) had lactate clearance of <10% , 1 (14.3%) had lactate clearance of >10% , 5 (71.4%) of them had normal lactate clearance .

This comparison had a p value of 0.036 which is less than 0.05 ,thus showing **statistical significance** .

GRAPH NO 6 : Bar diagram of various modes of injury among the study subjects and its relation to lactate clearance

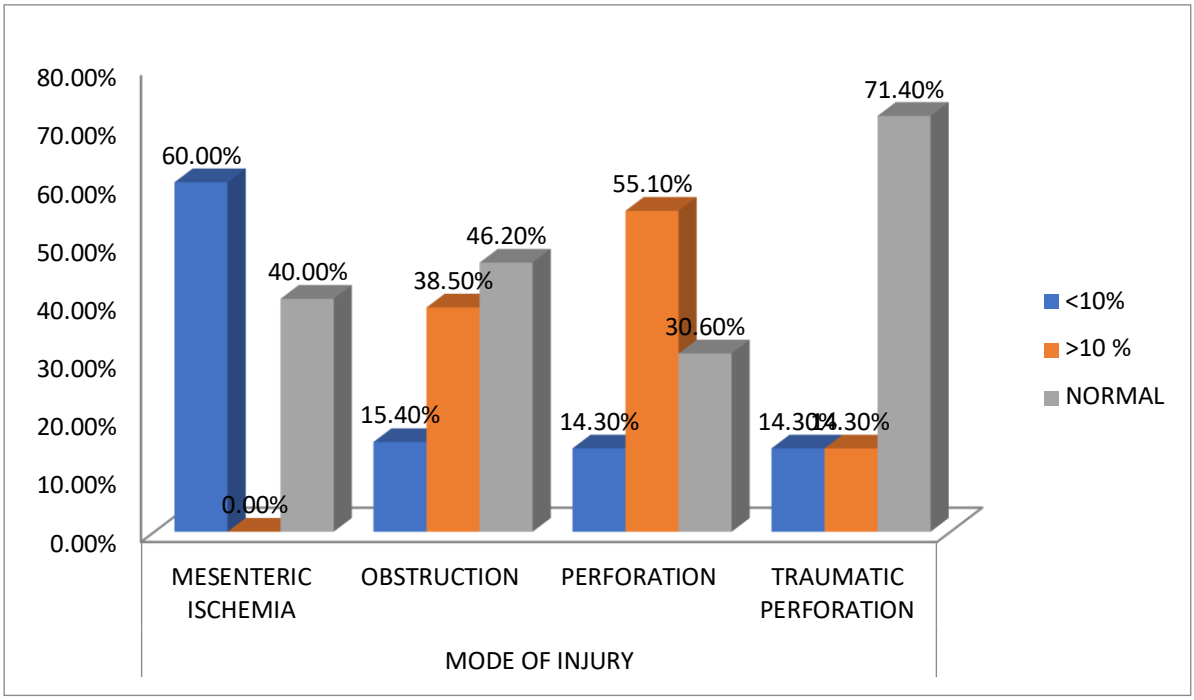


TABLE NO 16 : Various modes of injury among the study subjects and its relation to IL-6 levels.

IL-6 STATS	MODE OF INJURY				Total
	MESENTERIC ISCHEMIA	OBSTRUCTION	PERFORATION	TRAUMATIC PERFORATION	
<150 pg/mL	1	8	25	4	38
	20.0%	61.5%	51.0%	57.1%	51.4%
>150 pg/mL	4	5	24	3	36
	80.0%	38.5%	49.0%	42.9%	48.6%
Total	5	13	49	7	74
	100.0%	100.0%	100.0%	100.0%	100.0%
p value - 0.457					

This table shows the various modes of injury among the study subjects and their relation to IL-6 levels

Among the 5 patients who had mesenteric ischemia 1 (20%) of them had IL-6 value of <150 pg/mL and 4 (80%) of them had IL-6 value of >150 pg/mL.

Among the 13 patients who had obstruction 8 (61.5%) of them had IL-6 value of <150 pg/mL and 5 (38.5%) of them had IL-6 value of >150pg/mL.

Among the 49 patients who had perforation, 25(51%) of them had a IL-6 value of <150pg/mL and 24 of them (49%) had IL-6 value of >150pg/mL.

Among the 7 patients who had traumatic perforation 4 (57.1%) of them had IL-6 value of <150 pg/mL and 3 (42.9%) of them had a IL-6 value of >150pg/mL.

This comparison had a p value of 0.457 which is less than 0.05, thus showing **no statistical significance**.

TABLE NO 17: Various modes of injury and their outcome among the study subjects

OUTCOME	MODE OF INJURY				Total
	MESENTERIC ISCHEMIA	OBSTRUCTION	PERFORATION	TRAUMATIC PERFORATION	
SURVIVED	4	13	47	7	71
	80.0%	100.0%	95.9%	100.0%	95.9%
EXPIRED	1	0	2	0	3
	20.0%	0.0%	4.1%	0.0%	4.1%
Total	5	13	49	7	74
	100.0%	100.0%	100.0%	100.0%	100.0%
p value - 0.249					

This table shows the various modes of injury and their outcome among the study subjects

Among the 5 patients who had mesenteric ischemia 4 (80%) of them survived and 1 (20%) of them expired . Among the 13 (100%) patients who had obstruction ,all of the survived .Among the 49 patients who had perforation 47 (95.9%) of them survived , 2 (4.1%) of them expired . Among the 7 patients who had traumatic perforation all of them (100%) survived.

This comparison had a p value of 0.249 which is more than 0.05 , thus showing **no statistical significance** .

TABLE NO 18 : Duration of hospital stay of study subjects and its relation to CRP levels

CRP	N	Duration of stay in hospital (days)		Mean difference	p value*
		Mean	Std. Dev		
< 150	56	14.04	6.105	.389	0.84
> 150	21	17.05	11.182		

*Unpaired t test

This table shows the mean duration of stay in hospital of study subjects and its relation to CRP levels

Among the 77 study subjects 56 of them had mean duration of hospital stay of 14.04 days and CRP level among them were <150 . 21 of them had mean duration of hospital stay 17.05 days and CRP level among them were >150 . This comparison had p value of 0.84 which is more than 0.05 , thus showing **no statistical significance** .

TABLE NO 19 : Duration of hospital stay of study subjects and its relation to Lactate clearance

Lactate clearance	N	Duration of stay in hospital (days)		F value	p value*
		Mean	Std. Dev		
1	15	12.93	5.849	3.31	0.03
2	33	17.45	9.569		
3	28	13.36	5.158		
4	1	0.00			
Total	77	14.86	7.855		

*ANOVA

This table shows the mean duration of hospital stay among the study subjects and its relation to lactate clearance.

Among the 77 study subjects , 15 of them had mean duration of hospital stay of 12.93 days and lactate

GRAPH NO 07

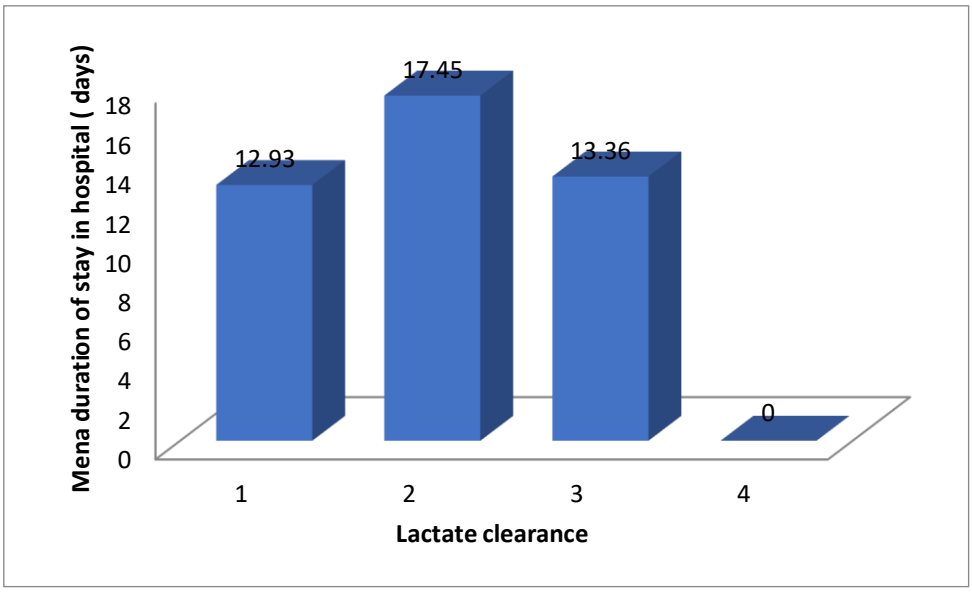


TABLE NO 20 : Duration of stay in hospital of study subjects and its relation to IL-6 values

IL 6	N	Duration of stay in hospital (days)		Mean difference	p value*
		Mean	Std. Dev		
< 150	38	12.95	5.362	-4.211	0.016
> 150	38	17.16	9.102		

*Unpaired t test

This table shows the mean duration of hospital stay of the study subjects and relation to IL-6 levels

The mean duration of hospital stay was 12.95 days in subjects whose IL-6 values <150 and the mean duration of hospital stay was 17.19 days in subjects whose IL-6 values >150.The p value of this comparison was 0.016 which is less than 0.05 , thus showing **high statistical significance** .

GRAPH NO 08 : Bar diagram showing the mean duration of hospital stay of study subjects in relation to IL-6 value.

