"POST- OPERATIVE PULMONARY COMPLICATIONS IN EMERGENCY LAPAROTOMY FOR ACUTE ABDOMINAL CONDITION'' – A ONE YEAR OBSERVATIONAL STUDY"

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LIST OF ABBREVIATIONS USED

ACS	-	Abdominal compartment syndrome
ARDS	-	Acute respiratory distress syndrome
COPD	-	Chronic obstructive pulmonary diseases
CPAP	-	Continuous positive airway pressure
GIT	-	Gastro intestinal track
ICU	-	Intensive care unit
IM	-	Intra muscular
IV	-	Intra venous
MS	-	Microsoft
OSA	-	Obstructive sleep apnoea
PPC	-	Post-operative pulmonary complications
SC	-	Sub cutaneous
SPSS	-	Statistical package for social sciences
VAP	-	Ventilator associated Pneumonia
WHO	-	World Health Organization

ABSTRACT

Introduction:

Laparotomy is one of the most common surgical procedures done in a routine surgical practice. By definition, the word laparotomy describes exploration of the abdomen and to continue further according to the cause identified. Postoperative pulmonary complication (PPC) includes virtually any complication affecting the respiratory system after anesthesia and surgery. Postoperative pulmonary complications can be considered as a measurement of a complex outcome. Since there are only a few studies in literature regarding the post-operative lung complication following emergency laparotomy in our country, our study aims to estimate the post-operative pulmonary complications following emergency laparotomy for acute abdominal conditions. Considering that demographic and clinical characteristics of patients as well as preoperative diagnoses and surgical strategies adopted in emergency situations are expected to be quite diverse from those in elective surgery.

Materials and methods:

This study was conducted in the department of General Surgery among patients undergoing emergency laparotomy for acute abdomen condition at KLES Dr Prabhakar Kore hospital and MRC, Belagavi the study was conducted between January 2020 and December 2020. Patients undergoing emergency laparotomy for acute abdominal under general anaesthesia and aged between 18 to 75 years were included in the study. Patients with known cases of respiratory illness were excluded from the study. Data entry was done using MS Excel and data analysis was done using SPSS version 23.0. Descriptive statistics were interpreted in frequency and percentage. Institute ethical committee clearance certification was sought and

obtained before the study was begun. Informed written consent was obtained from all patients before including them in the study.

Results:

This study was conducted among 30 patients, where maximum of the study participants were in the age group of 31-40 years, and predominantly males. Majority of the study participants were diagnosed with peritonitis secondary to perforation (56.7 %) followed by intestinal obstruction (33.3 %) and blunt abdomen (10 %). The incidence of PPC in the study is 57 % (17 out of 30 cases) and more than half of the participants developed plural effusion (53.3%), 36 % of the participants developed atelectasis and 17 % of the study participants developed pneumonia during the post-op period.

Conclusion:

Post-operative pulmonary complications increase morbidity after surgery. Pre-operative assessment aids in identifying patients at risk of developing post-operative pulmonary complications. Proper pre-operative assessment by the pulmonologists, and management of existing risk factors would reduce the incidence, or possibly eliminate completely the occurrence of post- operative pulmonary complications.

Key Words: Post-operative complications, pulmonary complications, emergency laparotomy, acute abdomen

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INTRODUCTION

Laparotomy is one of the most common surgical procedures done in a routine surgical practice. By definition, the word laparotomy describes exploration of the abdomen and to continue further according to the cause identified.[1]

Postoperative complications can be defined as any negative consequence as perceived by the surgeon or by the patient which may occur intraoperatively, in the immediate postoperative period, or in the delayed post-operative period. Complications following abdominal surgery causes a daunting challenge to surgeon in a general surgery unit, where abdominal surgery constitutes the bulk of major surgical procedures.

Various factors like proper resuscitation, careful surgical technique, age of the patient, other co-morbid conditions such as coronary artery disease, diabetes mellitus, hypertension, any other chronic illness, anaesthesia technique and postoperative care contribute to final result. The post-operative mortality should be a better measure of quality than death rates and other intermediate outcomes.[2] Hence, early detection and proper intervention can diminish the morbidity and mortality related with complication.[3]

The bulk of surgical procedures performed worldwide is larger and, though many advances have been made in the past decades, few surgical care exposes patients to considerable risk of morbidity and mortality. It has been estimated that worldwide >230 million major operations occur annually.[4] The safety of surgical care has improved considerably within the global health landscape. Until now it remains a persistent concern in both developed and developing countries. In 2009, the WHO

composed a 19-item surgical safety checklist for implementation in various countries around the world and a study was done to measure its outcomes[5]. From the results of the aforesaid study, it was seen that overall, 30-day mortality after emergency laparotomy was ten-times higher than for elective surgery.

Postoperative pulmonary complication (PPC) includes virtually any complication affecting the respiratory system after anesthesia and surgery. Postoperative pulmonary complications can be considered as a measurement of a complex outcome.[5]

The frequency of PPCs after laparotomy reported in the literature has varied widely.[6] The incidence of PPCs in major surgery is found to be ranging from 25 - 50%. In 2015, a European joint taskforce published guidelines for perioperative clinical outcome (EPCO) definitions.[7] The taskforce defined respiratory infection, respiratory failure, pleural effusion, atelectasis, pneumothorax, bronchospasm, and aspiration pneumonitis to be the compound measures and defined pneumonia, acute respiratory distress syndrome (ARDS), and pulmonary embolus as separate adverse outcomes. Studies have shown the incidence of complications being 20 to 69% for atelectasis, and from 9 to 40% for postoperative pneumonia.[8]

A systemic review of American college of physicians showed that 60% of the study results indicate the presence of post-operative lung complications following laparotomy.[9] Following major abdominal surgeries, pulmonary complications are found the leading cause of post-operative morbidity and mortality affecting 25–50% of patients.[10,11] Postoperative pulmonary complications (PPCs) occur with a frequency equal to or greater than cardiac complications and might be more commonly seen than cardiac complications and can be taken as a significant predictor of long-term mortality after surgery.[12]

In addition, these complications can lead to increased patient discomfort, increased consumption of resources, longer length of stay and, thus, over all increased health care costs. [11] Patients who have abdominal or thoracic incisions experience wound pain and diaphragmatic dysfunction and this in turn compromises effective respiration. Atelectasis is the pathological process leading to alveolar collapse.[11] Surgery in supine position causes reduced lung volume, impairment of function of respiratory muscles and leads to alterations in lung mechanisms for air exchange. In post-operative period few patients undergoing laparotomy have compromised ability to achieve an effective tidal volume. These decreased tidal volumes reduce the inflating forces within the lung and may lead to alveolar collapse. This in turn creates a restrictive lung disorder, causing reduced lung compliance, compromised mucociliary clearance, depletion of surfactant and this leading to pre-disposition to infection.[13,14]

A number of factors are responsible for the variability including patient selection, differences in the surgical procedures studied and variation in the definition of PPCs. The emergency nature of the surgical procedure has also been autonomously associated with higher rates of postoperative pneumonia and respiratory failure.[15] Midline laparotomy incisions are thought to be leading to more chest complications than transverse or oblique incisions.[16] It is, nevertheless, very difficult to differentiate between the effect of the direction of incision and the effects of cigarette smoking and chronic bronchitis, the VQ instabilities induced by general anaesthesia, the ventilatory depression caused by the incision in the abdominal wall and the complication.[17]

Although postoperative pulmonary complications (PPC) are recognized to be at large, the range of incidence of the same in the existing literature is variable, ranging from 9% to 40%, probably due to methodological inconsistencies among

various studies. The identification and correction of modifiable perioperative risk factors should lead to further improvement of outcomes and should improve the mortality and morbidity and cost of health care. Chest physiotherapy aims to lessen the probability of these complications and hasten recovery. Various exercises aimed at maximising inspiratory effort and may be beneficial for the patients. The incentive spirometer is a handheld device that patients use to achieve effective inspiration and can be used for post-operative cases.

But a recent systematic review has questioned the utility and outcome of routine postoperative respiratory physiotherapy following upper abdominal surgery. In contrast, other evidence proposes that postoperative mobilisation may lessen the incidence of pulmonary complications, though the quantity and intensity of mobilisation to achieve this outcome is unidentified.[18]

Despite of the availability of vast literature about emergency laparotomy and postoperative pulmonary complications the strategies to prevent postoperative pulmonary complications remain poorly defined.

Since there are only a few studies in literature regarding the post-operative lung complication following emergency laparotomy in our country, our study aims to estimate the post-operative pulmonary complications following emergency laparotomy for acute abdominal conditions. Considering that demographic and clinical characteristics of patients as well as preoperative diagnoses and surgical strategies adopted in emergency situations are expected to be quite diverse from those in elective surgery. This study will also be helpful for evaluating the utility of existing risk prediction models for reduced adverse outcomes and optimal perioperative results.

AIM

To estimate the incidence of post-operative pulmonary complications among patients undergoing emergency laparotomy for acute abdominal condition

REVIEW OF LITERATURE

ACUTE ABDOMEN

HISTORY: Difficulties of acute abdomen detected as early as in 8th century BC.

In the era of Hippocrates, they named as “Ileae passion Ileus”.

Intestinal obstruction: In ancient times intestinal obstruction was treated by

1. Giving enemas.
2. Sushrutha recommended incision of intestine,
3. Replacement of intestinal segments after moisturising them with honey and butter,
4. Sewing up of intestine.

1556 – Pierrefraneo – surgery for inguinal hernia

1836 – Jaharnfriedrich – resection of gangrenous bowel

1710 – Jeanjulima – colostomy

1911 – Schwartz – gas distended bowel loops/ air fluid levels in x rays.

1727 –Rowlinson - signs and symptoms of perforation peritonitis

1891 – Hensher – intervention for peptic ulcer perforation

1736 – Claudius Amyand – first appendicectomy

1755 – Lorenz heister – appendix is the site of inflammation

Mc Burney – clinical features of appendicitis.

DEFINITION:

The term acute abdomen refers to signs and symptoms of abdominal pain and tenderness, a clinical presentation that often requires emergency surgical therapy.

Many diseases, some of which are not surgical or intra-abdominal, can produce acute abdominal pain and tenderness. So, every attempt is made to make a correct diagnosis so that the preferred therapy, often a laparoscopy or laparotomy, is appropriate. The diagnoses associated with an acute abdomen vary according to age and gender.[19,20] Appendicitis is more common in the young, whereas biliary disease, bowel obstruction, intestinal ischemia and infarction, and diverticulitis are more common in elderly patients. Nonsurgical causes of an acute abdomen can be divided into three categories: endocrine and metabolic, haematological, and toxins or drugs.[21]

NON SURGICAL CAUSES OF ACUTE ABDOMEN
Endocrine and Metabolic Causes
Uremia Diabetic crisis Addisonian crisis Acute intermittent porphyria Hereditary Mediterranean fever
Hematological Causes
Sickle cell crisis Acute leukemia Other blood dyscrasias
Toxins and Drugs
Lead poisoning Other heavy metal poisoning Narcotic withdrawal Black widow spider poisoning

SURGICAL CAUSES OF ACUTE ABDOMEN
Hemorrhage
Solid organ trauma
Leaking or ruptured arterial aneurysm
Ruptured ectopic pregnancy
Bleeding gastrointestinal diverticulum
Arteriovenous malformation of gastrointestinal tract
Intestinal ulceration
Aortoduodenal fistula after aortic vascular graft
Hemorrhagic pancreatitis
Mallory-Weiss syndrome
Spontaneous rupture of spleen
Infection
Appendicitis
Cholecystitis
Meckel's diverticulitis
Hepatic abscess
Diverticular abscess
Psoas abscess
Perforation
Perforated gastrointestinal ulcer
Perforated gastrointestinal cancer
Boerhaave's syndrome
Perforated diverticulum
Obstruction
Adhesion related small or large bowel obstruction
Sigmoid volvulus
Cecal volvulus
Incarcerated hernias
Inflammatory bowel disease
Gastrointestinal malignancy
Intussusception

Ischemia
Buerger's disease Mesenteric thrombosis or embolism Ovarian torsion Ischemic colitis Testicular torsion Strangulated hernias

Management of acute abdomen:

Medical Therapy

A variety of disease processes (e.g., hemorrhagic, infectious, and toxic gastroenteritis; severe liver failure; pancreatitis; prostatitis; pyelonephritis; ulceration of the gastrointestinal [GI] tract) can cause acute signs of abdominal pain and can usually be managed with medical therapy. If appropriate medical measures are taken and the clinical status of the patient does not improve, however, re-evaluating the causative agent is necessary.

Fluid Therapy

The mainstay of medical therapy for patients with acute abdomen is treating the underlying cause once it is discovered. Regardless of the cause, however, several generalized treatment regimens apply to critically ill patients. Shock is the most important problem to address. Once hypovolemia and decreased tissue perfusion to abdominal viscera are present, compromise of the intestinal wall can lead to translocation of intraluminal bacteria and can predispose patients to septicemia and/or endotoxemia. Decreased venous return and portal hypertension are additional concerns during shock.1 Aggressive IV fluid therapy should be initiated via a large-bore catheter using a balanced electrolyte solution, including 0.9% saline and lactated

Ringer's solution (bolus followed by IV infusion at a rate of 125 ml/hr). In most cases involving shock, one-fourth of the calculated volume of fluid should be administered rapidly. Then the patient's perfusion parameters (including heart rate, capillary refill time, blood pressure, and urine output) should be reassessed. Fluid therapy can be titrated based on a patient's clinical response to therapy and cardiovascular status. If severe metabolic acidosis represented by a blood pH less than 7.1 continues despite adequate fluid resuscitation, administering sodium bicarbonate (NaHCO3) can be beneficial.2 The bicarbonate deficit can be calculated with the following formula: Bicarbonate deficit = Base deficit x 0.3 x kg.

In some cases, blood gas values cannot be measured but can only be estimated. This can be achieved by classifying suspected acidosis as mild, moderate, or severe. The base deficits would correlate at -5, -10, and -15, respectively.3 One-fourth of the calculated NaHCO3 replacement dose should be delivered IV over 20 minutes followed by a new blood gas measurement and assessment. Acidosis frequently improves following improved perfusion. If NaHCO3 therapy is administered before fluid volume resuscitation, metabolic alkalosis may occur; therefore, this is not recommended as empiric therapy.

