ORIGINAL RESEARCH PAPER
Volume - 14 | Issue - 10 | October - 2025 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

A CLINICAL STUDY ON POST OPERATIVE PULMONARY COMPLICATIONS FOLLOWING EMERGENCY LAPAROTOMY

Clinical Research

Dr Madhurjya Roy Post Graduate Trainee, Dept of Gen. Surgery, TMCH, Tezpur, Assam
Dr Dhirendra Nath Choudhury Professor & Head, Dept of Gen. Surgery, TMCH, Tezpur, Assam
Dr Labanya Kumar Acharjya Assistant. Prof, Dept of Gen. Surgery, TMCH, Tezpur, Assam
Dr Kamal Krishna Patowary* Post Graduate Trainee, Dept of Gen. Surgery, TMCH, Tezpur, Assam *Corresponding Author

ABSTRACT

Objectives: To analyze the incidence and underlying causes of "post-operative pulmonary complications (PPCs)". **Methods:** A total of 100 patients undergoing emergency laparotomy at Tezpur Medical College and Hospital, Tezpur were enrolled in this prospective observational study. Post op pulmonary complications were identified based on routine clinical examination, fall in oxygen saturation (<94%), increased in respiratory rate (>20), any abnormality in chest x ray and any added sounds heard on auscultation. **Results:** Emergency laparotomy was undertaken for multiple clinical conditions, the most frequent being perforation peritonitis, abdominal trauma, intestinal blockage, and appendicular perforation. Of the 100 participants, 27 experienced post-operative pulmonary complications. These complications were more prevalent among patients of advanced age, those with a history of smoking, and those who underwent prolonged surgical procedures. **Conclusion:** Postoperative pulmonary complications are a major contributor to increased morbidity and prolonged hospital stays after emergency laparotomy. This research underlines the critical role of timely detection of contributing factors, including advanced age, underlying pulmonary disorders, and longer operative times.

KEYWORDS

Postoperative Pulmonary Complications (PPCs), Emergency Laparotomy, Risk Factors, Advanced Age, Smoking, Duration of Surgery, Respiratory Physiotherapy

INTRODUCTION

Post-surgical pulmonary complications are frequently observed after exploratory laparotomies and significantly strain healthcare services by raising costs, using more resources, lengthening hospital stays, and elevating both morbidity and mortality rates(1)

The general occurrence of postoperative pulmonary complications is estimated between 5–10%. However, reports show wide variability in laparotomy-related complications, with atelectasis affecting 20–69% and postoperative pneumonia ranging from 9–40%.(3). Factors that heighten the risk of PPCs encompass advanced age, smoking habits, inadequate nutrition, blood loss before or during surgery, urgent surgical procedures, and operations in the upper abdomen or chest area.(4,5). Urgent surgical interventions are known to be associated with greater risks of illness and death compared to planned or elective operations.(2). The type of emergency surgery itself has been independently linked to increased incidences of postoperative pneumonia and respiratory failure (5).

Although the exact cause of PPCs remains unclear, it is believed that reduced lung expansion, leading to atelectasis, along with impaired mucociliary function, play a critical role.(1,5).

Postoperative lung re-expansion and secretion clearance can be aided by incentive spirometry and techniques such as deep breathing and coughing exercises(5). Maintaining consistent alveolar inflation and preserving functional residual lung volume is believed to help in reducing the risk of PPCs.(5).

AIMS AND OBJECTIVES

The primary goal of this study was to examine the rate of post-operative pulmonary complications and determine the factors that contribute to their occurrence.

MATERIALS AND METHODS

A total of 100 patients who underwent emergency laparotomy at Tezpur Medical College and Hospital, Tezpur, Assam, were enrolled in this one-year prospective observational study conducted between June 1, 2023, and May 30, 2024.

All patients, regardless of age or sex, admitted through SOPD, casualty, or interdepartmental transfers, undergoing emergency laparotomy within the study duration, were included in this stud..

Inclusion Criteria

1. Adult patients of 18-70 years.
2. Patients undergoing emergency laparotomies under GA.
3. ASA grade I & II.

Exclusion Criteria

1. Patients who had uncontrolled pulmonary disease existing prior to surgical procedure (e.g., COPD, ILD)
2. ASA III, IV.
3. Patients not willing to enroll themselves in this study.