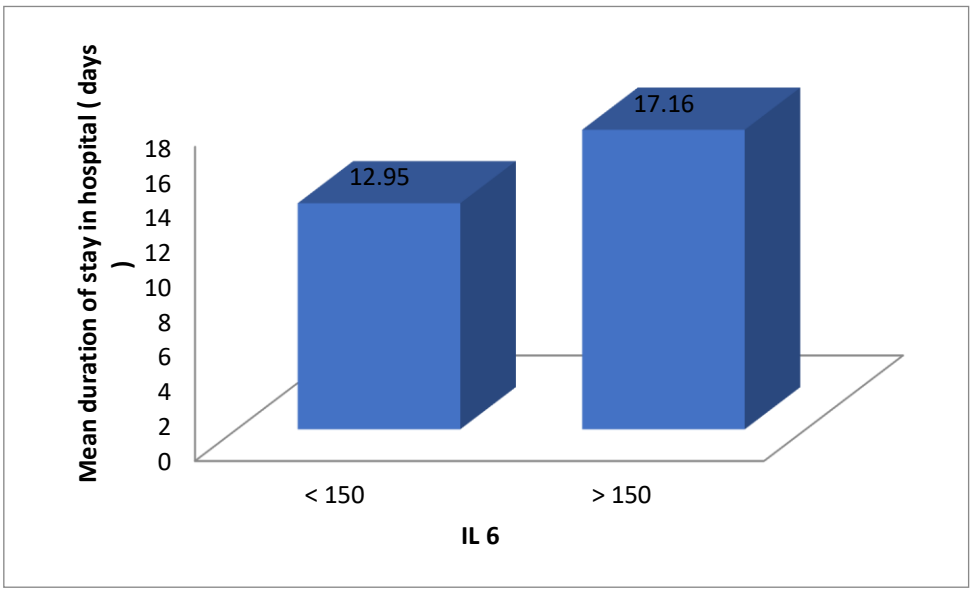


TABLE NO 21 : Age distribution of the study subjects who developed paralytic ileus And did not.

Age group	PARALYTIC ILEUS		Total
	Yes	No	
< 20	1	3	4
	2.7%	8.1%	5.4%
21-30	13	5	18
	35.1%	13.5%	24.3%
31-40	3	9	12
	8.1%	24.3%	16.2%
41-50	2	5	7
	5.4%	13.5%	9.5%
51-60	6	9	15
	16.2%	24.3%	20.3%
61-70	8	6	14
	21.6%	16.2%	18.9%
71-80	4	0	4
	10.8%	0.0%	5.4%
Total	37	37	74
	100.0%	100.0%	100.0%
p value - 0.033			

This table shows the age distribution of study subjects.

Among the 37 patients who developed paralytic ileus 1 of them which is 2.7% belonged to age group of <20, 13 which is 35.1% belonged to age group of 21-30 , 3 which is 8.1% belonged to age group 31-40 , 2 which is 5.4% belonged to age group of 41-50 , 6 which is 16.2% belonged to age group 51-60, 8 which is 21.6% belonged to 61-70 age group, 4 which is 10.8% belonged to age group of 71-80.

Among the 37 patients who didn't develop paralytic ileus 3 of them which is 8.1% belonged to age group <20, 5 which is 13.5% belonged to age group 21-30, 9 which is 24.3% belonged to age group 31-40, 5 which is 13.5% belonged to age group 41-50,9 which is 24.3% belonged to age group 51-60, 6 which is 16.2% belonged to age group 61-70 . The p value of this comparison is 0.033 which is less than 0.05, thus showing **statistical significance.**

GRAPH NO 09 : Bar diagram showing the age distribution among the study subjects

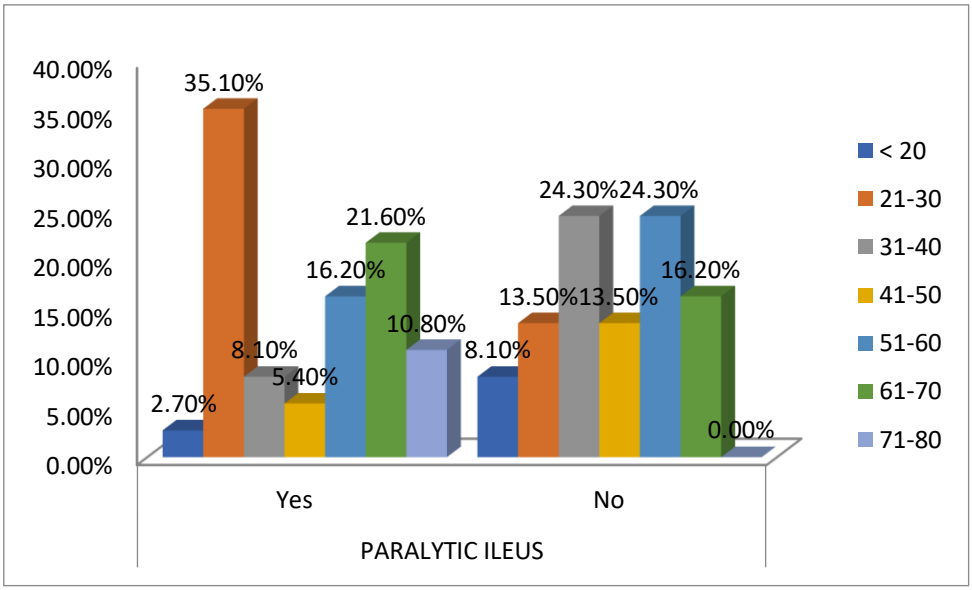


TABLE NO 22 :Incidence of paralytic ileus among the study subjects and its relation to CRP levels

CRP	PARALYTIC ILEUS		Total
	Yes	No	
< 150	9	16	25
	24.3%	43.2%	33.8%
> 150	28	21	49
	75.7%	56.8%	66.2%
Total	37	37	74
	100.0%	100.0%	100.0%
p value - 0.085			

This table shows the incidence of paralytic ileus among the subjects and its relation to CRP levels.

Among the 37 patients who developed paralytic ileus, 9 of them which is 24.3% had CRP value of <150, 28 of them which is 75.7% had CRP value of >150.

Among the 37 patients who didn't develop paralytic ileus,16 of them which is 43.2% had CRP value of <150 and 21 of them which is 56.8% had CRP value >150. The p value of this comparison is 0.085 which is more than 0.05, thus showing **no statistical significance**.

TABLE NO 23 : Incidence of paralytic ileus among the study subjects and the mortality outcomes

MORTALITY	PARALYTIC ILEUS		Total
	Yes	No	
Survived	34	37	71
	91.9%	100.0%	95.9%
Expired	3	0	3
	8.1%	0.0%	4.1%
Total	37	37	74
	100.0%	100.0%	100.0%
p value - 0.077			

This table shows the incidence of paralytic ileus among the subjects and the mortality outcomes among these study subjects.

Among the 37 patients who developed paralytic ileus 34 of them which is 91.9% survived and 3 which is 8.1% expired .

Among the 37 patients who didn't develop paralytic ileus which is 100% have survived , this comparison has a p value of 0.077 which is more than 0.05 , thus showing **no statistical significance** .

TABLE NO 24 : Incidence of paralytic ileus among the study subjects and its relation to Lactate clearance

LACTATE CLEARANCE	PARALYTIC ILEUS		Total
	Yes	No	
<10%	11	2	13
	29.7%	5.4%	17.6%
>10 %	18	15	33
	48.6%	40.5%	44.6%
NORMAL	8	20	28
	21.6%	54.1%	37.8%
Total	37	37	74
	100.0%	100.0%	100.0%
p value - 0.003			

This table shows the incidence of paralytic ileus among the subjects and its relation to lactate clearance

Among the 37 patients who developed paralytic ileus ,11 of them which is 29.7% had lactate clearance <10% , 18 of them which is 48.6% had lactate clearance of >10% and 8 which is 21.6% had normal lactate clearance .

Among the 37 patients who didn't develop paralytic ileus, 2 of them which is 5.4% had lactate clearance of <10% , 15 of them which is 40.5% had a lactate clearance of >10% and 20 of them which is 54.1% had normal lactate clearance .this comparison has a p value of 0.003 which is less than 0.05 thus showing **statistical significance** .

GRAPH 10 : Bar diagram showing the incidence of paralytic ileus among study subjects and its relation to lactate clearance .

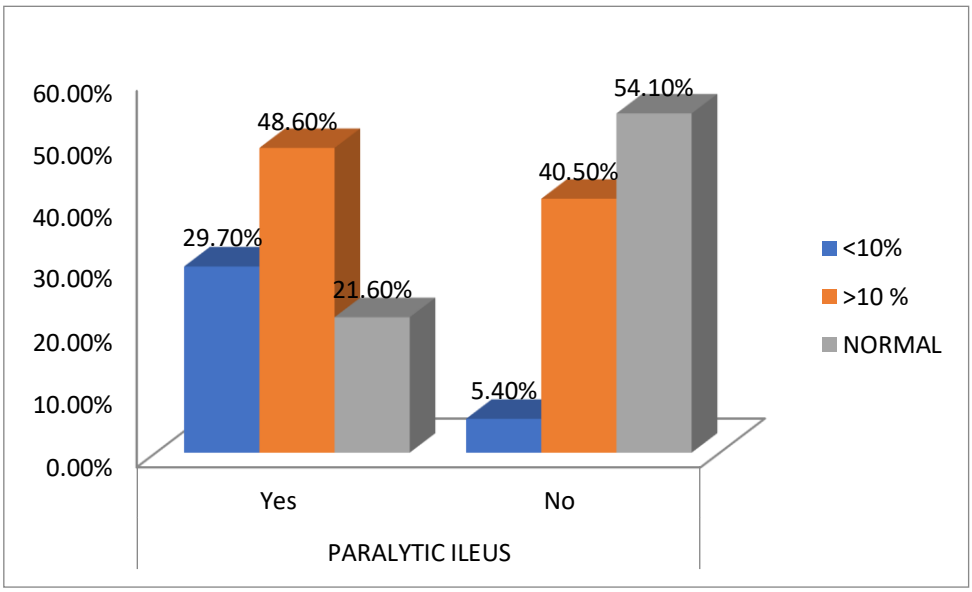


TABLE NO 25 : Incidence of paralytic ileus among the study subjects and its relation to levels of IL-6