Drug Therapy

Once a patient's hypovolemic status has been addressed and proper fluid therapy initiated, medical therapy should continue by addressing the need for antimicrobial therapy. All therapeutic choices for infection should ideally be based on results of culture and susceptibility testing. However, empirical therapy is almost always warranted while laboratory results are pending. When available, a Gram's stain should be used to help obtain a diagnosis. Knowledge of resident microbes originating

from the suspected source of infection is also very important in choosing the most appropriate course of antibiotic therapy. To provide broad-spectrum (aerobic and anaerobic) coverage, combination antibiotic therapy is often chosen.4

An extremely important aspect of medical management that should never be forgotten or delayed is the judicious use of analgesics. Even if eventual correction of the underlying problem is foreseen, that does not prevent immediate discomfort. The choice of analgesics used are IV Paracetamol 100 mg tds or IV Tramadol 50 mg bd

Antiemetics are indicated not only to counteract potential side effects of opioids but also as general therapeutics for patients with acute abdomen. The selective 5-HT3 antagonist, ondansetron 4 mg IV tds provides antiemetic effects in patients with a traumatized abdomen. Metoclopramide promotes GI motility, and is contraindicated in patients with suspected bowel obstruction.4 Chlorpromazine is also relatively contraindicated because it blocks alpha-receptors, thereby producing hypotension.

Emergency Laparotomy

Definition of Emergency Laparotomy:

An emergency laparotomy is a non-elective surgical procedure involving an incision through the abdominal wall when the patient's well-being or life is in jeopardy.

Indications for Emergency Laparotomy

Laparotomy may be exploratory when patients present with acute or unexplained abdominal pain whose symptoms have not been explained by clinical or radiological diagnostic methods[12]. The most common indications for laparotomy in the non-traumatic setting are intestinal obstruction or perforation of a viscus.

Intestinal obstruction may present with abdominal pain and distension, vomiting and absolute constipation.

Abdominal x-rays may show dilated loops of small or large bowel with air-fluid levels. Patients with perforation will have clinical signs of peritonitis and may have a pneumoperitoneum on an erect chest x-ray (75% of cases). The common sites of perforation are the large bowel (due to diverticular disease or malignancy), the duodenum or stomach (due to peptic ulcer disease), or less commonly, the small bowel (due to adhesional obstruction, ischaemia or herniation). Patients with pain and fever may have intra-abdominal sepsis due to a diverticular abscess, appendicitis, perforated viscus or tubo-ovarian abscess.

Types of Incisions used for Emergency Laparotomy and their Advantages/Disadvantages

Midline Incision

A laparotomy can be performed through a variety of incisions but the most common one is a midline laparotomy, a vertical incision which follows the relatively bloodless linea alba. The upper midline incision usually extends form the xiphoid process to the umbilicus and a lower midline incision ends at the pubic symphysis inferiorly. Some pathologies will require a full midline from the xiphoid process to pubic symphysis to allow for wide access to the abdominal cavity. The method of a midline incision is as follows: incise the skin in the midline, through the subcutaneous tissues and along the linea alba.

Advantages: This incision gives excellent access and it can be extended if required. There should be minimum blood loss through the avascular linea alba and minimum nerve or muscle damage. This incision can be made and closed quickly

(mass closure). Disadvantages: There is a risk of incisional hernia. Incisional hernias are a common complication of midline laparotomies and are defined as 'abdominal wall gaps around post-operative scars, perceptible or palpable by clinical examination or imaging'

Paramedian Incision

A paramedian or original McEvedy's incision is lateral to the midline which involves incising the skin and the rectus sheath along its lateral margin. Access is gained by pulling the rectus medially.

Advantages: This previously popular incision allows access to lateral structures such as the kidney, adrenals and spleen. Disadvantages: Very high incisional hernia rate and the incision needs to be closed in layers which takes longer.

Kocher's Incision

This is an oblique incision made in the right upper quadrant of the abdomen, which is classically used for access to the gallbladder and biliary tract but also allows good access to the liver.

Advantages: This incision provides good access to liver and gallbladder and the incision be extended across the midline.

Disadvantages: This incision does not provide access to lower abdomen and takes longer to make and close as it is usually performed in layers.

Pfannenstiel Incision

This is a transverse incision just above the pubic symphysis which involves incising the skin and subcutaneous tissues transversally, retracting the rectus muscles

laterally and opening the peritoneum either vertically or transversely. It is the incision of choice for Caesarian section and to access the uterus and ovaries.

Advantages: This incision permits urgent access to the gravid uterus and it's location means that it may be hidden in the pubic hair line.

Disadvantages: There is a risk of incisional hernia and also of injury to the bladder if not catheterized during surgery. It gives limited access to the abdominal organs and to the deep pelvic organs in the obese patient.

ANESTHETIC RISK FACTORS RELATED TO EMERGENCY LAPAROTOMY:

Post-operative pulmonary complications are as prevalent as cardiac complications and contribute equally to morbidity, mortality and length of hospital stay.[22] Clinically significant pulmonary complications encountered postoperatively include atelectasis, pneumonia, bronchitis, pneumothorax, aspiration, bronchospasm and worsening of underlying chronic lung disease. Though, compared with Preoperative Cardiac Risk evaluation, there have been scarce studies predicting pulmonary risk. There is data to suggest that postoperative pulmonary complications are predictors of long term mortality.[23]

Most postoperative pulmonary complications progress as a result of variations in lung volumes that occur in response to dysfunction of muscles of respiration and other changes in chest wall mechanics. Abdominal and thoracic surgical procedures cause large decreases in vital capacity and smaller but vital reductions in functional residual capacity (FRC), which has been recognized for decades as the single most important lung volume measurement involved in the etiology of respiratory complications.[24] Although no consistent changes occur in FRC after non-abdominal,

non- thoracic surgery, FRC decreases after lower abdominal operations by 10 to 15%, by 30% after upper abdominal operations, and by 35% after thoracotomy and lung resection.[25-28] Other factors that decrease FRC include the supine position, obesity, the presence of ascites, the development of peritonitis, and general anaesthesia.

POST OPERATIVE PULMONARY COMPLICATIONS:

Pulmonary complications are a major cause of morbidity and mortality during the postoperative period. The reported incidence of postoperative pulmonary complications ranges from 25 to 50 percent, depending upon the patient population and the criteria used to define a complication. The incidence also varies across hospitals, with one study reporting lower rates of complications in hospitals with a high volume of patients than in hospitals with a lower volume following esophagectomy, pancreatectomy, and intact abdominal aortic aneurysm repair.

Traditional definitions of postoperative pulmonary complications include atelectasis, bronchospasm, pneumonia, and exacerbation of chronic lung disease. However, the list can be expanded to include acute upper airway obstruction, complications from obstructive sleep apnea, pleural effusions, chemical pneumonitis, pulmonary edema, hypoxemia due to abdominal compartment syndrome, and tracheal laceration or rupture.

RISK FACTORS FOR POST OPERATIVE PULMONARY COMPLICATIONS

PATIENTS'- RELATED FACTORS:

AGE:

Post-operative pulmonary complications are noted to be associated with increasing age[29] though the risk of surgical mortality was also seen to be similar across age groups when stratified by American Society of Anaesthesiology (ASA) class.[30] A systematic review reported by the American College of Physicians estimated the impact of age on post-operative pulmonary complications in several studies and observed that age greater than 50 years was an independent predictor of post-operative pulmonary risk.[7]

CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD):

COPD is also an independent and important patient-related risk factor for post-operative pulmonary complications. In a prospective study that assessed pulmonary risk in patients with COPD (established by clinical findings and chest X-ray), complications occurred in 26% of patients compared with 8% of patients without COPD.[31] Another report showed that patients with severe COPD were six times more likely to have major post-operative pulmonary complications after thoracic or abdominal surgeries than those without COPD.[32] COPD also increases the risk of postoperative arrhythmias which impact negatively on the lungs.[33] ASTHMA uncontrolled or poorly controlled asthma has been noted to increase the risk of postoperative pulmonary complications. Bronchospasm and laryngospasm have been noted to develop in patients with bronchial hyper-reactivity after undergoing tracheal

intubation and these patients may benefit from short-acting beta2 agonist and corticosteroid use 5-7 days before surgery.[34]

SMOKING:

Smokers have increased risk of post-operative pulmonary complications especially current smokers who continue to smoke four to eight weeks before surgery.[35] This may be explained by their increased carbon monoxide retention, increased incidence of cough, sputum production, and dysfunctional cilia, all of which heighten their risk of post-operative chest infection.[36,37] Smokers with more than 20 pack year history of smoking have higher incidence of postoperative pulmonary complication than those with less pack years, in the absence of underlying lung disease.[38]

OBESITY:

Physiologic changes that accompany obesity include reduction in lung volumes, ventilation/perfusion mismatch and relative hypoxemia.[39] These may worsen during anaesthesia and increase the risk of pulmonary complication. Report by Hall et al[40] among 1000 patients undergoing laparatomy and study by Brooks-Brunn, found obesity as an independent risk factor for post-operative pulmonary complications.[41]

OBSTRUCTIVE SLEEP APNOEA:

This is an emerging risk factor for post-operative pulmonary complications and is noted to increase the risk of critical respiratory events immediately after surgery including hypoxemia and unplanned re-intubation.[42] Obstructive sleep apnea also increases incidence of intensive care unit(ICU) admission post surgeries.[43]

PULMONARY HYPERTENSION:

Pulmonary hypertension, primary or secondary (defined as right ventricular systolic pressure of > 35mmHg) in patients undergoing non-cardiac surgery increased the risk of postoperative congestive heart failure, ischaemic cardiac events, arrhythmias, strokes and respiratory failure(which is the most frequent morbidity).[44] Also patients with pulmonary hypertension who cannot walk >332m during a 6mins walk test had a higher mortality rate than those who can. [45]

INTERSTITIAL LUNG DISEASE:

Three studies have assessed the pre-operative evaluation of patients with interstitial lung disease. The first found that grade 3 or 4 dyspnoea at rest using American Thoracic Society shortness of breath scale had higher mortality post-surgery.[46]

UPPER RESPIRATORY INFECTION:

Data regarding the risk of pulmonary complication among patients with current or recent upper respiratory infection is limited. Yet it seems instructive and prudent to defer elective surgery in this setting because of risk of spread of the infection to the lower respiratory tract especially for patients that will undergo general anaesthesia.[47]

METABOLIC FACTORS:

A multi-factorial risk index for post-operative respiratory failure identified two metabolic risk factors which include serum albumin 30mg/dl or blood urea >10mmol/l, although serum albumin was noted to be a stronger predictor of pulmonary risk than Blood Urea Nitrogen.[48]

PROCEDURE-RELATED FACTORS

SURGICAL SITE

This is the most important factor in predicting the overall risk of post-operative pulmonary complication. The incidence of pulmonary complication is inversely related to the distance of the surgical incision from the diaphragm, thus the complication rate is significantly higher in thoracic and upper abdominal surgeries than in lower abdominal surgeries and other peripheral surgeries such as limb surgeries.

DURATION OF SURGERY

Surgeries lasting more than 3-4 hours are associated with higher risk of pulmonary complication. A study of risk factors for pneumonia in 520 patients, found an incidence of 8% for surgeries lasting less than 2 hours versus 40% for procedures more than 4hours.[49]

TYPE OF ANAESTHESIA

Surgeries in supine posture under general anaesthesia cause alteration in lung volumes, impairment in the functions of respiratory muscles, alterations in lung mechanics related to gas exchange, and mucociliary impairment which increase the risk of post-operative pulmonary complications. Duration of anaesthesia also influences post-operative outcome. Long acting neuromuscular blockers like pancuronium, pipercuronium may lead to incomplete reversal of neuromuscular blockade and residual paralysis of respiratory muscles. Residual paralysis compromises cough, airway patency, ability to overcome airway resistance and airway protection leading to airway obstruction, micro-aspiration, atelectasis, and pneumonia.[50]

ATELECTASIS

Atelectasis is one of the most common postoperative pulmonary complications, particularly following abdominal and thoracoabdominal procedures.[51]

Clinical presentation

Postoperative atelectasis can be asymptomatic or it may manifest as increased work of breathing and hypoxemia. The onset of hypoxemia due to postoperative atelectasis tends to occur after the patient has left the post-anesthesia care unit. It typically becomes most severe during the second postoperative night and continues through the fourth or fifth postoperative night.

Pathogenesis

Postoperative atelectasis is usually caused by decreased compliance of lung tissue, impaired regional ventilation, retained airway secretions, and/or postoperative pain that interferes with spontaneous deep breathing and coughing.[52]

Management

The initial approach to managing postoperative atelectasis depends upon whether the patient has abundant secretions, which we define as frequent expectoration, the expectoration of large amounts of sputum, and/or prominent rhonchi on auscultation. For patients without abundant secretions, continuous positive airway pressure may be beneficial. For patients with abundant secretions, chest physiotherapy and suctioning are appropriate. Some patients with abundant secretions may also benefit from bronchoscopy; the absence of air bronchograms may help identify patients who are more likely to benefit from bronchoscopy.

BRONCHOSPASM

Bronchospasm is common during the postoperative period. Clinical manifestations include dyspnea, wheezing, chest tightness, tachypnea, small tidal volumes, a prolonged expiratory time, and hypercapnia. Postoperative bronchospasm can be caused by aspiration, histamine release incited by medications (eg, opiates, tubocurarine, or atracurium), an allergic response to medications, or an exacerbation of a chronic pulmonary condition, such as asthma or chronic obstructive pulmonary disease. It can also be caused by reflex constriction of bronchial smooth muscles due to tracheal stimulation by secretions, suctioning, endotracheal intubation, or other surgical stimulation. Reflex bronchoconstriction is particularly common when the bronchodilatory effects of inhalational anesthetics wane.[53]

Treatment of postoperative bronchospasm consists of treating the underlying cause, removing potential contributors (eg, medications), and pharmacotherapy. Short-acting inhaled beta-2-agonists (eg, albuterol , metaproterenol) are bronchodilators that are considered first-line pharmacotherapy. Patients who do not improve after one or two doses of the inhaled bronchodilators may benefit from the addition of systemic glucocorticoids.

PNEUMONIA

Postoperative pneumonia has clinical manifestations and a diagnostic approach that is nearly identical to other types of hospital-acquired pneumonia (HAP) and ventilator-associated pneumonia (VAP). However, it has some unique risk factors and treatment considerations.[54]

Clinical presentation

Postoperative pneumonia tends to occur within five postoperative days. It may present with fever, leukocytosis, increased secretions, and pulmonary infiltrates on chest radiographs. Hypoxemia may develop, or the patient may require more supplemental oxygen to maintain the same oxyhemoglobin saturation. Respiratory distress, dyspnea, tachypnea, small tidal volumes, and hypercapnia may also occur. The minute ventilation often increases prior to the development of any blood gas abnormalities, a consequence of the patient becoming more catabolic due to the developing infection.

Diagnosis

The diagnosis of postoperative pneumonia can be difficult because there are many other postoperative causes of fever and/or pulmonary infiltrates, such as atelectasis, pulmonary embolism, and acute lung injury. This was illustrated in a prospective cohort study of 129 consecutive surgical ICU patients with abnormal chest radiographs.[55] Forty-eight percent of the patients were recovering from operative procedures and causes of pulmonary infiltrates in this population included pneumonia (30 percent), pulmonary edema (29 percent), acute lung injury (15 percent), and atelectasis (13 percent).