At the time of admission, comprehensive history and physical examination were conducted and recorded using a standardized format. Baseline tests—such as CBC, urinalysis, renal function tests, electrolytes, chest X-ray, ECG, viral markers (HIV, hepatitis B/C), blood group, and random blood sugar—were obtained. Additional imaging, including abdominal X-ray and ultrasonography, was done where clinically indicated.

Initial management included intravenous fluid replacement with Ringer's lactate, insertion of a Foley catheter, and placement of a nasogastric tube, followed by assessment by the anesthesia team..

Based on the clinical evaluation, emergency laparotomy was subsequently performed.

After surgery, patients were carefully observed for signs of respiratory complications, overall morbidity, and mortality. Data on potential risk factors, the onset time of respiratory issues, and the length of hospital stay were systematically documented. Those presenting with symptoms such as cough, post-operative fever, or chest discomfort underwent further diagnostic workup, including chest X-ray (PA view), chest ultrasound, and HRCT when indicated

Data Collection: In this prospective observational study conducted at the Department of General Surgery, Tezpur Medical College and Hospital over 12 months, data were collected from 100 patients undergoing emergency exploratory laparotomy. A structured proforma was used to ensure systematic collection of relevant variables.

Data were grouped under the following categories:

1. Patient Demographics:

Age, sex, BMI, smoking history, alcohol use.

2. Preoperative Clinical Parameters:

Presence of comorbidities (especially respiratory conditions like

COPD, asthma), ASA grade, baseline oxygen saturation, nutritional status (serum albumin), and chest X-ray findings.

3. Intraoperative Details:

Indication for surgery, type and duration of surgery, anesthesia type, blood loss, incision type, and intraoperative fluid management.

4. Postoperative Outcomes:

Development of PPCs (atelectasis, pneumonia, ARDS, respiratory failure), time of onset, need for oxygen therapy or ventilator support, duration of hospital and ICU stay, and final outcomes including recovery or mortality.

Data were recorded contemporaneously during the patient's hospital stay. Efforts were made to ensure accuracy and completeness by cross-checking medical records, surgical notes, and daily clinical assessments.

Data Analysis

Data were compiled using Microsoft Excel and subsequently analyzed with SPSS version 25. Categorical variables were assessed accordingly, such as the presence or absence of postoperative pulmonary complications (PPCs), smoking status, nutritional status, gender and were expressed as frequencies and percentages. Continuous data, including age, surgical duration, and intraoperative blood loss, were expressed as mean ± standard deviation (SD). The Shapiro-Wilk test was used to assess the normal distribution of these variables.

The rate of postoperative pulmonary complications (PPCs) was determined by calculating the proportion of affected individuals within the total study sample. Associations between PPCs and potential risk factors—such as age over 40, smoking status, existing pulmonary diseases, and surgery duration—were analyzed using the Chi-square test or Fisher's exact test for categorical variables, and the independent t-test for continuous data. Statistical significance was defined as a p-value less than 0.05. Any missing data were addressed through listwise deletion. To ensure data reliability, 10% of the entries were randomly selected and cross-verified.

Additionally, multivariate logistic regression analysis was conducted to determine independent risk factors for PPCs, and findings were reported as adjusted odds ratios (AORs) with corresponding 95% confidence intervals (CIs).

Ethical approval for the study was obtained from the Institutional Ethics Committee prior to its initiation.

RESULTS

Table1: Distribution of Cases Based on Age

Age group (years)	Total no of cases	Percent
18-30	06	4%
31-40	15	11%
41-50	26	26%
51-60	29	28%
61-70	13	21%
71-80	06	10%
TOTAL	100	100%