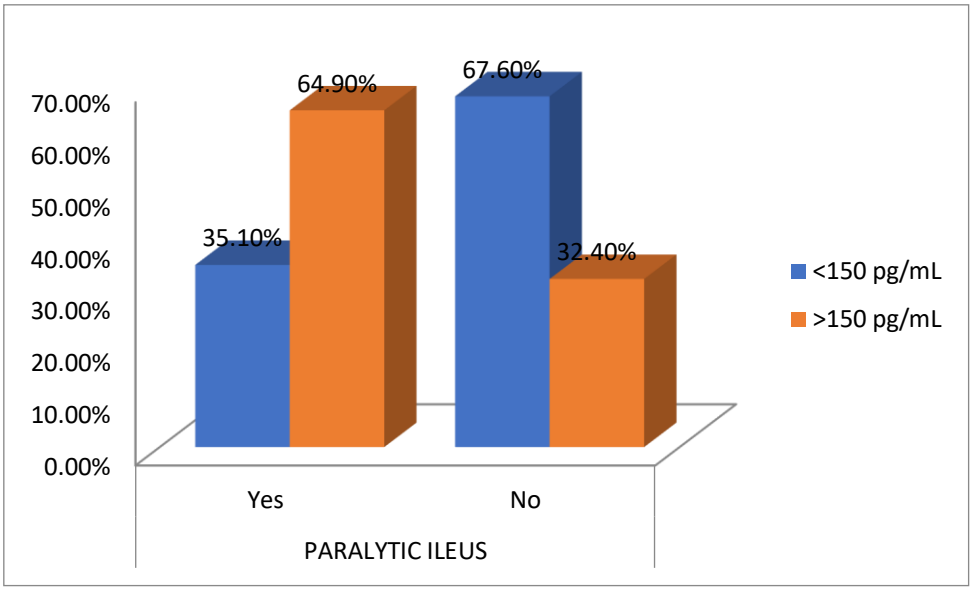
IL-6	PARALYTIC ILEUS		Total
	Yes	No	
<150 pg/mL	13	25	38
	35.1%	67.6%	51.4%
>150 pg/mL	24	12	36
	64.9%	32.4%	48.6%
Total	37	37	74
	100.0%	100.0%	100.0%
p value - 0.005			

This table shows the incidence of paralytic ileus among the subjects and its relation to IL-6

Among the 37 patients who had paralytic ileus 13 which is 35.1% had IL-6 value of <150 pg/mL and 24 which is 64.9% had IL-6 value of >150 pg/mL .

Among the 37 patients who didn't develop paralytic ileus 25 which is 67.6% had IL-6 value of <150 pg/mL and 12 which is 32.4% had IL-6 value of >150 pg/mL.This comparison had a p value of 0.005 which is less than 0.05 thus showing **statistical significance** .

GRAPH NO 11 :Graph showing the percentage of incidence of paralytic ileus among the subjects and its relation to IL-6 levels



<u>TABLE NO 26</u>: Distribution of mortality with SSI

SURGICAL SITE INFECTION	Outcome		Total
	Survived	Expired	
Yes	45	3	48
	63.4%	100.0%	64.9%
No	26	0	26
	36.6%	0.0%	35.1%
Total	71	3	74*
	100.0%	100.0%	100.0%
p value - 0.193			

TABLE NO 27 – ANASTOMOTIC LEAK VS MORTALITY

-

ANASTOMOTIC LEAK	Outcome		Total
	Survived	Expired	
Yes	3	3	6
	4.2%	100.0%	8.1%
No	68	0	68
	95.8%	0.0%	91.9%
Total	71	3	74*
	100.0%	100.0%	100.0%
p value - 0.001			

patients expired before PO 3 – So NA *4

*4 patients expired before PO 3 – So NA

*4 patients expired before PO 3 – So NA

GRAPH NO 12 -

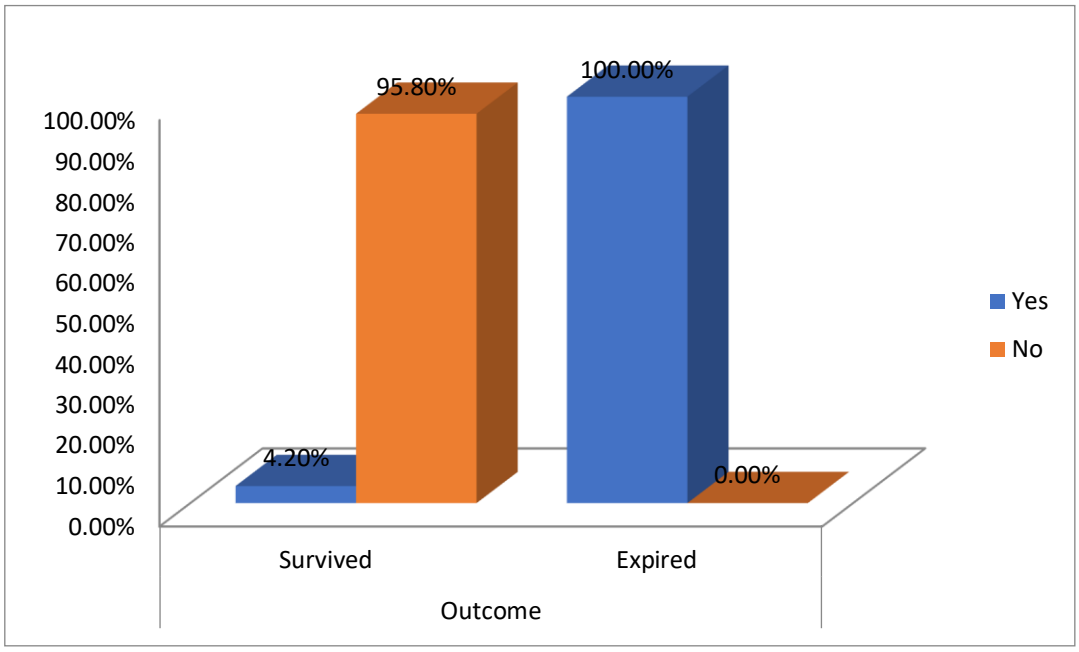


TABLE NO – 28 – CRP, LACTATE 1 & 2, LACTATE CLEARANCE AND IL6

INDIVIDUAL EFFECT ON PREDICTING MORTALITY

Lab investigations	Outcome	N	Mean	Std. Dev	Mean Difference	p value*
C REACTIVE PROTEIN (mg/dl)	Expired	7	205.86	103.734	-16.805	0.768
	Survived	71	222.66	146.386		
SERUM LACTATE-1 (mmol/l)	Expired	7	5.00	2.582	2.141	0.002
	Survived	71	2.86	1.543		
SERUM LACTATE-2 (mmol/l)	Expired	6	6.50	2.429	4.627	0.000
	Survived	71	1.87	.985		
LACTATE CLEARANCE	Expired	3	.25	.131	-0.574	0.580
	Survived	33	.83	1.756		
INTERLEUKIN-6	Expired	6	1792.17	890.561	1528.223	0.000
	Survived	71	263.94	327.422		

*Independent t test

GRAPH NO 13

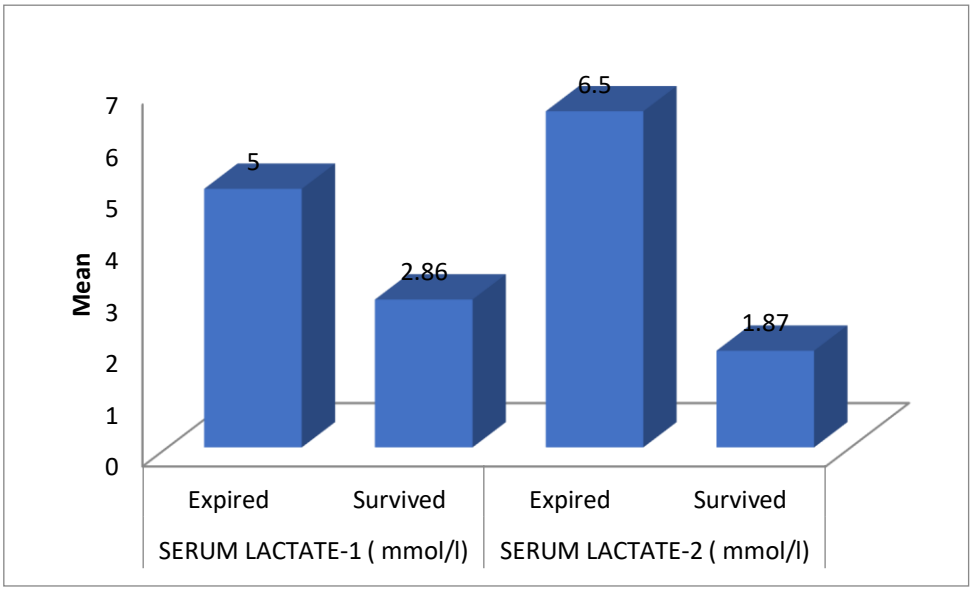


TABLE NO 29 – LACTATE 1 & 2 EFFECT ON MORTALITY

Outcome	Serum lactate (mmol/l)	N	Mean	Std. Dev	Mean difference	p value*
Survived	Reading 1	71	2.86	1.543	.986	0.00
	Reading 2	71	1.87	.985		
Expired	Reading 1	6	5.00	2.828	-1.500	.363
	Reading 2	6	6.50	2.429		

*Paired t test

TABLENO 30- Combination of CRP, Lactate Clearance and Interleukin 6 in patients who developed SSI.