Pathogens

Gram-negative bacteria and Staphylococcus aureus were the most commonly cultured microorganisms, while the most frequent bacterial combinations were Enterobacteriaceae plus either Staphylococcus aureus or streptococci. Haemophilus influenzae and Streptococcus pneumoniae accounted for 19 percent and 10 percent, respectively, of the microorganisms isolated from respiratory and blood cultures.

There are risk factors for postoperative pneumonia caused by particular microorganisms:

- Haemophilus influenzae or Streptococcus pneumoniae – Traumatically injured patients appear to be at increased risk for postoperative pneumonia due to Haemophilus influenzae or Streptococcus pneumoniae.
- Staphylococcus aureus – Neurosurgical patients (particularly those who are mechanically ventilated), victims of blunt trauma and coma, and patients who have sustained closed head injuries seem to be at increased risk for postoperative pneumonia due to Staphylococcus aureus .
- Pseudomonas aeruginosa – No particular type of surgery has been convincingly shown to increase the likelihood of postoperative Pseudomonas pneumonia. However, risk factors for Pseudomonas pneumonia include: intubation >8 days, structural lung disease (eg, bronchiectasis, cystic fibrosis, and chronic obstructive pulmonary disease [COPD]), corticosteroid therapy, malnutrition, and prolonged exposure to antibiotics.
- Acinetobacter species – Acinetobacter species are a well-recognized cause of postoperative pneumonia, although no particular type of surgery has been shown to predispose patients to postoperative Acinetobacter pneumonia. The most important risk factor for Acinetobacter pneumonia is mechanical ventilation. Multidrug resistance is an increasing problem and Acinetobacter pneumonia is associated with a high mortality rate.
- Anaerobic species – The role of anaerobes in the pathogenesis of postoperative pneumonia is uncertain. Abdominal surgery is generally

considered a risk factor for pneumonia due to anaerobic organisms, but several studies suggest that anaerobes may not be important pathogens in this setting.

Treatment

The management of postoperative pneumonia involves the collection of respiratory specimens for microbiological analysis, followed by the initiation of empiric antimicrobial therapy. Once the microbiological data has been reported and the patient's response to empiric therapy assessed, the antimicrobial regimen should be tailored.

ACUTE UPPER AIRWAY OBSTRUCTION

Acute upper airway obstruction typically occurs during the immediate postoperative period. It usually manifests as stridor if the obstruction is incomplete or aphonia if the obstruction is complete. Patients also may develop respiratory distress with dyspnea, tachypnea, tachycardia, and diaphoresis. Causes of acute upper airway obstruction include laryngeal edema, iatrogenic vocal cord paralysis, laryngospasm, and obstruction from the tongue or other soft tissues.

EXACERBATION OF OBSTRUCTIVE SLEEP APNEA

Obstructive sleep apnea (OSA) is a common disorder characterized by apneas and hypopneas due to repetitive complete or partial collapse of the upper airway during sleep. The repetitive upper airway collapse may lead to frequent awakenings and/or episodic oxyhemoglobin desaturation.

OSA can be exacerbated during the postoperative period, which manifests as more frequent, more severe, or more prolonged episodes of oxyhemoglobin desaturation during sleep. This is often accompanied by new or worse hypercapnia.

The frequency of oxyhemoglobin desaturation was demonstrated by a series of 438 patients with known or suspected OSA who underwent surgery.[56]

PLEURAL EFFUSION

Small pleural effusions are common during the immediate postoperative period following abdominal surgery. This was demonstrated by a series of 200 abdominal surgery patients who had posteroanterior, left lateral, and bilateral decubitus radiographs performed 48 to 72 hours after surgery.[57] Pleural effusions were found in 97 patients (49 percent). Among the pleural effusions, 52 percent were <4 mm, 27 percent were 4 to 10 mm, and 21 percent were >10 mm (on the decubitus radiographs). Most effusions were exudates.

CHEMICAL PNEUMONITIS

Surgical patients are at risk for chemical pneumonitis resulting from the aspiration of acidic gastric contents during the perioperative period. The clinical features of chemical pneumonitis include the abrupt onset of dyspnea and tachycardia. Patients may also exhibit fever, bronchospasm, hypoxemia, cyanosis, and/or pink frothy sputum. Infiltrates may appear in one or both lower lobes, usually within the first 24 hours.

PULMONARY EDEMA

Postoperative pulmonary edema can be cardiogenic, non-cardiogenic, or a combination of both.

An important cause of postoperative non-cardiogenic edema is negative pressure pulmonary edema, which can result from laryngospasm or other forms of upper airway obstruction following extubation. Patients usually present with signs of

acute upper airway obstruction following extubation and, upon relief of the obstruction, immediately develop dyspnea with pink frothy sputum and bilateral infiltrates on their chest radiograph.

The etiology of negative pressure pulmonary edema is multifactorial, but appears to be related to the generation of markedly negative intrathoracic pressure due to forced inspiration against a closed glottis, referred to as a Mueller (or reverse Valsalva) maneuver. As the intrathoracic pressure becomes more negative, blood flow to the right heart increases. This causes the pulmonary vascular bed to dilate, the interstitial pressure around the capillaries to become more negative, and intravascular fluid to be drawn into the interstitial space. This worsens gas exchange and triggers a cascade of hypoxemia, catecholamine release, and systemic and pulmonary hypertension. The result is an acute increase in afterload, which worsens transcapillary fluid efflux and increases interstitial and alveolar edema.[58]

Treatment of negative pressure pulmonary edema is supportive. All patients receive supplemental oxygen and some may benefit from diuresis if they are hypervolemic. Bronchodilators and/or non-invasive continuous positive airway pressure (CPAP) may be helpful, although some patients will require reintubation. Most cases resolve spontaneously in a relatively short period of time with no long-term sequelae.

PULMONARY EMBOLISM

Acute pulmonary embolism is a well-known postoperative pulmonary complication.

ABDOMINAL COMPARTMENT SYNDROME

Progressive hypoxemia may be the initial manifestation of abdominal compartment syndrome (ACS). ACS refers to symptomatic organ dysfunction resulting from an increase in the intraabdominal pressure. It is most common in trauma patients who require massive fluid resuscitation following injury or emergent abdominal surgery.

TRACHEAL LACERATION OR RUPTURE

Laceration or rupture of the upper airway is an unusual but well-described complication of endotracheal intubation. Clinical and radiographic signs of the injuries include respiratory compromise, subcutaneous emphysema, pneumomediastinum, and unilateral or bilateral pneumothorax.

Surgical management is generally required and may involve sternotomy, thoracotomy, or cervicotomy. Conservative management may be considered in clinically stable patients with small (<2 cm) tears, minimal air leaks, or prohibitively high operative mortality.

SIMILAR STUDIES:

Peter R. Smith et al[12] conducted a study on postoperative pulmonary complications after laparotomy to elucidate the incidence of PPCs after laparotomy and clarify risks for their development. They conducted a retrospective study of all laparotomies in adult patients on the general surgery service at their university-affiliated hospital in 2004. They observed that twenty-five PPCs (7.0%) occurred in 359 laparotomies.

Serejo et al[26] conducted a study named “Risk factors for pulmonary complications after emergency abdominal surgery”. The aim of this study was to determine the

incidence and predictors of pulmonary complications following emergency abdominal surgery

Two hundred and sixty-six consecutive adult patients were included in the study and seventy five (28.2%) developed PPC.

Juhi Bisen et al in their study observed the predictors of post-operative pulmonary complications following emergency laparotomy. This was a prospective observational study conducted in 270 patients who got admitted through SOPD, casualty or transferred from other department, and undergoing emergency laparotomy over a period of 1 year (June 1, 2018–May 31, 2019). Two hundred seventy patients were included in the present study and 55 (20.4%) developed PPCs. Pneumonia (20) was the most common PPC followed by atelectasis (15).

Sohail Hameed Chaudhary et al[59] conducted a study on postoperative complications in emergency laparotomies at Bahawal Victoria Hospital, Bahawalpur where three hundred and twenty patients undergoing laparotomy were included in this study. Post-operative complications were seen in 287(89.7%) patients out of 320 patients.

Chauhan S et al[60] conducted a study named "A comparative study of postoperative complications in emergency versus elective laparotomy at a tertiary care centre". This comparative study was carried out at Department of General Surgery in Bundelkhand Medical College, Sagar, Madhya Pradesh during period of January 2015 to February 2016. All the patients who underwent laparotomy (elective or emergency) were included in the study. A total of 350 patients underwent emergency laparotomy and 50 patients underwent elective laparotomy out of which 128 (36.57%) patients developed complications following emergency laparotomy while 11 (22%) patients developed complication after elective laparotomy.

Chinyelu Uchenna Ufoaroh et al[61] in their study titled "Pre-operative pulmonary assessment and risk factors for post-operative pulmonary complications in elective abdominal surgery in Nigeria" studied the pre-operative risk factors for PPCs in abdominal surgery. They observed that the overall, the prevalence of PPCs was 52%.

L. T. Tengberg et al[62] observed the complications after emergency laparotomy beyond the immediate postoperative period in a retrospective, observational cohort study among 1139 patients after emergency laparotomy. A major complication occurred in 537/1139 (47%) of all patients within 30 days of surgery. Unadjusted 30-day mortality was 20.2% and 1-year mortality was 34%. One hundred and thirty-seven of 230 (60%) deaths occurred between 72 h and 30 days after surgery, all of them had complications, indicating that there is a prolonged period with a high frequency of complications and mortality after emergency laparotomy.

Mohit Gangwal et al studied the Incidence of post-operative pulmonary complications following emergency laparotomy in tertiary care centre in Vindhya region of Madhya Pradesh, India. Incidence of post-operative pulmonary complications in the study was 30.2%.

M. J. Greenall et al[28] conducted a randomised controlled clinical trial on the influence of midline or transverse laparotomy on post-operative pulmonary complications. The incidence of all chest complications (score 4 or more) in their study was 29.4 per cent after midline and 33.9 percent after transverse laparotomy and that of serious complications (score 7 or more) was 9.1 per cent and 7.7 per cent respectively.

In a study done by **K.J. Haines** et al,[29] the incidence of postoperative pulmonary complications was 39%. Incision type and time to mobilise away from the bed were independently associated with a diagnosis of postoperative pulmonary complications.

K. Westwood et al[23] in a non-randomised pilot study of 263 patients , found that the addition of the incentive spirometer, as part of an intensive post-operative physiotherapy programme, decreased the occurrence of pulmonary complications (6 vs 17%, p=0.01) and length of stay on the surgical high dependency unit (3.1 vs 4 days p=0.03).

MATERIAL AND METHODS

1.1. **Study setting:**

This study was conducted in the department of General Surgery at KLES Dr Prabhakar Kore hospital and medical Research center, Belagavi

1.2. **Study Population:**

Patients undergoing emergency laparotomy for acute abdomen condition at KLES Dr Prabhakar Kore hospital and MRC, Belagavi

1.3. **Study design:**

A one year observational study

1.4. **Study sample:**

Patients presenting in emergency department and admitted under department of general surgery and operated for acute abdomen (Emergency Laparotomy)

1.5. **Sample Size estimation:**

30

1.6. **Sampling technique:**

Universal sampling technique was used to select study participants

1.7. **Study Period:**

One year from January 2020 to December 2020

1.8. **Inclusion Criteria:**

- Patients undergoing surgery under general anaesthesia
- Patients giving valid consent
- Patients undergoing emergency laparotomy for acute abdominal condition
- Patients aged between 18 and 75 years

1.9. **Exclusion Criteria:**

- Patients undergoing surgery under anesthesia other than general anesthesia
- Known cases of respiratory illness

1.10. **Statistical analysis:**

Data entry was done using MS Excel and data analysis was done using SPSS version 23.0. Descriptive statistics were interpreted in frequency and percentage.

1.11. **Ethical Considerations:**

Institute ethical committee clearance certification was sought and obtained before the study was begun. Informed written consent was obtained from all patients before including them in the study.

RESULTS

Table no 1. Distribution of study participants based on age (n=30)

Age (in years)	**Frequency**	**Percentage**
< 20	2	6.7
21 -30	5	16.7
31- 40	6	20.0
41- 50	5	16.7
51 – 60	6	20.0
> 60	6	20.0
Total	30	100.0

Maximum of the study participants were in the age group of 31-40 years, 51 – 60 years and above 60 years (20 %). The mean age of the study participants was observed to be 44.7 ± 16.4 years.

Figure 1. Distribution of study participants based on age (n=30)

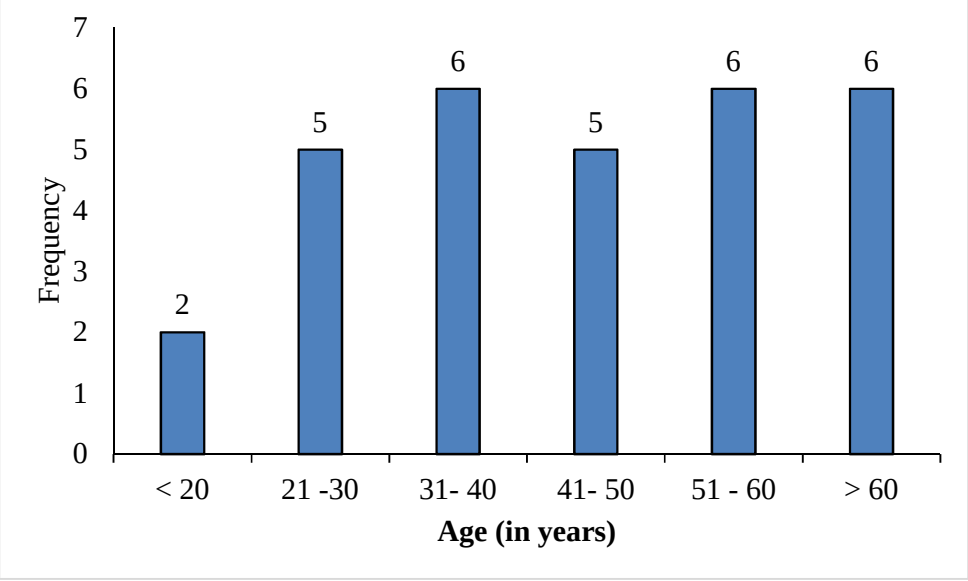


Table no 2.Distribution of study participants based on gender (n=30)		
Gender	**Frequency**	**Percentage**
Male	24	80
Female	06	20
Total	30	100.0

Maximum of the study participants were males (80 %), while 20 % of them were females.