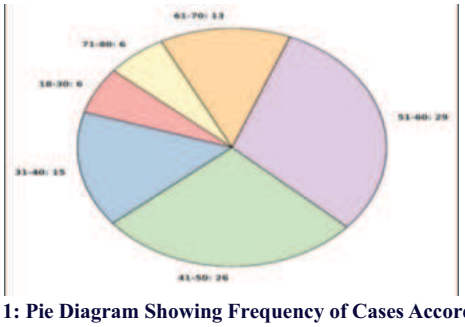

Figure 1: Pie Diagram Showing Frequency of Cases According to Age

Table2: Gender-wise Distribution of Study Participants

GENDER	FREQUENCY	PERCENT
FEMALE	35	35%
MALE	65	65%
TOTAL	100	100%

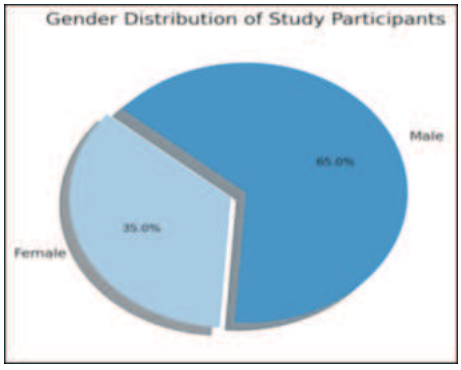

Figure 2: Pie Diagram Showing "Gender Distribution of Study Participants

Table3: Diagnostic Profile of the Study Population

Diagnosis	No of Patients	Percent
Peritonitis secondary to peptic ulcer perforation	28	28%
Traumatic hollow viscus perforation	21	21%
Acute intestinal obstruction	17	17%
Splenic injury	12	12%
Pyoperitoneum	8	8%
Abdominal tuberculosis	4	4%
Appendicular perforation	10	10%
Total	100	100 %

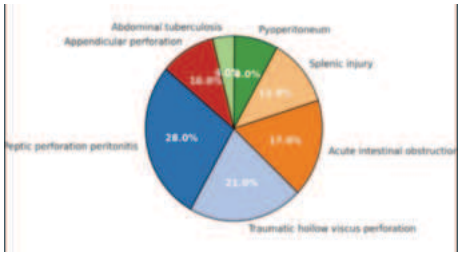

Figure 3: Pie Diagram Showing Distribution of Study Participants According to Diagnosis

Table 4: Frequency Distribution of Various Pre-existing Pulmonary Conditions

VARIABLES	FREQUENCY	PERCENT
COPD	6	6%
Bronchial asthma	5	5%
Pulmonary tuberculosis	3	3%
Chronic bronchitis	3	3%
Total	17	17%

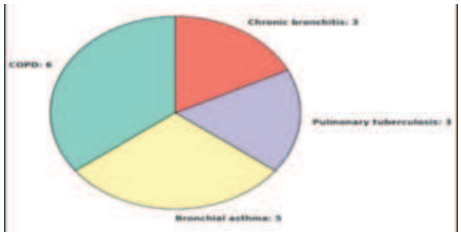

Figure 4: Pie Diagram Showing Frequency Distribution of Various Pre-existing Pulmonary Conditions

Table 5: Various Post Operative Pulmonary Complications (PPC's)"

VARIABLES	CASES	PERCENT
ARDS	7	7%
Atelectasis	4	4%
Pneumonia	5	5%
Aspiration pneumonia	3	3%
Pleural effusion	4	4%
Pulmonary oedema	3	3%
Respiratory failure	1	1%
Total	27	27%

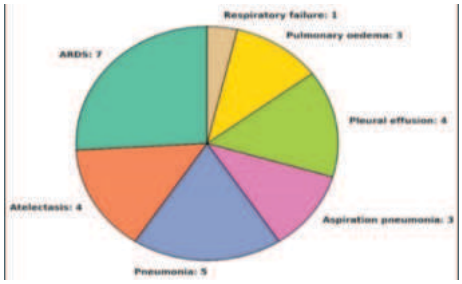

Figure 5: Distribution of Various "Post Operative Pulmonary Complications (PPC's)"

Table 6: Distribution of Patients <40 Years & > 40 Years

Age Category	Number of Patients
≤ 40 years	21
> 40 years	74

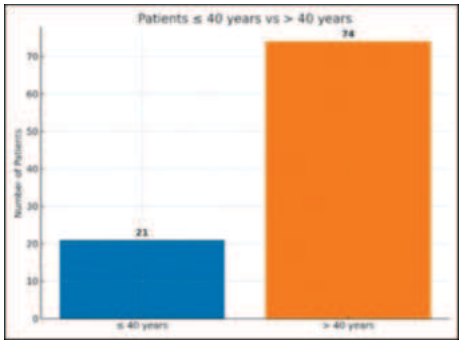

Figure 6: Distribution of Patients < 40 Years & > 40 Years

Table 7: Distribution of Post Operative Pulmonary Complications (PPC's)

Complication	Total Cases	Cases in > 40 years	Cases in ≤ 40 years	% in > 40 years	% in ≤ 40 years
ARDS	7	6	1	85.7	14.3
Atelectasis	4	3	1	75.0	25.0
Pneumonia	5	4	1	80.0	20.0
Aspiration pneumonia	3	3	0	100.0	0.0
Pleural effusion	4	3	1	75.0	25.0
Pulmonary oedema	3	2	1	66.7	33.3
Respiratory failure	1	1	0	100.0	0.0
Total	27	22	5		