Surgical site infection					
LACTATE CLEARANCE	CRP	IL - 6		Total	p value
		< 150	> 150		
< 10%	< 150	0	1	1	0.52
		0.0%	9.1%	9.1%	
	> 150	3	7	10	
		27.3%	63.6%	90.9%	
	Total	3	8	11	
		27.3%	72.7%	100.0%	
> 10%	< 150	1	5	6	0.22
		4.2%	20.8%	25.0%	
	> 150	8	10	18	
		33.3%	41.7%	75.0%	
	Total	9	15	24	
		37.5%	62.5%	100.0%	
Normal	< 150	2	1	3	0.13
		15.4%	7.7%	23.1%	
	> 150	2	8	10	
		15.4%	61.5%	76.9%	
	Total	4	9	13	
		30.8%	69.2%	100.0%	
Total	< 150	3	7	10	0.80
		6.3%	14.6%	20.8%	
	> 150	13	25	38	
		27.1%	52.1%	79.2%	
	Total	16	32	48	
		33.3%	66.7%	100.0%	

TABLE NO 31- Combination of CRP, Lactate Clearance and Interleukin 6 in patients who developed Wound Dehiscence.

Wound dehiscence					
LACTATE CLEARANCE	CRP	IL - 6		Total	p value
		< 150	> 150		
< 10%	< 150		1	1	NA
			33.3%	33.3%	
	> 150		2	2	
			66.7%	66.7%	
	Total		3	3	
			100.0%	100.0%	
> 10%	< 150	0	4	4	0.217
		0.0%	28.6%	28.6%	
	> 150	3	7	10	
		21.4%	50.0%	71.4%	
	Total	3	11	14	
		21.4%	78.6%	100.0%	
Normal	< 150	1		1	NA
		33.3%		33.3%	
	> 150	2		2	
		66.7%		66.7%	
	Total	3		3	
		100.0%		100.0%	
Total	< 150	1	5	6	0.394
		5.0%	25.0%	30.0%	
	> 150	5	9	14	
		25.0%	45.0%	70.0%	
	Total	6	14	20	
		30.0%	70.0%	100.0%	

TABLE NO 32 - Combination of CRP, Lactate Clearance and Interleukin 6 in patients who developed Anastomotic leak.

-

Anastomotic leak					
LACTATE CLEARANCE	CRP	IL - 6		Total	p value
		< 150	> 150		
< 10%	> 150		1	1	NA
			100.0%	100.0%	
	Total		1	1	
			100.0%	100.0%	
> 10%	< 150		2	2	NA
			50.0%	50.0%	
	> 150		2	2	
			50.0%	50.0%	
	Total		4	4	
			100.0%	100.0%	
Normal	> 150	1		1	NA
		100.0%		100.0%	
	Total	1		1	
		100.0%		100.0%	
Total	< 150	0	2	2	0.439
		0.0%	33.3%	33.3%	
	> 150	1	3	4	
		16.7%	50.0%	66.7%	
	Total	1	5	6	
		16.7%	83.3%	100.0%	

TABLE NO 33 - Combination of CRP, Lactate Clearance and Interleukin 6 in patients who developed Paralytic Ileus.

Paralytic ileus					
LACTATE CLEARANCE	CRP	IL - 6		Total	p value
		< 150	> 150		
< 10%	< 150	0	1	1	0.521
		0.0%	9.1%	9.1%	
	> 150	3	7	10	
		27.3%	63.6%	90.9%	
	Total	3	8	11	
		27.3%	72.7%	100.0%	
> 10%	< 150	2	4	6	0.732
		11.1%	22.2%	33.3%	
	> 150	5	7	12	
		27.8%	38.9%	66.7%	
	Total	7	11	18	
		38.9%	61.1%	100.0%	
Normal	< 150	1	1	2	0.673
		12.5%	12.5%	25.0%	
	> 150	2	4	6	
		25.0%	50.0%	75.0%	
	Total	3	5	8	
		37.5%	62.5%	100.0%	
Total	< 150	3	6	9	0.896
		8.1%	16.2%	24.3%	
	> 150	10	18	28	
		27.0%	48.6%	75.7%	
	Total	13	24	37	
		35.1%	64.9%	100.0%	

TABLE NO 34 - Combination of CRP, Lactate Clearance and Interleukin 6 in patients Who expired.

LACTATE CLEARANCE	CRP	IL - 6		Total	p value
		< 150	> 150		
< 10%	> 150	3		3	NA
		100.0%		100.0%	
	Total	3		3	
		100.0%		100.0%	
> 10%	< 150	1		1	NA
		33.3%		33.3%	
	> 150	2		2	
		66.7%		66.7%	
	Total	3		3	
		100.0%		100.0%	
Normal	> 150		1	1	NA
			100.0%	100.0%	
	Total		1	1	
			100.0%	100.0%	
Total	< 150	1	0	1	0.659
		14.3%	0.0%	14.3%	
	> 150	5	1	6	
		71.4%	14.3%	85.7%	
	Total	6	1	7	
		85.7%	14.3%	100.0%	

TABLE NO 35 – combination of Lactate clearance and CRP in patients who developed SSI.

Surgical site infection				
Lactate clearance	CRP		Total	p value
	< 150	> 150		
< 10	1	10	11	0.546
	2.1%	20.8%	22.9%	
> 10	6	18	24	
	12.5%	37.5%	50.0%	
Normal	3	10	13	
	6.3%	20.8%	27.1%	
Total	10	38	48	
	20.8%	79.2%	100.0%	

TABLE NO 36 - combination of Lactate clearance and CRP in patients who developed Wound Dehiscence.

Wound dehiscence				
Lactate clearance	CRP		Total	p value
	< 150	> 150		
< 10	1	2	3	0.978
	5.0%	10.0%	15.0%	
> 10	4	10	14	
	20.0%	50.0%	70.0%	
Normal	1	2	3	
	5.0%	10.0%	15.0%	
Total	6	14	20	
	30.0%	70.0%	100.0%	

TABLE NO 37 - combination of Lactate clearance and CRP in patients who developed Anastomotic Leak.

Anastomotic leak				
Lactate clearance	CRP		Total	p value
	< 150	> 150		
< 10	0	1	1	0.472
	0.0%	16.7%	16.7%	
> 10	2	2	4	
	33.3%	33.3%	66.7%	
Normal	0	1	1	
	0.0%	16.7%	16.7%	
Total	2	4	6	
	33.3%	66.7%	100.0%	

TABLE NO 38 - combination of Lactate clearance and CRP in patients who developed Paralytic ileus.

Paralytic ileus				
Lactate clearance	CRP		Total	p value
	< 150	> 150		
< 10	1	10	11	0.336
	2.7%	27.0%	29.7%	
> 10	6	12	18	
	16.2%	32.4%	48.6%	
Normal	2	6	8	
	5.4%	16.2%	21.6%	
Total	9	28	37	
	24.3%	75.7%	100.0%	

TABLE NO 39 - combination of Lactate clearance and CRP in patients who expired.

Mortality				
Lactate clearance	CRP		Total	p value
	< 150	> 150		
< 10	0	3	3	0.459
	0.0%	42.9%	42.9%	
> 10	1	2	3	
	14.3%	28.6%	42.9%	
Normal	0	1	1	
	0.0%	14.3%	14.3%	
Total	1	6	7	
	14.3%	85.7%	100.0%	

TABLE NO 40 - combination of Lactate clearance and IL6 in patients who developed SSI.

Surgical site infection				
Lactate clearance	IL - 6		Total	p value
	< 150	> 150		
< 10	3	8	11	0.816
	6.3%	16.7%	22.9%	
> 10	9	15	24	
	18.8%	31.3%	50.0%	
Normal	4	9	13	
	8.3%	18.8%	27.1%	
Total	16	32	48	
	33.3%	66.7%	100.0%	

TABLE NO 41 : Comparison of lactate clearance and IL-6 values in patients who developed wound dehiscence

Wound dehiscence				
Lactate clearance	IL - 6		Total	p value
	< 150	> 150		
< 10	0	3	3	0.012
	0.0%	15.0%	15.0%	
> 10	3	11	14	
	15.0%	55.0%	70.0%	
Normal	3	0	3	
	15.0%	0.0%	15.0%	
Total	6	14	20	
	30.0%	70.0%	100.0%	

This table shows the distribution of lactate clearance and IL-6 values among the patients who developed wound dehiscence
Among the 20 patients who developed wound dehiscence , 3 of them (15%) had IL-6 value of >150 and lactate clearance in these patients was <10
Among the 14 (70%) patients who had lactate clearance of >10 , 3 of them (15%) had IL-6 value <150 and 11 of them (55%) had IL-6 value of >150 .
Among the 3 (15%) patients who had normal lactate clearance , all of them had IL-6 value of <150.
This comparison had a p value of 0.012 which is less than 0.05 , thus showing high statistical significance.

TABLE NO 42 : Comparison of lactate clearance and IL-6 values in patients who developed anastomotic leak

Anastomotic leak				
Lactate clearance	IL - 6		Total	p value
	< 150	> 150		
< 10	0	1	1	0.05
	0.0%	16.7%	16.7%	
> 10	0	4	4	
	0.0%	66.7%	66.7%	
Normal	1	0	1	
	16.7%	0.0%	16.7%	
Total	1	5	6	
	16.7%	83.3%	100.0%	

This table shows the comparison of lactate clearance and IL-6 values among patients who developed anastomotic leak

Among the 6 patients who developed anastomotic leak , 1 of them (16.7%) had lactate clearance of <10 and IL-6 value of >150
Among them 4 (66.7%) patients had lactate clearance of >10 and IL-6 value in these patients >150
Among them 1 patient (16.7%) had normal lactate clearance and IL-6 value was <150 in this patient
This comparison had a p value of 0.05 , thus showing statistical significance.

TABLE NO 43 - The efficacy of lactate clearance and IL-6 values together in predicting Paralytic ileus.