Figure 2. Distribution of study participants based on gender (n=30)

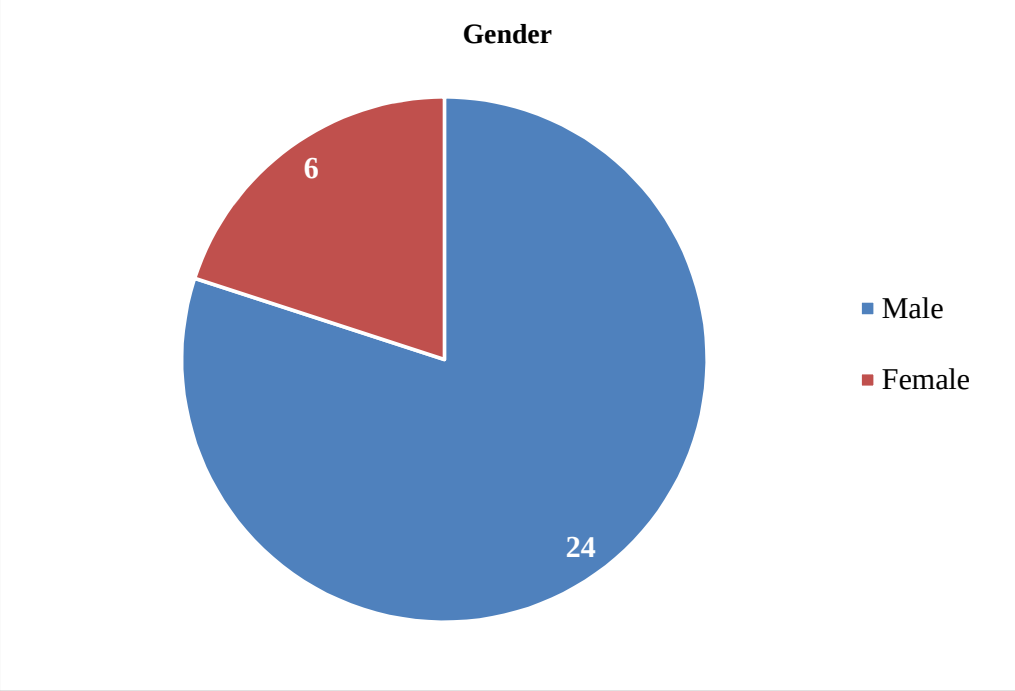


Table no 3.Distribution of study participants based on the duration of hospital stay (n=30)

Duration of hospital stay	**Frequency**	**Percentage**
< 7 days	5	16.7
> 7 days	25	83.3
Total	30	100.0

Maximum of the study participants stayed in the hospital for more than 7 days (83.3 %). The mean duration of hospital stay among the study participants was 10.2 ± 2.6 days.

Figure 3. Distribution of study participants based on the duration of hospital stay (n=30)

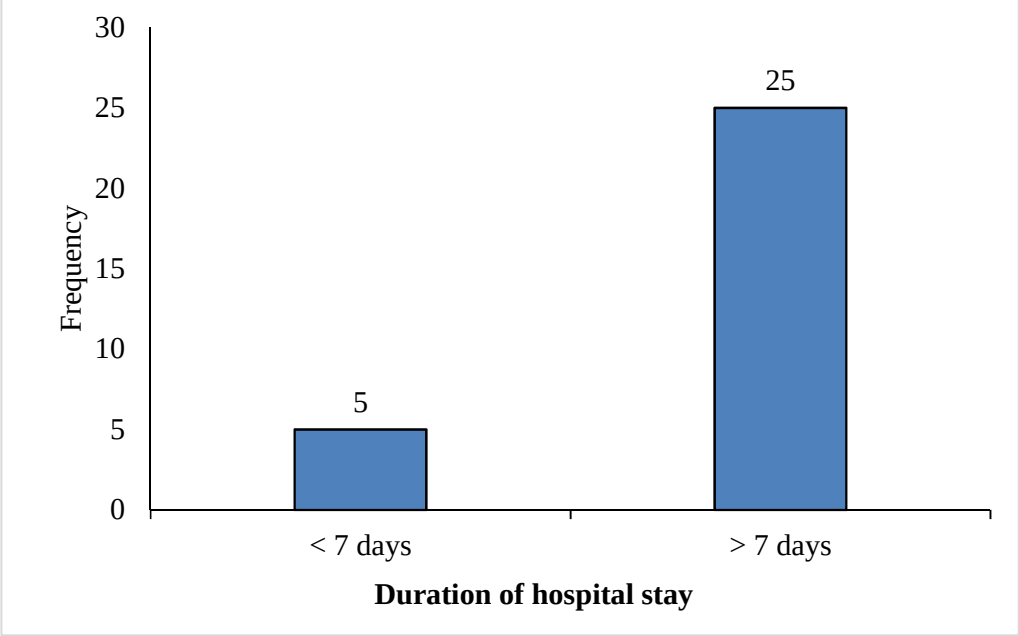


Table no 4.Distribution of study participants based on the diagnosis (n=30)		
Diagnosis	**Frequency**	**Percentage**
Peritonitis secondary to perforation	17	56.7
Intestinal obstruction	10	33.3
Blunt abdomen	3	10.0
Total	30	100.0

Majority of the study participants were diagnosed with peritonitis secondary to perforation (56.7 %) followed by intestinal obstruction (33.3 %) and blunt abdomen (10 %).

Figure 4. Distribution of study participants based on the diagnosis (n=30)

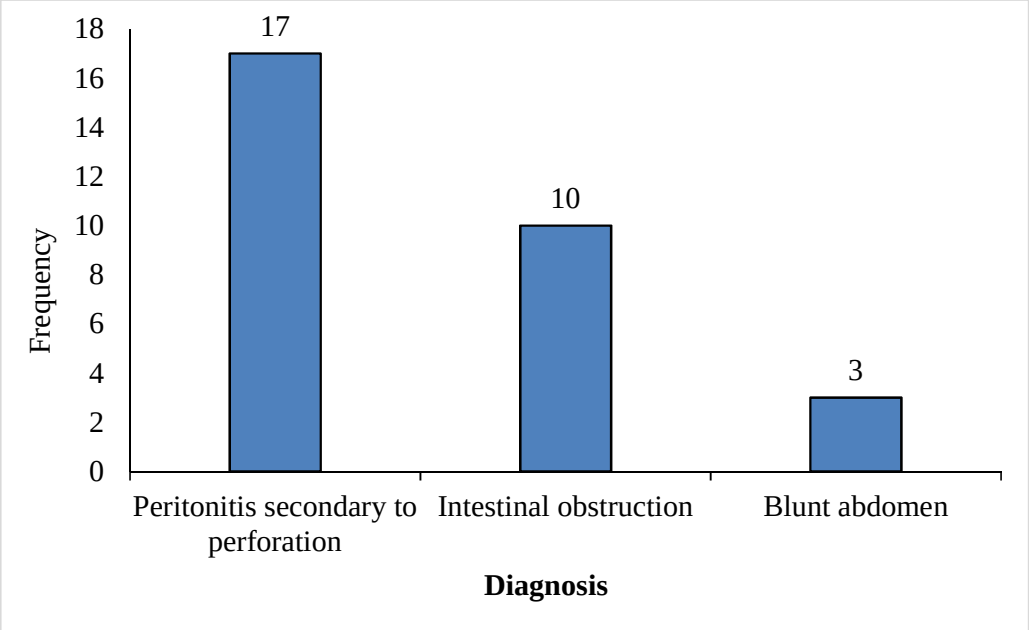


Table no 5. Distribution of study participants based on the duration of surgery (n=30)

Duration of surgery (in hours)	Frequency	Percentage
2	7	23.3
2.5	1	3.3
3	22	73.3
Total	30	100.0

Maximum of the surgeries had a duration of more than 3 hours (73.3 %) followed by 2 hours (23.3 %) and 2.5 hours (3.3 %)

Figure 5. Distribution of study participants based on the duration of surgery (n=30)

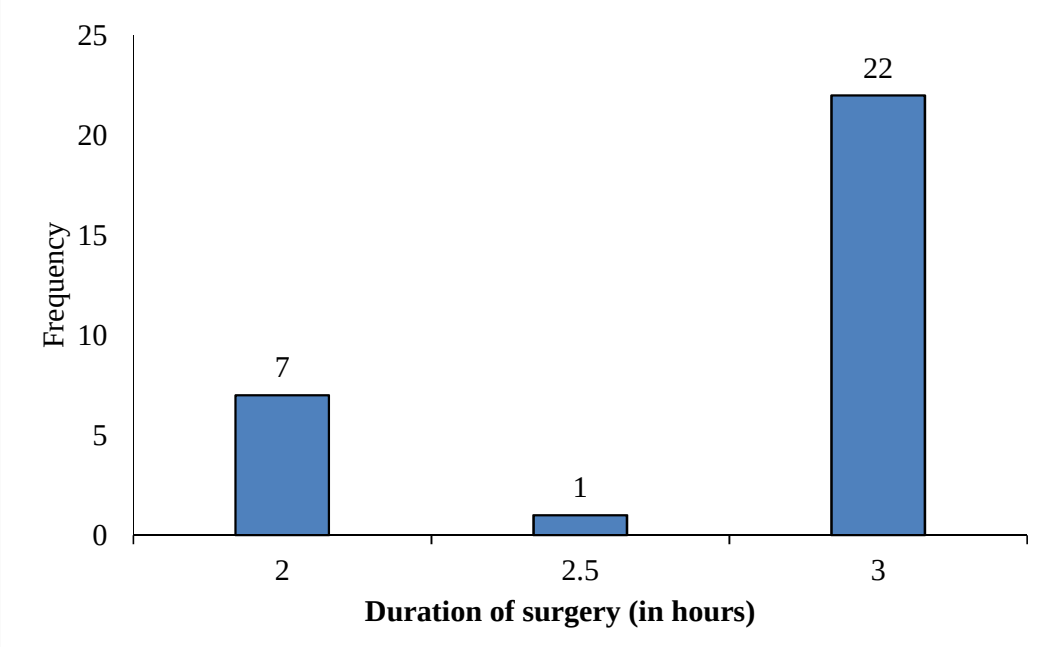


Table no 6.Distribution of study participants based on history of diabetes mellitus (n=30)

Diabetes Mellitus	**Frequency**	**Percentage**
Yes	7	23.3
No	23	76.7
Total	30	100.0

Among the study participants 23.3 % of them had history of diabetes mellitus.

Figure 6. Distribution of study participants based on history of diabetes mellitus (n=30)

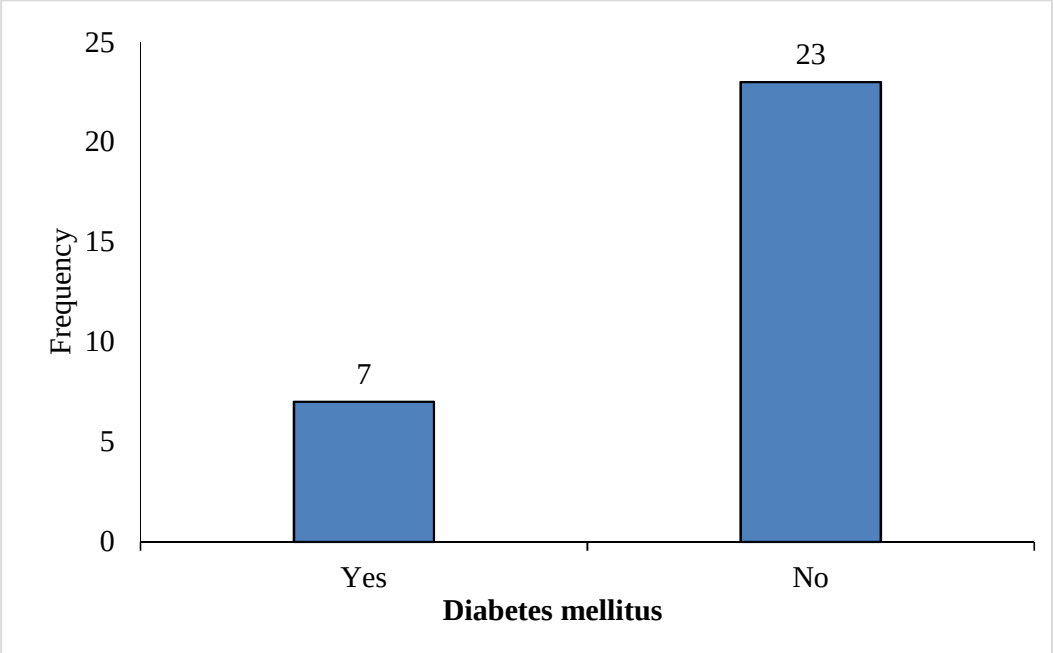


Table no 7.Distribution of study participants based on history of Hypertension (n=30)

Hypertension	**Frequency**	**Percentage**
Yes	7	23.3
No	23	76.7
Total	30	100.0

Among the study participants 23.3 % of them had history of hypertension.

Figure 7. Distribution of study participants based on history of hypertension (n=30)

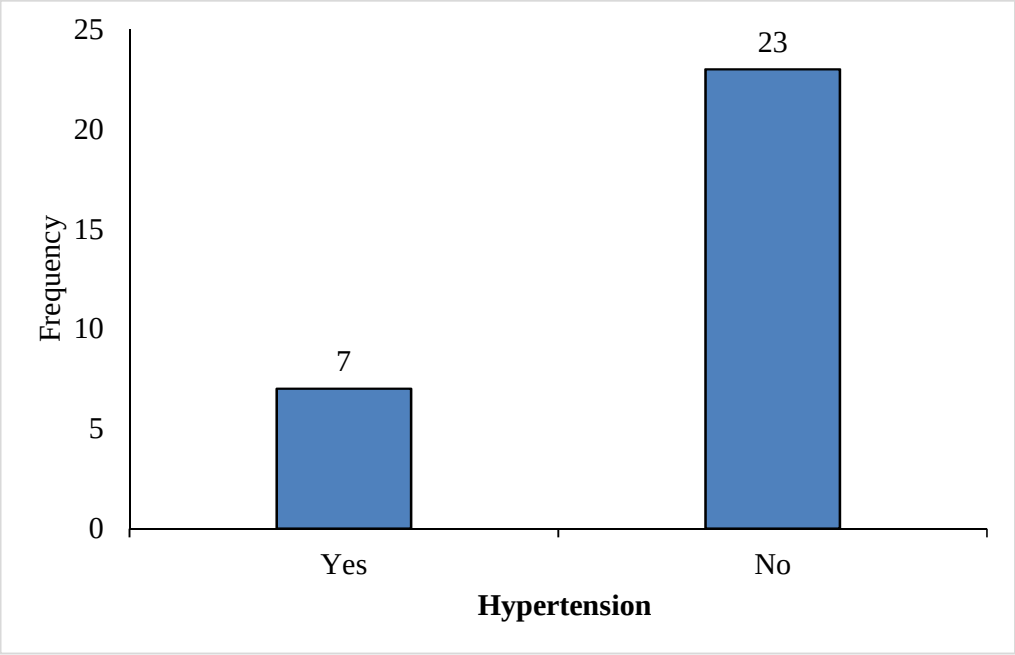


Table no 8.Distribution of study participants based on post-op respiratory infection (n=30)

Respiratory infection	**Frequency**	**Percentage**
Yes	4	13.3
No	26	86.7
Total	30	100.0

Among the study participants 13.3 % of them had post-op respiratory infection while the rest 86.7 % did not had post-op respiratory infection.

Figure 8. Distribution of study participants based on post-op respiratory infection (n=30)

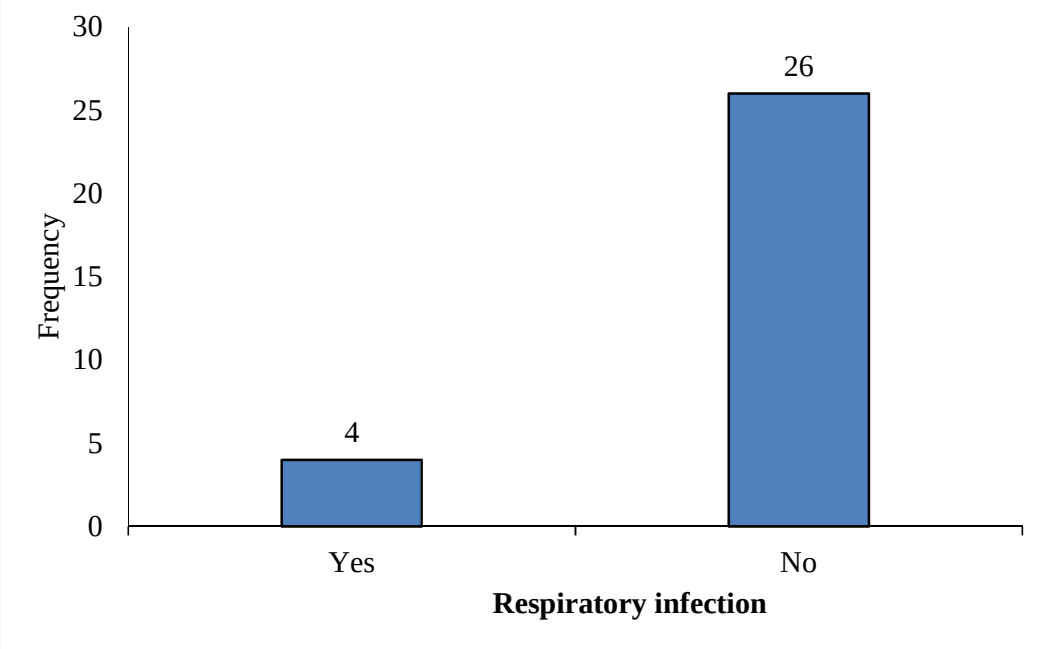


Table no 9.Distribution of study participants based on post-op respiratory failure (n=30)

Respiratory failure	**Frequency**	**Percentage**
Yes	0	0.0
No	30	100.0
Total	30	100.0

In our study, none of the study participants developed respiratory failure during the post-op period.

Figure 9. Distribution of study participants based on post-op respiratory failure (n=30)

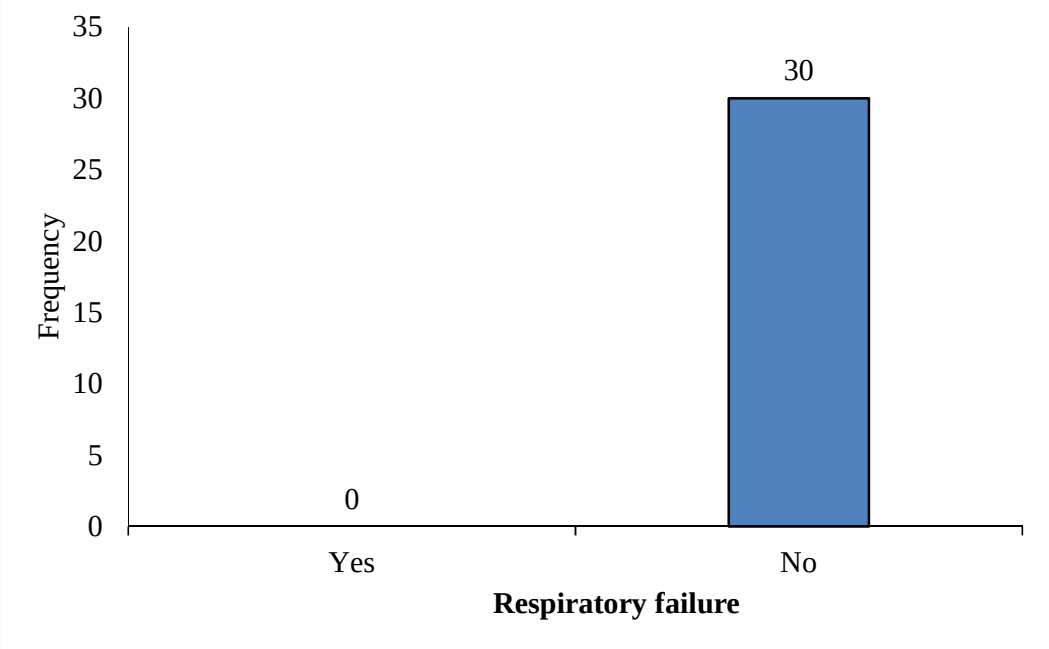


Table no 10.Distribution of study participants based on post-op pleural effusion (n=30)

Plural effusion	**Frequency**	**Percentage**
Yes	16	53.3
No	14	46.7
Total	30	100.0

In our study, more than half of the participants developed pleural effusion in the post-op period (53.3%).

Figure 10. Distribution of study participants based on post-op pleural effusion (n=30)

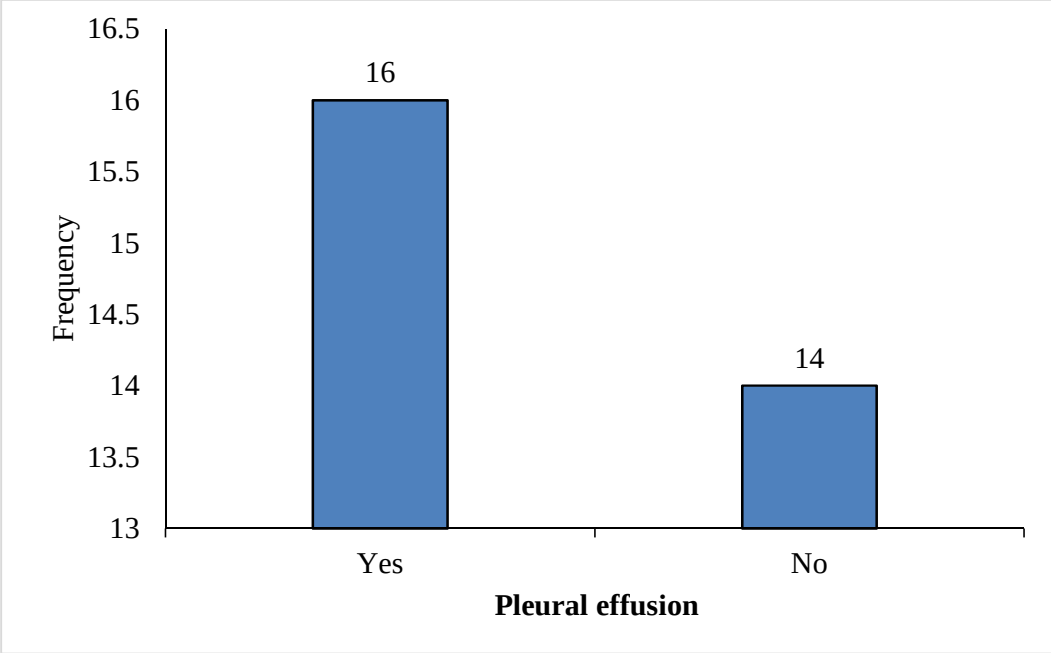


Table no 11.Distribution of study participants based on post-op atelectasis (n=30)

Atelectasis	**Frequency**	**Percentage**
Yes	11	36.7
No	19	63.3
Total	30	100.0

In our study, 36 % of the participants developed atelectasis in the post-op period.

Figure 11. Distribution of study participants based on post-op atelectasis (n=30)

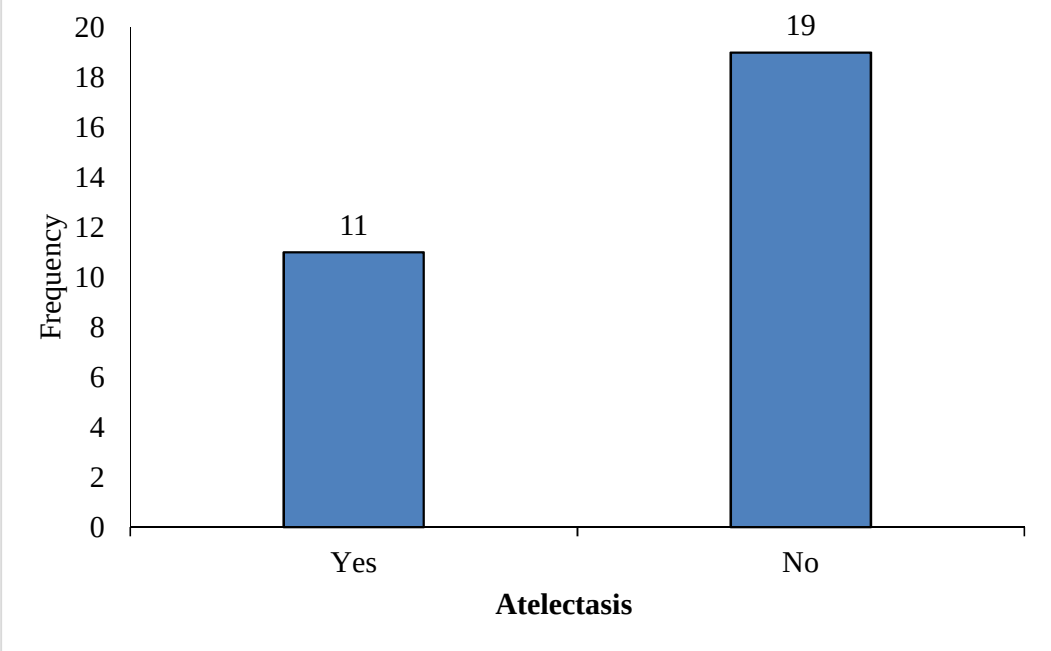


Table no 12.Distribution of study participants based on post-op pneumonia (n=30)

Pneumonia	**Frequency**	**Percentage**
Yes	5	16.7
No	25	83.3
Total	30	100.0

Around 17 % of the study participants developed pneumonia during the post-op period.

Figure 12. Distribution of study participants based on post-op pneumonia (n=30)

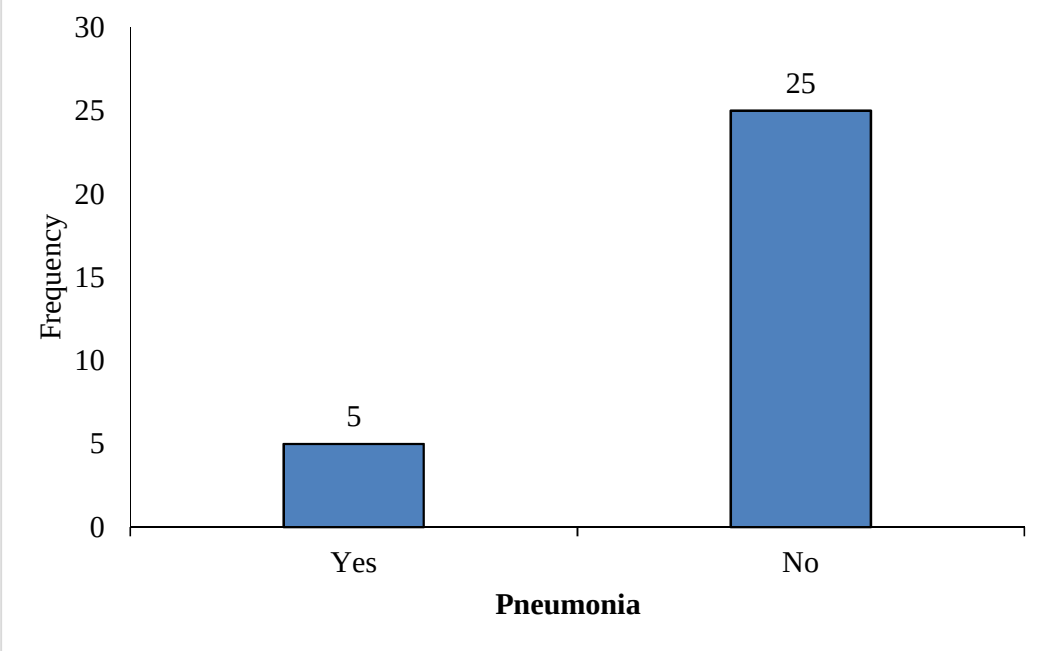


Table no 13.Distribution of study participants based on post-op aspiration pneumonitis (n=30)

Aspiration pneumonitis	**Frequency**	**Percentage**
Yes	1	3.3
No	29	96.7
Total	30	100.0

Among the study participants only one patient developed aspiration pneumonitis in the post-op period.