Paralytic ileus				
Lactate clearance	IL - 6		Total	p value
	< 150	> 150		
< 10	3	8	11	0.807
	8.1%	21.6%	29.7%	
> 10	7	11	18	
	18.9%	29.7%	48.6%	
Normal	3	5	8	
	8.1%	13.5%	21.6%	
Total	13	24	37	
	35.1%	64.9%	100.0%	

TABLE NO 44 :The efficacy of lactate clearance and IL-6 values together in prediction of mortality

Mortality				
Lactate clearance	IL - 6		Total	p value
	< 150	> 150		
< 10	3	0	3	0.03
	42.9%	0.0%	42.9%	
> 10	3	0	3	
	42.9%	0.0%	42.9%	
Normal	0	1	1	
	0.0%	14.3%	14.3%	
Total	6	1	7	
	85.7%	14.3%	100.0%	

This table shows the combined effect of lactate clearance and IL-6 in prediction of mortality Among the 7 patients who expired , 3 patients (42.9%) had lactate clearance <10 and IL-6 of <150.

Among the other 3 (42.9%) patients who expired , lactate clearance was >10 and in these patients IL-6 was <150.

Among the other 1 patient (14.3%) who expired , lactate clearance was normal and IL-6 was>150.This comparison has a p value of 0.03 which is less than0.05 ,thus showing statistical significance .

TABLE NO 45 - combination of CRP and IL6 in patients who developed SSI.

Surgical site infection				
CRP	IL - 6		Total	p value
	< 150	> 150		
< 150	3	7	10	0.56
	6.3%	14.6%	20.8%	
> 150	13	25	38	
	27.1%	52.1%	79.2%	
Total	16	32	48	
	33.3%	66.7%	100.0%	

TABLE NO 46 - combination of CRP and IL6 in patients who developed Wound Dehiscence.

Wound dehiscence				
CRP	IL - 6		Total	p value
	< 150	> 150		
< 150	1	5	6	0.387
	5.0%	25.0%	30.0%	
> 150	5	9	14	
	25.0%	45.0%	70.0%	
Total	6	14	20	
	30.0%	70.0%	100.0%	

TABLE NO 47 - combination of CRP and IL6 in patients who developed Anastomotic Leak.

Anastomotic leak				
CRP	IL - 6		Total	p value
	< 150	> 150		
< 150	0	2	2	0.667
	0.0%	33.3%	33.3%	
> 150	1	3	4	
	16.7%	50.0%	66.7%	
Total	1	5	6	
	16.7%	83.3%	100.0%	

TABLE NO 48 - combination of CRP and IL6 in patients who developed Paralytic ileus.

Paralytic ileus				
CRP	IL - 6		Total	p value
	< 150	> 150		
< 150	3	6	9	0.614
	8.1%	16.2%	24.3%	
> 150	10	18	28	
	27.0%	48.6%	75.7%	
Total	13	24	37	
	35.1%	64.9%	100.0%	

TABLE NO 49 - combination of CRP and IL6 in patients who expired.

Mortality				
CRP	IL - 6		Total	p value
	< 150	> 150		
< 150	1	0	1	0.659
	14.3%	0.0%	14.3%	
> 150	5	1	6	
	71.4%	14.3%	85.7%	
Total	6	1	7	
	85.7%	14.3%	100.0%	

DISCUSSION

Acute abdomen is a major concern for a surgeon following surgery. Many methods have been devised to avoid the dreaded postoperative complications. Acute abdomen is often associated with a significant amount of mortality and morbidity. Timely intervention can help reduce the complications and help in better outcomes for the patient. The prognosis of acute abdomen is currently determined using a variety of techniques, most of which are expensive and time-consuming and need clinical, biochemical, and radiographic evaluation of the disease.

CRP is a routinely used marker of inflammation in hospital these days. CRP alone was not a effective marker for managing acute abdomen and should be used in conjuncture with clinical or other biochemical parameters(Salem et al), but it was observed in our study that CRP is a statistically significant marker for predicting surgical site infection (p-0.001). It was also observed that mortality rate was also high in patients with initially higher rates of CRP (Suzana.M.A. et;al.).Elevated CRP levels were also seen to correlate with acute appendicitis in a study by Gurleyik E and others our study showed a similar observation where in CRP was elevated in all the Appendicitis patient.

Normal Lactate level in blood range from 0.5-2.5 mmol/L Raised lactate level is an early sign of tissue hypoxia. Serum lactate levels were seen to be elevated in patients of appendicitis and mesenteric ischemia. It was observed in our study that patients with On admission lactate level > 4 mmol/l and 24 hour lactate clearance < 10 % were at higher risk of wound dehiscence(p-0.02)and surgical site infections (p-0.026),increased duration of hospital stay (p-0.03),paralytic ileus (p-0.003) and mortality. Similar observations were made in a study by Singh.S.K. and others Significant association was seen between 24 hour lactate clearance with mortality. This helped in separating survivors from critically ill patients and implementing intensive management measures. Septic shock is one of the common causes of

hyperlactatemia. Post operative lactate level is considered a good predictor and independent risk factor of in hospital mortality(p-0.001) (Kang.M.K. and others). In our study we made a similar observation in patients with postoperative lactate level > 6 mmol/l risk of mortality was significant. Increased in house mortality was associated with elevated lactate levels (Velickovic and others).

Normal Interleukin 6 levels range from 0-10 pg/ml but in our study we used a level of 150pg/ml wherein we observed that patients with high interleukin 6 (>150 pg/ml) were at increased risk of wound dehiscence (p-0.025), surgical site infections (p-0.001), duration of hospital stay (p-0.016), and paralytic ileus (p-0.005) and higher risk of mortality as all the patients who expired during our study had an average interleukin 6 values of > 1100 pg/ml. IL-6 measured 6 hours after initiation of sepsis predicted mortality over 3 days as these patients were at increased risk of abdominal abscess/peritonitis (Remick.D.G and others). Apart from the trauma to the body by acute abdomen the surgical procedure also adds to the damage to the body and hence increases the value of IL6 hence the sample was tested 24 hours after the surgery. IL6 also plays a major role in the mucosal regeneration in the damaged tissues of in gp130-SFK-YAP-Notch pathway (Taniguchi.k and others 2015). Patients with high IL6 levels on Post operative day – 1 had a 3 fold increased risk of postoperative complications and increased the duration of hospital stay(Rettig and others in 2016) and ideal cut-off for prediction of postoperative complications was set at 432 pg/ml with a specificity of 70% and sensitivity of 64%. Patients with high interleukin6 levels are at an increased risk of developing sepsis

It was observed that patients with CRP >150 mg/L and lactate clearance <10% were at higher risk of developing Surgical site infections, paralytic ileus and wound dehiscence but statistically insignificant (p-0.546), (p-0.336), (p-0.978) respectively. In a

similar study by Pandey VK et al. 2018 considering similar factors, paralytic ileus was statistically significant. A case report by Meyer CZ had similar observations. Tahir S et al. in their study mentioned a cut-off level of45.5 mg/L CRP was 85% sensitive and 85.7% specific in predicting strangulation in acute abdomen and serum lactate was 100% sensitive and 91.4% specific when using a cut-off value 4.5 mmol/L.

When used together Lactate clearance and IL6 performed as better predictors of wound dehiscence (p-0.012), Anastomotic leak (p-0.05), and mortality (p-0.03). Lactate clearance and Interleukin 6 were seen to be effective individually in predicting morbidities of acute abdomen and post laparotomy. They seem to perform better with a further improved clinical significance when combined

CRP and IL6 were individually seen to be better predictors of Surgical Site Infection(p-0.001) and wound dehiscence (p-0.001) and when combined the test (p-0.56) showed clinically no significance. In a similar study by Hajong.et al. it was said that CRP and IL6 either alone or in combination as biochemical markers in postoperative patients correlate well and patients with normal CRP and very low IL6 can be discharged early.

CONCLUSION

The post-surgical outcomes were used to assess the efficacy of individual and combined use of the biochemical parameters in our study, C-Reactive protein, Serum Lactate clearance and Interleukin 6 in predicting the morbidity and mortality associated with the clinical condition of the patient during the time of assessment.

It can be concluded by our study that in surgical gastro intestinal emergencies, combining the clinical assessment and biochemical investigations we can assess the prognosis of acute abdomen, thereby aiding in the initiation of appropriate intensive management and further course in the hospital.

Surgical site infection were better predicted by C reactive protein and Interleukin 6 which was clinically significant.

Lactate clearance was found to be a better predictor of wound dehiscence, paralytic ileus, duration of hospital stay and mortality. Interleukin 6 was found to be a better predictor of Surgical site infection, duration of hospital stay, paralytic ileus and mortality. When used in combination IL6 and Lactate clearance were found to better assess wound dehiscence, and anastomotic leak and mortality.

Thus predicting the outcomes based on the above investigations and taking appropriate timely interventions and management measures help in controlling and preventing the morbidity and mortality in patients diagnosed with acute abdomen and undergoing emergency abdominal laparotomy.