Figure 13. Distribution of study participants based on post-op aspiration pneumonitis (n=30)

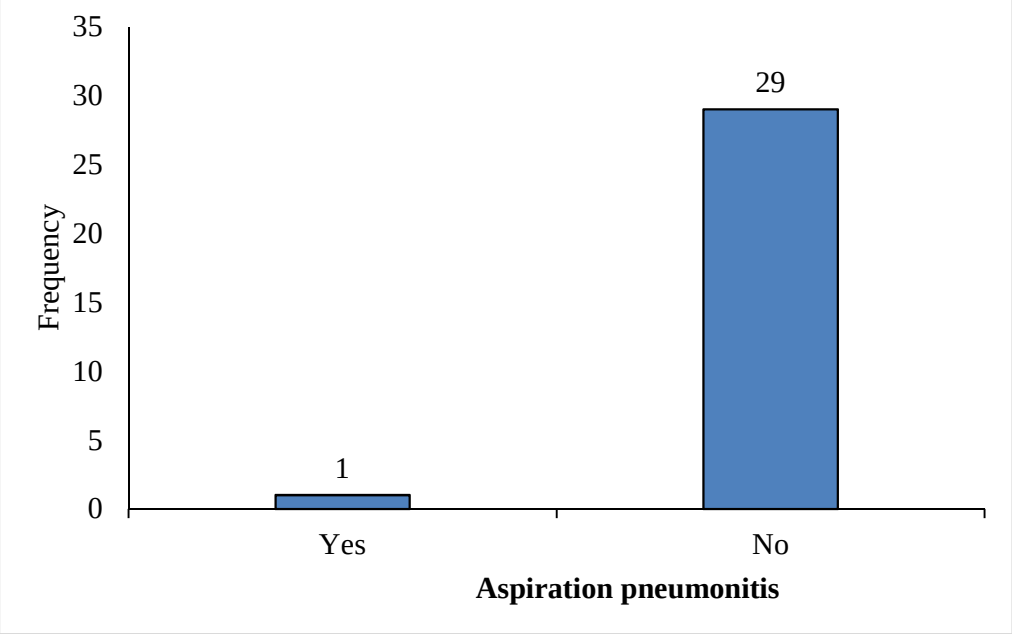


Table no 14.Distribution of study participants based on post-op tracheo-bronchitis (n=30)

Tracheo-bronchitis	**Frequency**	**Percentage**
Yes	0	0.0
No	30	100.0
Total	30	100.0

In our study, none of the study participants developed tracheo-bronchitis in the post- op period.

Figure 14. Distribution of study participants based on post- op tracheo-bronchitis (n=30)

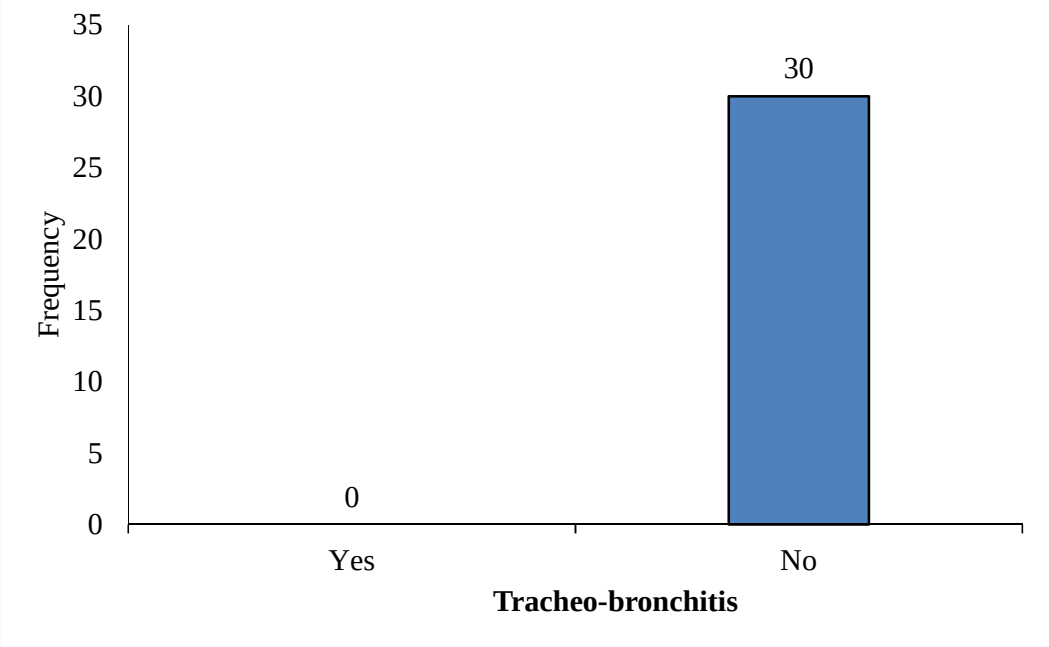
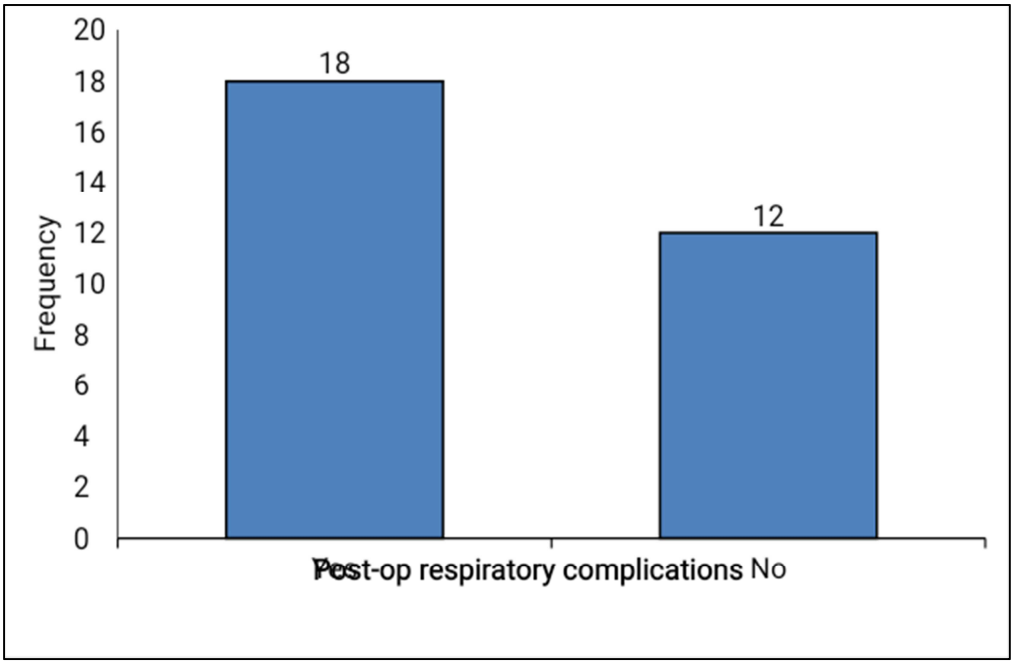


Table no 15.Distribution of study participants based on incidence of post op respiratory complications (n=30)

Infection	**Frequency**	**Percentage**
Yes	18	60.0
No	12	40.0
Total	30	100.0

In our study, the overall incidence of any post- op respiratory complications is 60 %

Figure 15. Distribution of study participants based on post- op respiratory complications (n=30)



DISCUSSION

Pulmonary complications following abdominal surgery include pneumonia, atelectasis and respiratory failure, and may also result in prolonged hospital stay and increased mortality rate among the patients undergoing emergency laparotomy.

Age:

In the present study, the maximum of the study participants was in the age group of 31-40 years, 51 – 60 years and above 60 years (20 %). The mean age of the study participants was observed to be 44.7 ± 16.4 years.

In a study done by **AR Bansal et al[63]** also showed similar age distribution ranging between 15–80 years. Similar observations were made by **Chauhan S et al[3], Sohail Hameed Chaudhary et al.[59]**

In their study, **Chinyelu Uchenna Ufoaroh et al[61]** observed no significant association was observed between age and PPCs, similar to that by **Kanat.et al[64]**, but differing from the studies by **Brooks-Brunn et al[65]**, **Pereira et al[66]**and **Nertila et al[67]** where age >50 years, were predictors of risks.

In a study done by **Serejo et al [15]** also concluded that there is importance of age as a risk factor and there is a tendency for advanced age to be associated with higher incidence of PPC.

Gender:

Maximum of the study participants were males (80 %), while 20 % of them were females. Similar male predominance is seen in studies done by **AR Bansal et al**

and **Chauhan S et al.** In contrast a study done by **Sohail Hameed Chaudhary et al** shows equal gender distribution and **Chinyelu Uchenna Ufoaroh et al** observed female sex predominance (62%) in their study.

Some authors believe male sex is associated with higher incidence of PPCs because of higher incidence of smoking among males. In a study by **Juhi Bisen et al**[68] shows that the incidence of respiratory complication among smokers is 30.98%, while 16.58% among non-smokers. There is also a positive correlation ($P < 0.01$) between smokers and respiratory complication following emergency laparotomy.

Diagnosis:

In the present study majority of the study participants were diagnosed with peritonitis secondary to perforation (56.7 %) followed by intestinal obstruction (33.3 %) and blunt abdomen (10 %).

In a study done by **Sohail Hameed Chaudhary et al** also the majority (61.9%) of cases were of acute abdomen/acute peritonitis, while others were acute intestinal obstruction (26.25%), abdominal trauma (11.85%). Acute perforated appendicitis (23.7%) was the leading causes of acute abdomen followed by ruptured ectopic pregnancy (17.6%) and perforated duodenal ulcer (17.1%).

Chauhan S et al also observed that the majority of cases were of acute abdomen/peritonitis. Other causes included peptic perforation peritonitis constituted (31.42%) cases followed by typhoid perforation peritonitis (24.28%), intestinal obstruction (21.7%), blunt and penetrating trauma abdomen (7.98%), appendicular perforation 17 (4.85%).

AR Bansal et al also had similar observations**.** The majority of cases were of perforation peritonitis (45%), while others were acute intestinal obstruction 25 (25%), Abdominal Trauma 19(19%). Perforated duodenal ulcer 27(27%) was the leading causes of acute abdomen followed by small intestine (16%) and burst appendix (5%).

Similar to the study **Gupta et al**,[69] **Jhoota et al**,[70] **Graham et al,**[63] stating that peptic perforation is most common among all cases of perforation peritonitis.

Chinyelu Uchenna Ufoaroh et al concluded that there is no significant association between PPCs and the indications for surgery.

Duration of Hospital stay:

Maximum of the study participants in our study stayed in the hospital for more than 7 days (83.3 %). The mean duration of hospital stay among the study participants was 10.2 ± 2.6 days.

L. T. Tengberg et al[62] in their study found that the majority (64%) of complications take place within 30 days of emergency laparotomy. They also found that the majority (60%) of patients who die within 30 days of surgery survive the first 72 postoperative hours. These findings suggest that there may be a considerably longer postoperative critical period after emergency laparotomy than the first 72-h period.

Duration of the surgery:

Maximum of the surgeries had a duration of more than 3 hours (73.3 %) followed by 2 hours (23.3 %) and 2.5 hours (3.3 %) in our study.

Juhi Bisen et al conducted a study where out of 270 patients who underwent emergency laparotomy, 55 patients were operated for more than 3 h; 32 (36.78%)

patients developed PPCs (P < 0.001). While of 160 patients who underwent surgery for less than 3 hours, 23(14%) developed PPC. **Brooks-Brunn et al** reported that duration of surgery >4 hours was a significant risk factor (P = 0.0062) for PPCs. **Kelkar et al**[71] found that incidence of respiratory complications was decreased in patients, operated for less than 3 hours. Similarly, **Verma et al**[72] reported that surgeries lasting >3 hours, chances of PPCs increased.

Co- morbid and post-op complications:

In the present study among the study participants 23.3 % of them had history of diabetes mellitus, 23.3 % of them had history of hypertension. 13.3 % of them had post-op respiratory infection while the rest 86.7 % did not had post-op respiratory infection.

The incidence of post-operative pulmonary complication in the present study is 60% (18 out of 30 cases) which is similar to, 5 to 60% as reported by **L.G.G. Serejo et al** and **Deodhar**. whereas it was 52 % in a study by **Chinyelu Uchenna Ufoaroh et al** and 20.4 % in a study done by **Juhi Bisen et al** and A review of **Smetana et al**[29] included 400 patients and reported a PPC frequency of 22.5%, In contrast to this high incidence of PPCs the study done by **Chauhan S et al** documented that 9.7% patients developed pulmonary complications following emergency laparotomy while 6% patients suffered from pulmonary complication after elective laparotomy. Similar results are seen by **Peter R. Smith et al**[12] who found a 7.0% incidence of PPCs after emergency laparotomy. In our study, none of the study participants developed respiratory failure during the post-op period.

In the present study, more than half of the participants developed pleural effusion in the post-op period (53.3%), while **Chinyelu Uchenna Ufoaroh et al,** found it to be 2 % in his study and **Juhi Bisen et al** found pleural effusion of 18.2% among the study participants. In the current study we found 36 % of the participants developed atelectasis while it was 27.3 % in the study done by **Juhi Bisen et al.**

Around 17 % of the study participants developed pneumonia during the post-op period in our study; similar findings were found by **Chinyelu Uchenna Ufoaroh et al,** where it was 16%, whereas it was higher in a study done by **Juhi Bisen et al** showed Pneumonia is most common PPCs in their study which was 36.4%. A national study by **Soomro AG et al**[73] reported post-operative Pneumonia as 4.2% this value is comparable with the above values. Another study of **Smith PR et al** reported post-operative pneumonia in 1.67% patients. **Sohail Hameed Chaudhary et al**, states that in their study patients were found to have post-operative pneumonia in 3.1% of the cases.

In our study, none of the study participants developed trachea bronchitis in the post- op period while **Juhi Bisen et al** showed trachea bronchitis of 5.4% in his study.

Treatment of respiratory disease following emergency laparotomy requires the involvement of chest physician, intensivist, chest physiotherapists and nursing staff hence early multidisciplinary team approach will help in reducing the mortality and morbidity.

CONCLUSION

Post-operative pulmonary complications increase morbidity after surgery. Pre-operative assessment aids in identifying patients at risk of developing post-operative pulmonary complications.

In elective cases we have ample amount of time to assess the patient condition and evaluate comorbidities which subsequently reduces the pulmonary complication incidence, but in emergency cases there is no much time to assess the patient condition, hence increased chances of complication.

Treatment of respiratory diseases following emergency laparotomy requires the involvement of chest physician, intensivist, chest physiotherapist and nursing staff, hence early multidisciplinary team approach will help in reducing the mortality and morbidity because of respiratory complications in post-operative laparotomy cases.

Further studies with larger sample size are required to know the exact incidence of post-operative pulmonary complications in emergency laparotomy cases

RECOMMENDATIONS

From the findings of this study, the following recommendations are made;

- The need for proper pulmonary assessment of all patients booked for abdominal surgery by the pulmonologist.

- Aggressive management of patients with known risk factors for post-operative pulmonary complications so as to reduce or eliminate the incidence of post-operative pulmonary complications.

- Further studies involving more hospitals and larger sample size in this part of the world is recommended.

- All patients booked for surgery requiring general anaesthesia should routinely do basic lung function studies, so as to detect at risk patients.

SUMMARY

- In our study, maximum of the study participants were in the age group of 31-40 years, 51 – 60 years and above 60 years (20 %). The mean age of the study participants was observed to be 44.7 ± 16.4 years and maximum of the study participants were males (80 %), while 20 % of them were females.
- Maximum of the study participants stayed in the hospital for more than 7 days (83.3 %). The mean duration of hospital stay among the study participants was 10.2 ± 2.6 days.
- Majority of the study participants were diagnosed with peritonitis secondary to perforation (56.7 %) followed by intestinal obstruction (33.3 %) and blunt abdomen (10 %).
- Maximum of the surgeries had a duration of more than 3 hours (73.3 %) followed by 2 hours (23.3 %) and 2.5 hours (3.3 %)
- Among the study participants 23.3 % of them had history of diabetes mellitus and hypertension.
- The incidence of PPC in the study is 60 % (18 out of 30 cases)
- Among the study participants 13.3 % of them had respiratory infection and none of the study participants developed respiratory failure during the post-op period.
- In our study, more than half of the participants developed plural effusion (53.3%), 36 % of the participants developed atelectasis and 17 % of the study participants developed pneumonia during the post- op period.
- Among the study participants only one patient developed aspiration pneumonitis in the post-op period

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ANNEXURE I– ETHICAL CLEARANCE LETTER

K.L.E. ACADEMY OF HIGHER EDUCATION AND RESEARCH
(Deemed – to- be- University)
Accredited 'A' Grade by NAAC (2nd Cycle) Placed in Category 'A' by MHRD (GoI)
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NEHRU NAGAR, BELAGAVI-590010 (KARNATAKA-INDIA)
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Fax No. +91 (0)831 – 2470759

Ref: MDC/DOME/ 251 **Date: 24/12/2019**

To,
(REG.NO. BH0119002)
PG student in Surgery,
J.N.Medical College,
BELAGAVI.

Sub: Institutional Ethical Clearance for the study.

With reference to the above, we wish to inform you that your proposed research project titled **"POST- OPERATIVE PULMONARY COMPLICATIONS IN EMERGENCY LAPAROTOMY FOR ACUTE ABDOMINAL CONDITION – A ONE YEAR OBSERVATIONAL STUDY ",** is ethical and justifiable. The proposed research project has been cleared by the JNMC Institutional Ethics Committee on Human Subjects Research.

(Dr. Anita Dalal)
Member Secretary
JNMC Institutional Ethics Committee
on Human Subjects Research,
J.N.Medical College, Belagavi.

(Dr. Roopa M Bellad)
Chairman,
JNMC Institutional Ethics Committee
on Human Subjects Research,
J.N.Medical College, Belagavi.

ANNEXURE II – CONSENT FORM

CONSENT FOR PARTICIPATION IN RESEARCH STUDY

Mr/Mrs/Miss. _____ we are requesting you to enroll yourself in study titled "**POST- OPERATIVE PULMONARY COMPLICATIONS IN EMERGENCY LAPAROTOMY FOR ACUTE ABDOMINAL CONDITION'' – A ONE YEAR OBSERVATIONAL STUDY** conducted by _____ , Post Graduate in M.S. General Surgery under the guidance of _____, Professor and Unit Chief General Surgery Dept _____ Professor, Departmentof General Anaesthesiology, J.N. Medical College, Belagavi-10 under KLE university, Belagavi.

Respected Sir/Madam,

We request you to participate in our study as you are eligible for participating in the study. Your participation in the research is absolutely voluntary. Your decision to participate in the study or otherwise will not affect the relationship with KLE hospital. If you decide not to participate, you are free to withdraw at any time. During the study your operative outcome will be accessed by some questions which will be answered by your operating surgeon.

Risks and Benefits:

There is no increased risk involved in becoming a part of this study and the complications are those which are normally anticipated. The results derived at the end of study will benefit all similar patients admitted in this hospital.

Withdrawing/removal from the study

The participant has freedom to withdraw from the study whenever he/she wishes and with any prior notice. Even if you decline to participate, there will not be any change in the line of your management or the relationship with your doctor. You will be told about all the new information that affects your decision to participate in the study. The investigator may also exclude a participant from the study at anytime.

Privacy and Confidentiality:

The only people to know that you are a research subject are members of the research team. No information about you or information provided by you during the research will be disclosed to other without your written permission except:

1. In emergency to protect your rights and welfare.
2. If required by law.

Institutional/sponsors policy:

If any unforeseen complications or injury occurs during the period of study the participant will be given treatment within the limitations of KLES Prabhakar Kore hospital general ward.

Financial Incentives for participation:

The participant neither gets any financial incentives during the period of study nor will be asked to pay for the purpose of this study.

Authorization to Publish Results:

When the results of the research are published or discussed, in a conference, no information will be displayed that would disclose your identity. Any information that is obtained in connection with this study and that can be identified with your identity remaining confidential.

In case of the queries during study or in future you may contact following persons,

1. **Dr ROOPA BELLAD$_{MD}$** Professor Department Of Paediatrics, Jawaharlal Nehru Medical College, Belagavi-590010, 9448113403

CONSENT FORM

- Study title: **"POST- OPERATIVE PULMONARY COMPLICATIONS IN EMERGENCY LAPAROTOMY FOR ACUTE ABDOMINAL CONDITION'' – A ONE YEAR OBSERVATIONAL STUDY**

I confirm that I have read and understood the information sheet for the above study and have had the opportunity to ask questions.

i. I understood that my participation in the study is voluntary and that I am free to withdraw at anytime, without giving any reason, without my medical care or legal rights being affected.

ii. I understood that doctor of the clinical trial, others working on the doctor's, the Ethics Committee and the regulatory authorities will not need my permission to look at my health records both in respect of the current study and any further research that may be conducted in relation to it, even if I withdraw from the trial. I agree to this access. However, I understood that my identity will not be revealed in any information released to third parties or published.

iii. I agree not to restrict the use of any data or results that arise from this study provided such a use is only for scientific purpose(s).

iv. I agree to take part in the above study.

Subject name: _____

Signature (or thumb impression) of the subject: _____

Date (dd-mm-yyyy): ☐☐ -☐☐ ☐☐☐☐

Name of the person obtaining informed consent: _____

Signature of the person obtaining informed consent: _____

If a patient has limited ability to read and write, In these instances the patient his/her thumb impression in the place of the signature.

Patient's Legally Acceptable Representative's Statement:

I, as the patient's legally acceptable representative, was present during the consenting procedure and understand the preceding information describing this study. All of the questions regarding the study and the patient's participation in it have been answered to my satisfaction and that of the patient. I state that all aspects of the study were clearly presented during the consent procedure. The patient is willing to participate in the study and I sign below on his/her behalf testifying to this effect.

Name of the patient: _____

Name of the Legally Acceptable Representative: _____

Relationship to the patient: _____

☐☐- ☐☐ ☐☐☐☐

Signature of the Legally Acceptable Representative: _____ Date (dd-mm-yyyy) :

ANNEXURE III – PROFORMA

PROFORMA OF CLINICAL EXAMINATION OF INDIVIDUAL PATIENT

Name : Age :

Address : IP no.:

Sex :

Date of admission: Date of discharge:

HISTORY

Clinical history:

Other associated illnesses :

GENERAL PHYSICAL EXAMINATION:

Weight: Height:

Pallor/Icterus/Cyanosis/Clubbing/Edema/Lymphadenopathy

Vitals Signs: PR: /min BP: mmhg RR: /min Temp:

DIAGNOSIS ;

SURGERY PERFORMED ;

TYPE OF ANAESTHESIA ;

DURATION OF SURGERY;

SYSTEMIC EXAMINATION ON ADMISSION

CVS:

CNS:

RS:

PA:

2.INVESTIGATIONS **ON ADMISSION**

POST SURGERY

- Total WBC count .
- Sputum culture.
- Arterial blood gas
- Chest x-ray

CLINICAL IMPRESSION:

RESPIRATORY INFECTION:

CLINICAL DIAGNOSIS.

Fever - Yes /No

INVESTIGATION.

Total WBC count > 12 ,000/cu mm - Yes /No

Sputum culture POSITIVE - Yes/No

RESPIRATORY FAILURE:

ABG:

Pao2 <8kpa(60mm hg) - Yes / No

Pao2:Fio2 ratio <40kpa (300mmHg) - Yes / No

Pulse oximetry <90% - Yes / No

PLEURAL EFFUSION:

CHEST X-RAY

Preoperative-

Post operative day 2-

Post operative day5 -

ATELECTASIS:

CHEST X-RAY

Preoperative-

Post operative day 2-

Post operative day5 -

PNEUMONIA:

CLINICAL DIAGNOSIS.

Fever >36 ℃ -Yes /No

INVESTIGATION.

Total WBC count > 12 ,000/cu mm - Yes /No

Sputum culture POSITIVE - Yes/No

ASPIRATION PNEUMONITIS

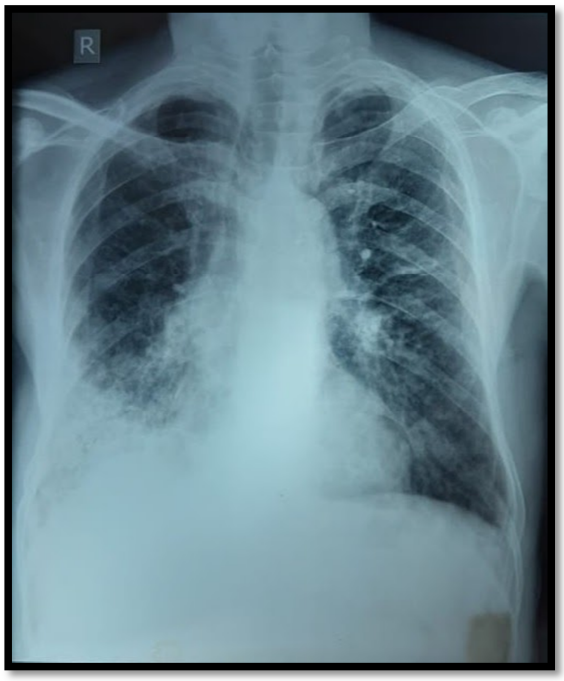
-Aspiration of gastric contents - Yes/No

TRACHEOBRONCHITIS:

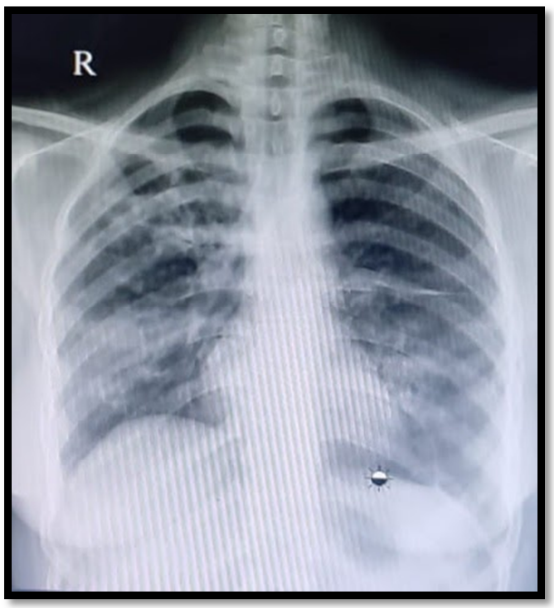
Cough -Yes/No

Purulent sputum -Yes/No

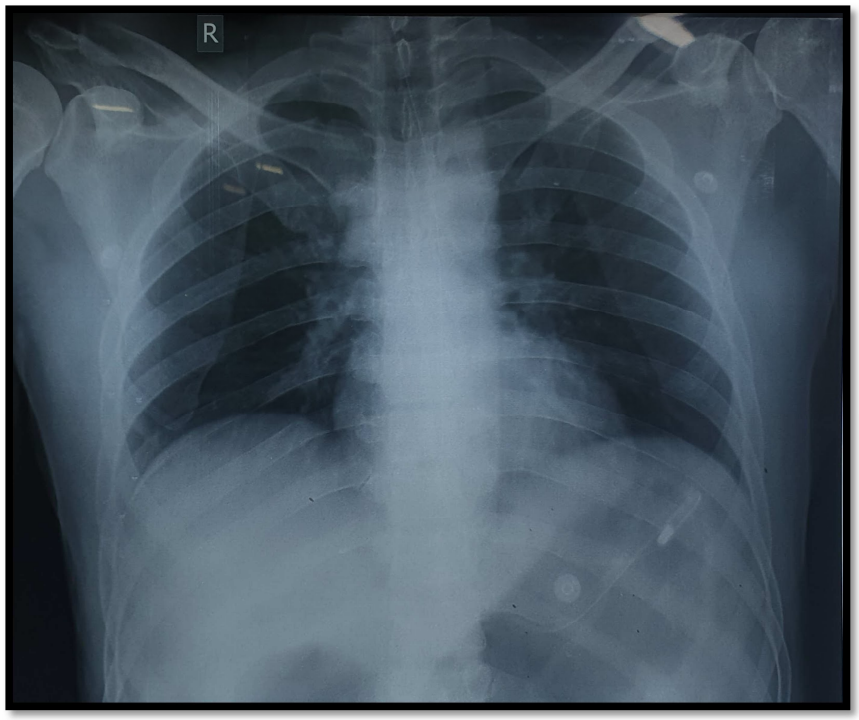
ANNEXURE IV - PHOTOGRAPHS



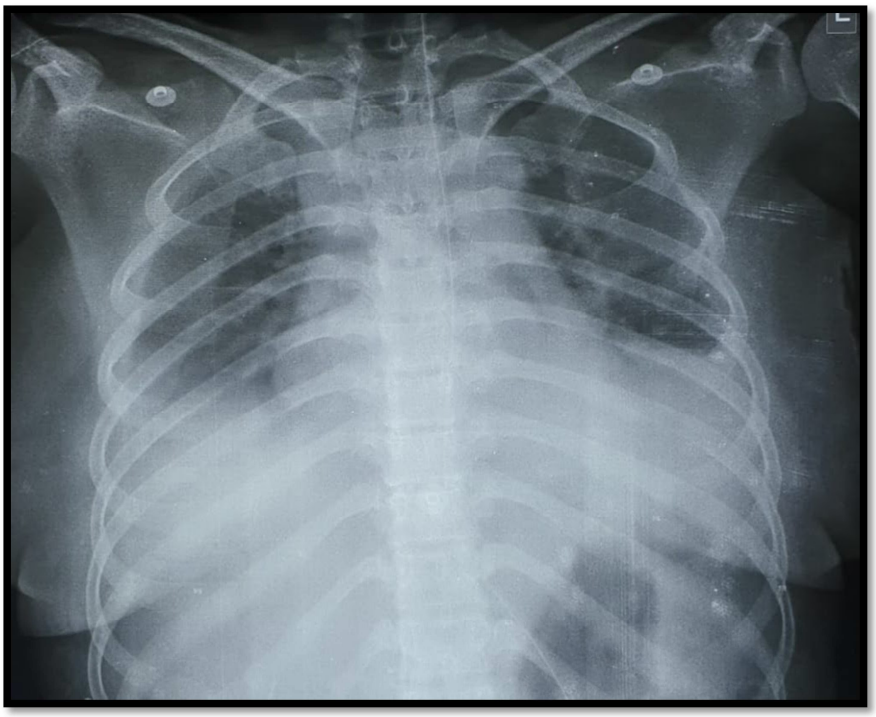
Photography 1 ; A 72 year old female underwent emergency laparotomy for acute abdomen, Postoperative x-ray shows Right lower zone consolidation with air bronchograms