SUMMARY

- The study titled "THE EFFECT OF SERUM C-REACTIVE PROTEIN, SERUM LACTATE CLEARANCE, AND SERUM INTERLEUKIN-6 IN PREDICTING OUTCOMES OF EMERGENCY GASTROINTESTINAL SURGERIES" is a work undertaken in B.L.D.E. (Deemed To Be University), SHRI. B. M. Patil Medical College Hospital & Research Centre, Vijayapura.
- Total of 78 patients presented with Acute Abdomen who underwent emergency abdominal surgeries were included in the study who were evaluated for Serum CRP, Lactate Clearance, and IL-6 to establish a relation with acute abdomen and its dreaded complications.
- Most of the patients with acute abdomen belonged to 2^{nd} and 5^{th} decade of life with a male female ratio M:F – 2.7:1 .
- Our study showed a statistical significance(p-0.001) between CRP and Surgical Site Infection. 24 hour lactate clearance < 10 % were at higher risk of wound dehiscence(p-0.02)and surgical site infections (p-0.026),increased duration of hospital stay (p-0.03),paralytic ileus (p-0.003) and mortality and high interleukin 6 (>150 pg/ml) were at increased risk of wound dehiscence (p-0.025), surgical site infections (p-0.001), duration of hospital stay (p-0.016), and paralytic ileus (p-0.005) and higher risk of mortality.
- Thus the post operative complications SSI, wound dehiscence, Anastomotic leak, Paralytic ileus and mortality were better indicated by raised CRP >150 mg/dL, Lactate clearance < 10% and raised Interleukin-6 > 150 pg/mL correlated with a statistical significance ($p<0.05$) and hence can be used as markers in predicting the morbidity and mortality in patients of acute abdomen undergoing emergency gastrointestinal surgeries.

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{ANNEXURE II}

BLDE (DEEMED TO BE UNIVERSITY)

SHRI B.M.PATIL MEDICAL COLLEGE HOSPITAL AND RESEARCH CENTER, VIJAYAPURA-586103

INFORMED CONSENT FOR PARTICIPATION IN DISSERTATION/RESEARCH

I, the undersigned,_____, S/O D/O_____, aged____years, resident of_____do hereby state/declare that DR**.** SANAGALA VENKATA SIDDHARTHA of Shri. B. M. Patil Medical College Hospital and Research Centre have examined me thoroughly on_____at_____(place). It has been explained to me in my language about the study. Further, Dr SANAGALA VENKATA SIDDHARTHA informed me that he is conducting dissertation/research titled "THE EFFECT OF SERUM C-REACTIVE PROTEIN, SERUM LACTATE CLEARANCE AND SERUM INTERLEUKIN-6 IN PREDICTING OUTCOMES OF EMERGENCY GASTROINTESTINAL SURGERIES" under the guidance of Dr RAMAKANTH BALOORKAR requesting my participation in the study. I will also be contacted on the phone at times necessary to ask regarding my condition. Further Doctor has informed me that my participation in this study will help in the evaluation of the results of the study, which is a useful reference to the treatment of other similar cases in the future.

The Doctor has also informed me that information given by me, observations made/ photographs/ video graphs taken upon me by the investigator will be kept secret and not assessed by the person other than my legal heir except for academic purposes or me.

The Doctor did inform me that though my participation is purely voluntary, based on the information given by me, I can ask for any clarification during the treatment/study related to diagnosis, the procedure of treatment, the result of treatment, or prognosis. At the same time, I have been informed that I can withdraw from my participation in this study at any time if I want or the investigator can terminate me from the course at any time but not the procedure of treatment and follow-up unless I request to be discharged.

After understanding the nature of the dissertation or research, the diagnosis made, and the mode of treatment. I am giving consent for the blood and other essential investigations and also for the follow-up.

I the undersigned Shri/Smt_____under my fully conscious state of mind agree to participate in the said research/dissertation.

Signature of the patient:

Signature of Doctor:

Date: -

Place: -

CONFIDENTIALITY:

I understand that the medical information produced by this study will become a part of this hospital record and will be subjected to the confidentiality and privacy regulation of this hospital. Knowledge of a sensitive, personal nature will not be a part of the medical records. Still, it will be stored in the investigator's research file and identified only by a code number. The code key connecting the name to the numbers will be kept in a separate secure location.

Suppose the data are used for publication in the medical literature or teaching purposes. In that case, no names will be used, and other identifiers such as photographs and audio or videotapes will be used only with my special written permission. I understand that I may see the picture and videos and hear audiotapes before giving this permission

REQUEST FOR INFORMATION:

I understand that I may ask more questions about the study at any time.

DR. SANAGALA VENKATA SIDDHARTHA is available to answer my questions or concerns. I understand that I will be informed of any significant new findings discovered during this study, which might influence my continued participation. If during this study, or later, I wish to discuss my involvement or concerns regarding this study with a person not directly involved, I am aware that the social worker of the hospital is available to talk with me. And that a copy of this consent form will be given to me for careful reading.

.

REFUSAL OR WITHDRAWAL OF PARTICIPATION:

I understand that my participation is voluntary, and I may refuse to participate or may withdraw consent and discontinue participation in the study at any time without prejudice to my present or future care at this hospital.

I also understand that DR. SANAGALA VENKATA SIDDHARTHA will terminate my participation in this study at any time after he has explained the reasons for doing so and has helped arrange for my continued care by my physician or therapist if this is appropriate

INJURY STATEMENT:

I understand that in the unlikely event of injury to me/my ward, resulting directly in my participation in this study, if such damage were reported promptly, then medical treatment would be available to me, but no further compensation will be provided.

I understand that by my agreement to participate in this study, I am not waiving any of my legal rights.

I have explained the purpose of this research, the procedures required, and the possible risks and benefits, to the best of my ability and in the patient's language.

DATE: -

DR. RAMAKANTH BALOORKAR (GUIDE)

DR. SANAGALA VENKATA SIDDHARTHA (INVESTIGATOR)

STUDY SUBJECT CONSENT STATEMENT:

I confirm that DR. SANAGALA VENKATA SIDDHARTHA has explained to me the purpose of this study, the procedure that I will undergo, and the possible benefits and discomforts that I may experience, in a language I understand.

I have explained all the above in detail, and I understand the same. Therefore, I agree to give my consent to participate as a subject in this research project.

_____ _____

(PARTICIPANT) DATE

_____ _____

(WITNESS) DATE

ANNEXURE III

PROFORMA

SL. NO

NAME	PHONE NO
AGE	IP NO
SEX	UNIT
RELIGION	DOA
OCCUPATION	WARD
ADDRESS	DOD

SOCIO-ECONOMIC STATUS

COMPLAINTS.

HISTORY OF PRESENT ILLNESS.

PAST HISTORY:

PERSONAL HISTORY:

GENERAL PHYSICAL EXAMINATION

BUILT: WELL/MODERATE/POOR

BODY MASS INDEX:

NOURISHMENT: WELL/MODERATE/POOR BMI=]

PALLOR

ICTERUS

CYANOSIS

CLUBBING

PEDAL EDEMA

GENERAL LYMPHADENOPATHY

VITAL DATA:

TEMPERATURE:

PULSE

RESPIRATORY RATE

BLOOD PRESSURE:

SYSTEMIC EXAMINATION

PER ABDOMEN:

RESPIRATORY SYSTEM

CARDIOVASCULAR SYSTEM

CENTRAL NERVOUS SYSTEM

PER RECTAL EXAMINATION

CLINICAL DIAGNOSIS:

INDICATION FOR EMERGENCY SURGERY:

PLAN OF TREATMENT:

LABORATORY TESTS

HB%

TOTAL COUNT

DIFFERENTIAL COUNT

N/L/E/B/M

RENAL FUNCTION TEST

LIVER FUNCTION TEST

SERUM LACTATE- On Admission

24 hours after surgery

SERUM CRP

SERUM INTERLEUKIN-6

HIV

HBsAg

ABG.

CHEST X-RAY

USG ABDOMEN & PELVIS

OTHER INVESTIGATIONS

SYSTEMIC ANTIBIOTICS USED

PROCEDURE:

3. TYPE OF CASE: CLEAN/ CLEAN CONTAMINATED /CONTAMINATED / DIRTY
4. OPERATING PROCEDURE:
5. INTRA-ABDOMINAL PATHOLOGY:
6. DURATION OF SURGERY:
7. POSTOPERATIVE DAY FINDING:
8. COMPLICATIONS:

ETHICAL COMMITTEE CLEARANCE CERTIFICATE

IEC/No-09/2021
date-22-01-2021

B.L.D.E. (DEEMED TO BE UNIVERSITY)

(Declared vide notification No. F.9-37/2007-U.3 (A) Dated. 29-2-2008 of the MHRD, Government of India under Section 3 of the UGC Act, 1956)

The Constituent College

SHRI. B. M. PATIL MEDICAL COLLEGE, HOSPITAL AND RESEARCH CENTRE

INSTITUTIONAL ETHICAL CLEARANCE CERTIFICATE

The Institutional ethical committee of this college met on 11-01-2021 at 11-00 am to scrutinize the synopsis of Postgraduate students of this college from Ethical Clearance point of view. After scrutiny the following original/corrected and revised version synopsis of the Thesis has been accorded Ethical Clearance

Title: The effect of serum C –Reactive protein, Serum lactate clearance & serum Interleukin-6 in predicting outcomes of emergency Gastrointestinal surgeries.

Name of PG student: Dr Sanagala Venkata Siddhartha, Department of Surgery

Name of Guide/Co-investigator: Dr Ramakant S Baloorkar,
Associate Professor, Department of Surgery

DR .S.V.PATIL
CHAIRMAN
Institutional Ethical Committee
B L D E (Deemed to be University)
Shri B.M. Patil Medical College,
VIJAYAPUR-586103 (Karnataka)

Following documents were placed before Ethical Committee for Scrutinization:

1. Copy of Synopsis / Research project
2. Copy of informed consent form

KEY TO MASTER CHART

CRP	**C REACTIVE PROTEIN**
CRP*	**C REACTIVE PROTEIN STATS**
SL1	**SERUM LACTATE 1 (ON ADMISSION)**
SL2	**SERUM LACTATE (24 HOURS AFTER SURGERY)**
LC	**LACTATE CLEARANCE**
IL6	**INTERLEUKIN-6**
IL6*	**INTERLEUKIN-6 STATS**
SSI	**SURGICAL SITE INFECTION**
WD	**WOUND DEHISCENCE**
AL	**ANASTOMOTIC LEAK**
PI	**PARALYTIC ILEUS**
DOS	**DURATION OF STAY**
M	**MORTALITY**

MASTER CHART

S.NO	AGE	SEX	CRP	CRP*	SL-1	SL-2	LC	IL6	IL6-*	SSI	WD	AL	PI	DOS	M
1	30	MALE	231.0 mg/dL	>150 mg/dL	1.5 MMOL/L	1.8 MMOL/L	<10 %	190.4 pg/mL	>150 pg/mL	YES	NO	NO	YES	21 DAYS 14 HOURS	NO
2	45	FEMALE	132 mg/dl	<150 mg.dL	4.6 MMPL/L	1.7 MMOL/L	>10 %	>1624 pg/mL	>150 pg/mL	YES	YES	NO	NO	18 DAYS 8 HOURS	NO
3	55	MALE	65.4 mg/dL	<150 mg.dL	1.5 MMOL/L	1.2 MMOL/L	NORMAL	269 pg/mL	>150 pg/mL	YES	NO	NO	YES	14 DAYS 12 HOURS	NO
4	22	MALE	359.5 mg/L	>150 mg/dL	2.2 MMOL/L	3.2 MMOL/L	<10%	139.4 pg/mL	<150 pg/mL	YES	NO	NO	YES	21 DAYS 16 HOURS	NO
5	46	MALE	250.9 mg/L	>150 mg/dL	2.8 MMOL/L	1.0 MMO;/L	>10%	147.3 pg/mL	<150 pg/mL	YES	NO	NO	NO	10DAYS 12 HOURS	NO
6	36	MALE	270 mg/dL	>150 mg/dL	3.8 MMOL/L	2.0 MMOL/L	>10%	339 pg/mL	>150 pg/mL	YES	NO	NO	YES	14DAYS 16 HOURS	NO
7	72	MALE	169.9 mg/dL	>150 mg/dL	3.4 MMOL/L	3.5 MMOL/L	<10%	176.8 pg/mL	>150 pg/mL	YES	NO	NO	YES	13DAYS 10 HOURS	NO
8	27	MALE	289.8 mg/L	>150 mg/dL	1.5 MMOL/L	8.0 MMOL/L	<10%	1606 pg/mL	>150 pg/mL	YES	NO	YES	YES	7DAYS 12 HOURS	YES
9	65	MALE	345.8 mg/L	>150 mg/dL	1.2 MMOL/L	1.5 MMOL/L	<10%	18.8 pg/mL	<150 pg/mL	NO	NO	NO	NO	8 DAYS 17HOURS	NO

10	26	MALE	270 mg/L	>150 mg/dL	2.5 MMOL/L	2.0 MMOL/L	NORMAL	155.5 pg/mL	>150 pg/mL	NO	NO	NO	NO	10 DAYS 14 HOURS	NO
11	57	MALE	250.9 mg/L	>150 mg/dL	1.5 MMOL/L	1.0 MMOL/L	NORMAL	125.3 pg/mL	<150 pg/mL	NO	NO	NO	NO	12 DAYS 18 HOURS	NO
12	22	MALE	257.0 mg/L	>150 mg/dL	1.2 MMOL/L	1.0 MMOL/L	NORMAL	194.4 pg/mL	>150 pg/mL	YES	NO	NO	NO	13 DAYS 17 HOURS	NO
13	32	MALE	359.5 mg/L	>150 mg/dL	1.5 MMOL/L	1.0 MMOL/L	NORMAL	158 pg/mL	>150 pg/mL	YES	NO	NO	YES	13DAYS 15 HOURS	NO
14	32	MALE	197.2 mg/dL	>150 mg/dL	2.2 MMOL/L	1.2 MMOL/L	NORMAL	147 pg/mL	<150 pg/mL	NO	NO	NO	NO	8 DAYS 12 HOURS	NO
15	28	MALE	82.6 mg/L	<150 mg.dL	2.5 MMOL/L	1.6 MMOL/L	NORMAL	105.7 pg/mL	<150 pg/mL	YES	NO	NO	YES	14DAYS 15 HOURS	NO
16	25	MALE	255.3 mg/L	>150 mg/dL	3.1 MMOL/L	2.1 mmol/l	>10%	196.3 pg/mL	>150 pg/mL	YES	YES	NO	YES	16 DAYS 12 HOURS	NO
17	65	MALE	225.2 mg/L	>150 mg/dL	2.5 MMOL/L	1.2 MMOL/L	NORMAL	72.7 pg/mL	<150 pg/mL	NO	NO	NO	NO	12 DAYS 14 HOURS	NO
18	18	MALE	84.7 mg/L	<150 mg.dL	3.8 MMOL/L	3.6 MMOL/L	<10%	406.7 pg/mL	>150 pg/mL	YES	YES	NO	YES	12DAYS 10 HOURS	NO
19	60	MALE	385.6 mg/L	>150 mg/dL	4.3 MMOL/L	1.8 MMOL/L	>10%	25.5 pg/mL	<150 pg/mL	YES	YES	NO	YES	21 DAYS 10 HOURS	NO

20	35	MALE	314.7 mg/L	>150 mg/dL	1.8 MMOL/L	1.4 MMOL/L	NORMAL	436 pg.mL	>150 pg/mL	YES	NO	NO	NO	19 DAYS 6 HOURS	NO
21	65	MALE	598.0 mg/L	>150 mg/dL	2.6 MMOL/L	2.2 MMOL/L	>10%	176.8 pg/mL	>150 pg/mL	YES	NO	NO	YES	23DAYS 6 HOURS	NO
22	65	FEMALE	263 mg/dL	>150 mg/dL	2.8 MMOL/L	1.2 MMOL/L	>10%	76 pg/mL	<150 pg/mL	YES	NO	NO	NO	16 DAYS 12 HOURS	NO
23	40	MALE	86 mg/dL	<150 mg.dL	1.2 MMOL/L	1.0 MMOL/L	NORMAL	106 pg/mL	<150 pg/mL	NO	NO	NO	NO	9DAYS 17 HOURS	NO
24	56	FEMALE	359.5 mg/L	>150 mg/dL	1.0 MMOL/L	1.4 MMOL/L	<10%	633.4 pg.mL	>150 pg/mL	YES	YES	NO	YES	15DAYS 8 HOURS	NO
25	26	MALE	111.7 mg/dL	<150 mg.dL	1.3 MMOL/L	1.O MMOL/L	NORMAL	102.4 pg.mL	<150 pg/mL	YES	YES	NO	NO	9 DAYS 7 HOURS	NO
26	50	MALE	86.2 mg/dL	<150 mg.dL	2.4 MMOL/L	1.1 MMOL/L	NORMAL	126.9 pg.mL	<150 pg/mL	NO	NO	NO	NO	14DAYS 8 HOURS	NO
27	77	FEMALE	>150 mg/dL	>150 mg/dL	4.9 MMOL/L	10.3 MMOL/L	<10%	3551.2 pg/ml	>150 pg/mL	DEATH	DEATH	DEATH	DEATH	18 HOURS	YES
28	50	MALE	>360 mg/L	>150 mg/dL	1.8 MMOL/L	1.1 MMOL/L	NORMAL	436 pg.mL	>150 pg/mL	YES	NO	NO	YES	21 DAYS 6 HOURS	NO
29	55	MALE	>150 mg/dL	>150 mg/dL	4.7 MMOL/L	DEATH	DEATH	DEATH	DEATH	DEATH	DEATH	DEATH	DEATH	DEATH	YES
30	27	FEMALE	281.9	>150 mg/dL	2.1 MMOL/L	3.1 MMOL/L	<10%	21.5 pg/mL	<150 pg/mL	YES	NO	NO	YES	5 DAYS 10 HOURS	NO

31	50	MALE	197.2 mg/dL	>150 mg/dL	7.1 MMOL/L	3.6 MMOL/L	>10%	75.8 pg/mL	<150 pg/mL	YES	YES	NO	YES	17 DAYS 9 HOURS	NO
32	50	MALE	263.6 mg/L	>150 mg/dL	2.8 MMOL/L	1.9 MMOL/L	>10%	101.6 pg/mL	<150 pg/mL	NO	NO	NO	NO	12 DAYS 8 HOURS	NO
33	60	MALE	303.9 mg/L	>150 mg/dL	1.7 MMOL/L	0.9 MMOL/L	NORMAL	326.5 pg/mL	>150 pg/mL	YES	NO	NO	NO	13DAYS 10 HOURS	NO
34	52	MALE	212.9 mg/L	>150 mg/dL	1.5 MMOL/L	1.0 MMOL/L	NORMAL	35.9 pg.mL	<150 pg/mL	NO	NO	NO	NO	14DAYS 8 HOURS	NO
35	18	MALE	35.6 mg/L	<150 mg.dL	1.1 MMOL/L	1.0 MMOL/L	NORMAL	125.3 pg/mL	<150 pg/mL	NO	NO	NO	NO	17DAYS 6 HOURS	NO
36	69	MALE	250.9 mg/L	>150 mg/dL	1.9 MMOL/L	1.4 MMOL/L	NORMAL	373.4 pg/mL	>150 pg/mL	YES	NO	NO	YES	13DAYS 10 OURS	NO
37	26	MALE	578.0 mg/dL	>150 mg/dL	3.9 MMOL/L	3.5 MMOL/L	>10%	106 pg/mL	<150 pg/mL	YES	NO	NO	YES	15DAYS 16 HOURS	NO
38	61	MALE	52.8 mg/dL	<150 mg.dL	3.0 MMOL/L	1.6 MMOL/L	>10%	69.1 pg/mL	<150 pg/mL	NO	NO	NO	NO	11DAYS 9HOURS	NO
39	55	FEMALE	565.1 mg/dL	>150 mg/dL	5.8 MMOL/L	4.7 MMOL/L	>10%	126.9 pg.mL	<150 pg/mL	NO	NO	NO	NO	08 DAYS 10 HOURS	NO
40	29	MALE	231.0 mg/dL	>150 mg/dL	9.7 MMOL/L	6.9 MMOL/L	>10%	1165 pg/mL	>150 pg/mL	DEATH	DEATH	DEATH	DEATH	DEATH	YES
41	22	MALE	435 mg/dL	>150 mg/dL	5.5 MMOL/L	1.5 MMOL/L	>10%	76.7 pg.mL	<150 pg/mL	YES	YES	NO	YES	13DAYS 12 HOURS	NO