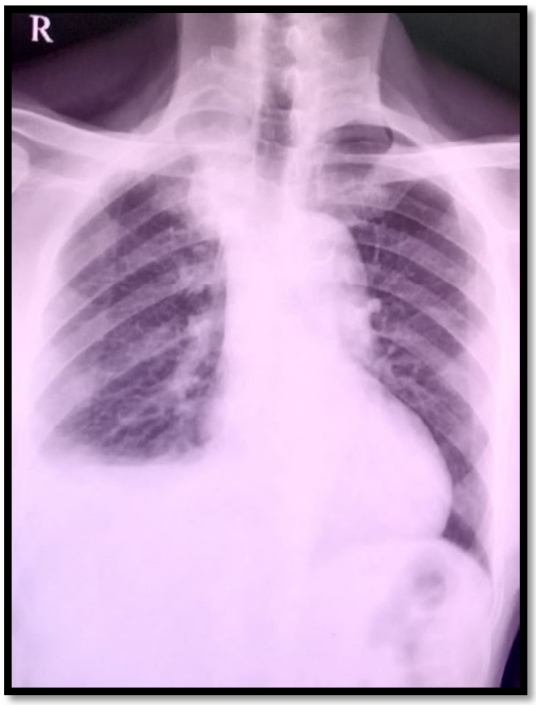
Photography 2 ; A 60 year old male underwent emergency laparotomy for acute abdomen, Postoperative x-ray shows Bilateral mid zone patchy opacity with air bronchogram - Pneumonia



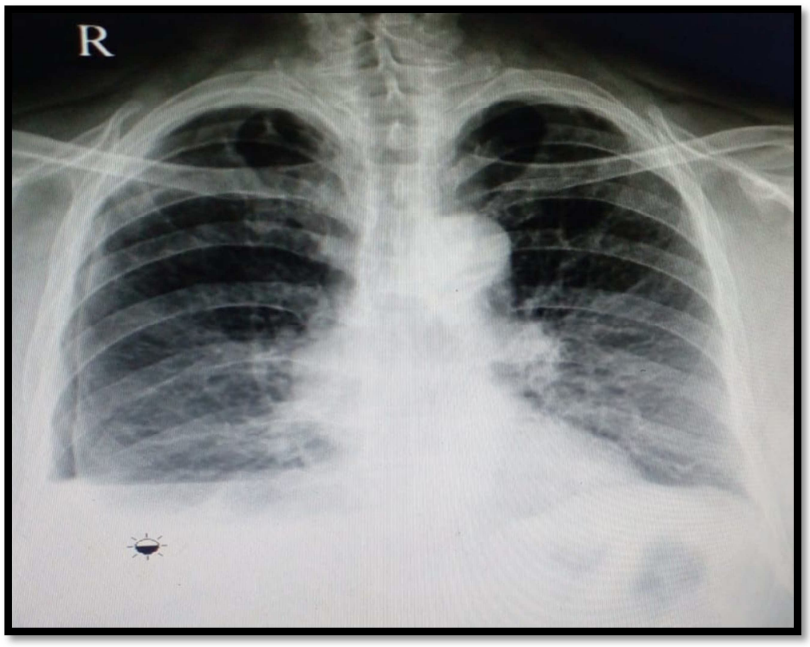
Photography 3 ; A 55 year old male underwent emergency laparotomy for acute abdomen, Postoperative x-ray shows blunting of right costophrenic recess suggestive of bilateral mild pleural effusion



Photography 4 ; A 60 year old male underwent emergency laparotomy for acute abdomen, Postoperative x-ray shows Bilateral moderate pleural effusion



Photography 5 ; A 70 year old male underwent emergency laparotomy for acute abdomen, Postoperative x-ray shows Right lower zone opacity with basal atelectasis



Photography 6 ; A 60 year old male underwent emergency laparotomy for acute abdomen, Postoperative x-ray shows Bilateral lower zone opacity with basal atelectasis

ANNEXURE V– MASTER CHART

SL NO	IP NO	NAME	AGE	SEX	DOA	DOD	DIAGNOSIS	SURGERY	ANASTESIA	DURATION OF SURGERY	DIABETIS MELITUS	HYPERTENSION	RESPIRATORY INFECTION	RESPIRATORYFAILIURE	PLEURAL EFFUSION	ATELECTASIS	PNEUMONIA	ASPIRATION PNEUMONITIS	TRACHEO BRONCHITIS	DAYS OF HOSPITAL STAY
1	1011192	NINGAPPA K SOLLAPURE	60	MALE	12-05-20	19-05-20	DUODENAL PERFORATION	EXPLORATORY LAPAROTOMY WITH GRAHAMS PATCHING REPAIR	GA	3 HOURS	NO	NO	NO	NO	YES	YES	NO	NO	NO	8 DAYS
2	1013630	KASTUREVVA P DHUPADAL	55	MALE	05-06-20	16-06-20	INTESTINAL OBSTRUCTION	EXPLORATORY LAPAROTOMY WITH ADHESIOLYSIS	GA	3 HOURS	YES	YES	YES	NO	YES	YES	YES	NO	NO	11 DAYS
3	1010794	CHETAN H KALAGUDI	21	MALE	06-05-20	10-05-20	DUODENAL PERFORATION	EXPLORATORY LAPAROTOMY WITH GRAHAMS PATCHING REPAIR	GA	3 HOURS	NO	NO	NO	NO	NO	NO	NO	NO	NO	5 DAYS
4	1014462	SHARAVVA K DESAI	67	FEMALE	11-05-20	17-05-20	INTESTINAL OBSTRUCTION	EXPLORATORY LAPAROTOMY WITH RESECTION ANASTOMOSIS	GA	3 HOURS	NO	NO	NO	NO	YES	YES	NO	NO	NO	7 DAYS
5	1011080	PARVATHI M SHIGGANUL	45	FEMALE	11-05-20	19-05-20	INTESTINAL OBSTRUCTION SECONDARY TO STRANGULATED HERNIA	EXPLORATORY LAPAROTOMY WITH RESECTION ANASTOMOSIS	GA	3 HOURS	YES	YES	YES	NO	YES	YES	NO	NO	NO	9 DAYS
6	1020872	ADIVEPPA M JINGI	35	MALE	13-08-20	21-05-20	PERITONITIS SECONDARY TO PERFORATED APPENDIX	EXPLORATORY LAPAROTOMY WITH PERITONEAL LAVAGE WITH APPENDICECTOMY	GA	3 HOURS	YES	NO	NO	NO	NO	YES	NO	NO	NO	6 DAYS
7	999517	HADIMANI M BASAVANNEPPA	66	MALE	04-02-20	16-02-20	INTESTINAL OBSTRUTION SECONDARY TO STRICTURE IN ASCENDING COLON	EXPLORATORY LAPAROTOMY RIGHT HEMICOLECTOMY WITH ILEOCOLIC ANASTOMOSIS	GA	3 HOURS	YES	YES	NO	NO	NO	NO	NO	NO	NO	14 DAYS
8	1009472	NARAYAN Y GAVADA	35	MALE	13-04-20	26-04-20	SMALL BOWEL OBSTRUCTION SECONDARY TO MULTIPLE STRICTURE	EXPLORATORY LAPAROTOMY WITH RESECTION ANASTOMOSIS	GA	3 HOURS	NO	NO	NO	NO	NO	NO	NO	NO	NO	12 DAYS
9	1013380	SUVARNA S PUJARI	42	MALE	03-06-20	15-06-20	INTESTINAL OBSTRUCTION	EXPLORATORY LAPAROTOMY WITH RESECTION ANASTOMOSIS	GA	3 HOURS	NO	NO	NO	NO	NO	NO	NO	NO	NO	12 DAYS

10	999631	JAYARAJ V GONAL	45	MALE	05-02-20	16-02-20	INTESTINAL OBSTRUCTION	EXPLORATORY LAPAROTOMY WITH RESECTION ANASTOMOSIS	GA	3 HOURS	NO	YES	NO	NO	NO	NO	NO	NO	NO	10 DAYS
11	1019776	SUNIL B BADIGER	25	MALE	28-07-20	01-08-20	DUODENAL PERFORATION	EXPLORATORY LAPAROTOMY WITH GRAHAMS PATCHING REPAIR	GA	2 HRS	NO	NO	NO	NO	NO	NO	NO	NO	NO	6 DAYS
12	1022912	CHANGUNA ARJUN	65	FEMALE	10-09-2020	21-09-20	PERITONITIS SECONDARY TOASCENDING COLON DIVERTICULAR PERFORATION	EXPLORATORY LAPAROTOMY WITH RESECTION ANASTOMOSIS	GA	3 HOURS	NO	YES	NO	NO	NO	NO	NO	NO	NO	12 DAYS
13	1009279	SUBHASH RAJU	27	MALE	09-04-20	16-09-20	JEJUNAL PERFORATION	EXPLORATORY LAPAROTOMY WITH PRIMARY CLOSURE OF ENTERIC PERFORATION	GA	3 HOURS	NO	NO	NO	NO	YES	NO	NO	NO	NO	8 DAYS
14	1019316	PULABAI VADDAR	65	MALE	21-07-20	01-08-20	INTESTINAL OBSTRUCTION SECONDARY TO OBSTRUCTED HERNIA	EXPLORATORY LAPAROTOMY WITH RESECTION ANASTOMOSIS	GA	3 HOURS	NO	NO	NO	NO	YES	NO	NO	NO	NO	10 DAYS
15	1006816	AVINASH	32	MALE	12-08-20	22-08-20	DUODENAL PERFORATION	EXPLORATORY LAPAROTOMY ,GRAHAMS PATCH	GA	2 HRS	NO	NO	NO	NO	NO	NO	NO	NO	NO	10 DAYS
16	1013275	SANDEEP YARDI	39	MALE	02-06-20	13-06-20	PERITONITIS SECONDARY TO PERFORATED APPENDIX	EXPLORATORY LAPAROTOMY WITH PERITONEAL LAVAGE WITH APPENDICECTOMY	GA	2 HOURS	NO	NO	NO	NO	NO	NO	NO	NO	NO	6 DAYS
17	1009703	VIKRAM MAHENDRA	19	MALE	17-04-20	01-05-20	SMALL BOWEL GANGRENE	EXPLORATORY LAPAROTOMY ,RESECTION ANASTOMOSIS	GA	3 HRS	NO	NO	YES	NO	YES	YES	YES	NO	NO	14 DAYS
18	1020422	RAYAPPA	60	MALE	07-08-20	19-08-20	DUODENAL PERFORATION	EXPLORATORY LAPAROTOMY ,GRAHAMS PATCH	GA	3 HRS	YES	NO	NO	NO	YES	NO	YES	NO	NO	12 DAYS
19	1025009	SAMMED RAJU	22	MALE	09-10-20	19-10-20	PENITRATING INJURY ABDOMEN	EMERGENCY LAPARATOMY WITH PRIMARY CLOSURE OF BOWEL PERFORATION	GA	3 HRS	NO	NO	NO	NO	YES	NO	NO	NO	NO	10 DAYS
20	1026099	RAMDAS D RAIKAR	62	MALE	23-10-20	25-10-20	APPENDICULAR ABSCESS	EXPLORATORY LAPAROTOMY PERIRONEAL LAVAGE	GA	2HRS	NO	YES	NO	NO	YES	YES	NO	NO	NO	12 DAYS
21	1031750	MARUTHI	20	MALE	18-12-20	30-12-20	BLUND ABDOMEN TRAUMA	EXPLORATORY LAPAROTOMY ,PRIMARY CLOSURE OF BOWEL PERFORATION	GA	3 HRS	NO	NO	NO	NO	YES	YES	NO	NO	NO	12 DAYS

22	1020059	APPASAB	55	MALE	01-08-20	10-08-20	DUODENAL PERFORATION	EXPLORATORY LAPAROTOMY ,GRAHAMS PATCH	GA	2 HRS	NO	NO	NO	NO	YES	NO	NO	NO	NO	10 DAYS
23	1022917	SHANKAR	50	MALE	12-08-20	20-08-20	ILEAL PERFORATION	EMERGENCY LAPARATOMY WITH PRIMARY CLOSURE OF BOWEL PERFORATION	GA	2HRS	NO	NO	NO	NO	NO	NO	NO	NO	NO	10 DAYS
24	998315	YALLAWWA	72	FEMALE	30-1-20	15-08-20	DUODENAL PERFORATION	EXPLORATORY LAPAROTOMY WITH GRAHAMS PATCHING REPAIR	GA	2.30 HRS	YES	NO	NO	NO	YES	YES	YES	NO	NO	16 DAYS
25	998602	PRAVEEN DESAI	48	MALE	31-01-20	11-01-20	APPENDICULAR PERFORATION	EXPLORATORY LAPAROTOMY WITH PERITONEAL LAVAGE WITH APPENDICECTOMY	GA	2HRS	NO	NO	NO	NO	NO	NO	NO	NO	NO	10 DAYS
26	1022681	SANTOSH GOUDER	36	MALE	30-12-20	14-01-20	STAPE INJURY ABDOMEN	EXPLORATORY LAPAROTOMY WITH PRIMARY CLOSURE OF ENTERIC PERFORATION	GA	2 HRS	NO	NO	NO	NO	NO	YES	NO	NO	NO	14 DAYS
27	1022581	SULOCHANA	55	FEMALE	11-12-20	21-12-20	PERITONITIS SECONDARY TO PERFORATED APPENDIX	EXPLORATORY LAPAROTOMY WITH PERITONEAL LAVAGE WITH APPENDICECTOMY	GA	3 HRS	NO	NO	NO	NO	NO	NO	NO	NO	NO	10 DAYS
28	1026862	KANYAKUMARI PATIL	25	FEMALE	14-11-20	20-11-20	ILEAL PERFORATION	EMERGENCY LAPARATOMY WITH PRIMARY CLOSURE OF BOWEL PERFORATION	GA	3HRS	NO	NO	NO	NO	YES	NO	NO	NO	NO	10 DAYS
29	1026980	SURAJ BABU	31	MALE	4-11-20	14-11-20	SMALLBOWEL OBSTRUTION WITH INTERNAL HERNIATION	EXPLORATORY LAPAROTOMY WITH ADHESIOLYSIS	GA	2 HRS	NO	NO	NO	NO	YES	NO	NO	NO	NO	10 DAYS
30	1026991	malappa	55	MALE	05-06-20	16-06-20	INTESTINAL OBSTRUCTION	EXPLORATORY LAPAROTOMY WITH ADHESIOLYSIS	GA	3 HOURS	YES	YES	YES	NO	YES	YES	YES	NO	NO	11 DAYS