42	32	MALE	396 mg/dL	>150 mg/dL	3.8 MMOL/L	3.0 MMOL/L	>10%	339 pg/mL	>150 pg/mL	YES	YES	NO	YES	15DAYS 12 HOURS	NO
43	30	MALE	317.4 mg/dL	>150 mg/dL	1.0 MMOL/L	1.4 MMOL/L	<10%	70 pg/mL	<150 pg/mL	YES	NO	NO	YES	8DAYS 10 HOURS	NO
44	35	MALE	65.4 mg/dL	<150 mg.dL	3.6 MMOL/L	2.5 MMOL/L	>10%	326 pg/mL	>150 pg/mL	NO	NO	NO	NO	12 DAYS 10 HOURS	NO
45	50	MALE	396 mg/dL	>150 mg/dL	1.5 MMOL/L	1.1 MMOL/L	NORMAL	120 pg/mL	<150 pg/mL	YES	YES	NO	YES	21DAYS 10 HOURS	NO
46	60	MALE	354 mg/dL	>150 mg/dL	4.1 MMOL/L	2.6 MMOL/L	>10%	1633 pg/mL	>150 pg/mL	YES	YES	YES	YES	37 DAYS 16 HOURS	YES
47	45	MALLE	155.1 mg/dL	>150 mg/dL	3.6 MMOL/L	1.8 MMOL/L	>10%	118 pg/mL	<150 pg/mL	YES	NO	NO	NO	7 DAYS 18 HOURS	NO
48	18	MALE	354 mg/dL	>150 mg/dL	4.9 MMOL/L	1.4 MMOL/L	>10%	355 pg.mL	>150 pg/mL	YES	YES	NO	NO	17 DAYS 10 HOURS	NO
49	40	MALE	237 mg/dL	>150 mg/dL	1.6 MMOL/L	1.1 MMOL/L	NORMAL	169 pg/mL	>150 pg/mL	YES	NO	NO	NO	18DAYS 11 HOURS	NO
50	47	MALE	23 mg/dL	<150 mg.dL	7.4 MMOL/L	2.2 MMOL/L	>10%	106 pg/mL	<150 pg/mL	YES	NO	NO	YES	25DAYS 10 HOURS	NO
51	49	MALE	41.2 mg/dL	<150 mg.dL	2.8 MMOL/L	2.2 MMOL/L	>10%	118.5 pg.mL	<150 pg/mL	NO	NO	NO	NO	12DAYS 16HOURS	NO
52	52	MALE	197.2	>150	3.6 MMOL/L	1.7 MMOL/L	>10%	81.4 pg/mL	<150	NO	NO	NO	NO	12DAYS	NO

			mg/dL	mg/dL					pg/mL					15HOURS	
53	18	MALE	57.9 mg/dL	<150 mg.dL	2.0 MMOL/L	1.5 MMOL/L	NORMAL	34.0 pg/mL	<150 pg/mL	NO	NO	NO	NO	7 DAYS 12 HOURS	NO
54	55	FEMALE	227.9 mg/dL	>150 mg/dL	3.1 MMOL/L	6.2 MMOL/L	<10%	1165 pg/mL	>150 pg/mL	DEATH	DEATH	DEATH	DEATH	2 DAYS 11 HOURS	YES
55	35	FEMALE	31.0 mg/dL	<150 mg.dL	1.8 MMOL/L	1.2 MMOL/L	NORMAL	132.0 pg.mL	<150 pg/mL	NO	NO	NO	NO	10 DAYS 12 HOURS	NO
56	73	FEMALE	197.4 mg/dL	>150 mg/dL	1.2 MMOL/L	0.6 MMOL/L	NORMAL	64 pg/mL	<150 pg/mL	YES	YES	YES	YES	29 DAYS 12 HOURS	NO
57	68	FEMALE	192.6 mg/dL	>150 mg/dL	1.9 MMOL/L	2.3 MMOL/L	<10%	373.4 pg/mL	>150 pg/mL	YES	NO	NO	YES	13DAYS 9 HOURS	NO
58	75	FEMALE	111.7 mg/dL	<150 mg.dL	4.8 MMOL/L	1.4 MMOL/L	>10%	374 pg/dL	>150 pg/mL	YES	YES	NO	YES	13 DAYS 14 HOURS	NO
59	75	FEMALE	389.3 mg/dL	>150 mg/dL	1.2 MMOL/L	1.8 MMOL/L	<10%	235.2 pg/mL	>150 pg/mL	YES	NO	NO	YES	14DAYS 9 HOURS	NO
60	60	FEMALE	37.7 mg/dL	<150 mg.dL	5.5 MMOL/L	4.9 MMOL/L	>10%	1633 pg/mL	>150 pg/mL	YES	YES	YES	YES	31DAYS 10 HOURS	YES
61	30	FEMALE	169.9 mg/dL	>150 mg/dL	2.5 MMOL/L	2.0 MMOL/L	>10%	52.0 pg/mL	<150 pg/mL	YES	NO	NO	YES	15 DAYS 15 HOURS	NO
62	23	FEMALE	169.3 mg/dL	<150 mg.dL	3.9 MMOL/L	3.4 MMOL/L	>10%	1614 pg/mL	>150 pg/mL	YES	YES	YES	YES	52DAYS	NO

63	62	MALE	57.8 mg/dL	<150 mg.dL	4.8 MMOL/L	4.3 MMOL/L	>10%	102.4 pg.mL	<150 pg/mL	NO	NO	NO	YES	8DAYS 12 HOURS	NO
64	23	MALE	50.5 mg.dL	>150 mg/dL	3.7 MMOL/L	3.1 MMOL/L	>10%	420.8 pg/mL	>150 pg/mL	YES	YES	YES	YES	28 DAYS 14 HOURS	NO
65	25	MALE	270 mg/dL	<150 mg.dL	1.8 MMOL/L	1.2 MMOL/L	NORMAL	132 pg.mL	<150 pg/mL	NO	NO	NO	NO	7 DAYS 12 HOURS	NO
66	25	MALE	65 mg/dL	<150 mg.dL	1.8 MMOL/L	1.2 MMOL/L	NORMAL	91 pg.mL	<150 pg/mL	NO	NO	NO	NO	10 DAYS 14 HOURS	NO
67	56	FEMALE	86.2 mg/dL	>150 mg/dL	1.2 MMOL/L	2.3 MMOL/L	<10%	524.8 pg/mL	>150 pg/mL	YES	YES	NO	YES	19 DAYS 18 HOURS	NO
68	35	MALE	169.9 mg/dL	<150 mg.dL	1.3 MMOL/L	1.0 MMOL/L	NORMAL	120.5 pg/mL	<150 pg/mL	NO	NO	NO	NO	15DAYS 16 HOURS	NO
69	50	FEMALE	43.0 mg/dL	<150 mg.dL	3.2 MMOL/L	2.9 MMOL/L	<10%	1596.3 pg/mL	>150 pg/mL	NO	NO	NO	NO	15 DAYS 21 HOURS	NO
70	45	FEMALE	84 mg/dL	<150 mg.dL	2.9 MMOL/L	1.8 MMOL/L	>10%	326 pg/mL	>150 pg/mL	YES	NO	NO	YES	17DAYS 20 HOURS	NO
71	64	FEMALE	43.0 mg/dL	>150 mg/dL	6.0 MMOL/L	4.0 MMOL/L	>10%	691.3 pg.mL	>150 pg/mL	YES	YES	NO	YES	19DAYS21HOURS	NO
72	24	MALE	385.6 mg/L	>150 mg/dL	1.8 MMOL/L	0.9 MMOL/L	NORMAL	734 pg/mL	>150 pg/mL	YES	NO	NO	YES	9DAYS 16 HOURS	NO
73	56	MALE	250.9	>150	3.8 MMOL/L	2.2 MMOL/L	>10%	82 pg/mL	<150	NO	NO	NO	NO	10DAYS 13	NO

			mg/L	mg/dL					pg/mL					HOURS	
74	45	MALE	192.6 mg/dL	<150 mg.dL	1.2 MMOL/L	1.0 MMOL/L	NORMAL	23 pg/mL	<150 pg/mL	NO	NO	NO	NO	8DAYS 15 HOURS	NO
75	50	MALE	43.0 mg/dL	>150 mg/dL	4.8 MMOL/L	2.5 MMOL/L	>10%	326.5 pg/mL	>150 pg/mL	YES	YES	NO	NO	16DAYS	NO
76	40	MALE	270 mg/dL	>150 mg/dL	2.8 MOL/L	1.6 MMOL/L	>10%	118 pg/mL	<150 pg/mL	NO	NO	NO	NO	15DAYS 10 HOURS	NO
77	32	FEMALE	112 mg/dL	<150 mg.dL	2.4 MMOL/L	1.8 MMOL/L	NORMAL	295 pg/mL	>150 pg/mL	NO	NO	NO	NO	9 DAYS 11 HOURS	NO
78	60	FEMALE	633 mg/dL	>150 mg/dL	4.8 MMOL/L	2.0 MMOL/L	>10%	454 pg/mL	>150 pg/mL	YES	NO	NO	NO	12 DAYS 17 HOURS	NO

20BMSUR012-VENKAT-THE EFFECT OF SERUM C-REACTIVE PROTEIN, SERUM LACTATE CLEARANCE, AND SERUM INTERLEUKIN-6 IN PREDICTING OUTCOMES OF EMERGENCY GASTROINTESTINAL SURGERIES

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