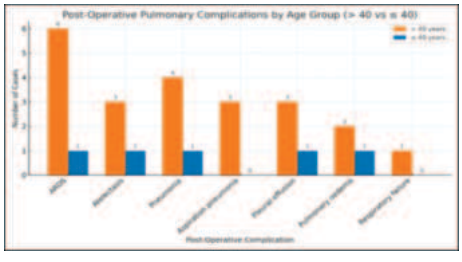

Figure 7: Distribution of Post Operative Pulmonary Complications

Table 8: Distribution of PPCs by Gender

Gender	Total Patients	Patients with Complications	Patients without Complications
Male	70	20	50
Female	30	7	23

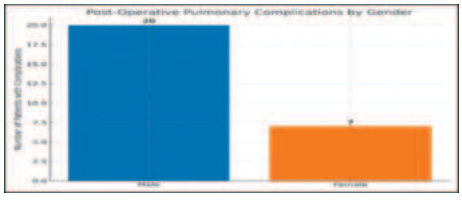

Figure 8: Distribution of PPCs by Gender

Table 09: Effect of Smoking on Lung Complications After Surgery

Smoking Status	Total Patients	Patients with Complications	Patients without Complications
Smoker	50	20	30
Non-Smoker	50	7	43

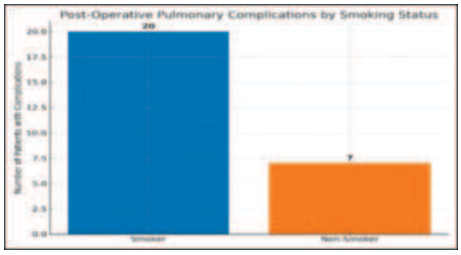

Figure 09: Effect of Smoking on Lung Complications After Surgery

Table 10: Prevalence of Post-operative Pulmonary Complications by Duration of Surgery

Surgery Duration	Total Patients	Patients with Complications	Patients without Complications	% with Complications
< 2 hours	40	5	35	12.5
2–4 hours	40	12	28	30.0
> 4 hours	20	10	10	50.0
Total	100	27	73	27%

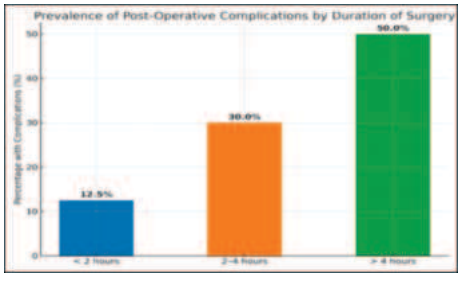

Figure 10: Prevalence of Post-operative Pulmonary Complications by Duration of Surgery

Table 11: Pre-operative Respiratory Comorbidities and Post-operative Respiratory Complications

"Pre-operative Comorbidity"	Total Patients	Patients with Post-Op Respiratory Complications
COPD	6	5
Bronchial Asthma	5	4
Pulmonary Tuberculosis	3	2
Chronic Bronchitis	3	2
Total	17	13

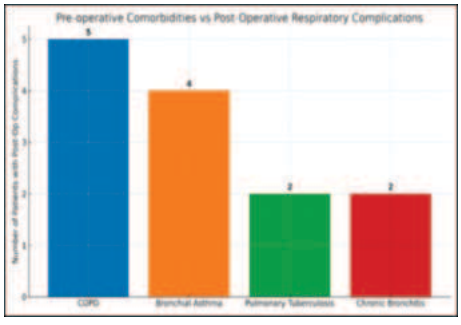

Figure 11: Pre-operative Respiratory Comorbidities and Post-operative Respiratory Complications

DISCUSSION

The present study ,a hospital based prospective observational study, was conducted for 12 months at the Department of General Surgery, Tezpur Medical college and hospital. Total 100 patients were included in this study

Studies by Stein M, Latmeir, Bartlett RH, and Lord have shown that postoperative pulmonary complication rates following abdominal surgeries can range widely from 5% to 60%.

Goreth L et al studied 260 patients, out of those, 75 (28.2%) developed postoperative pulmonary complications.

In the current study, we investigated the incidence and associated risk factors of postoperative pulmonary complications in patients undergoing emergency laparotomies under general anesthesia.

In the current study 27 (27%) patients out of 100 patients developed post op pulmonary complications. The most common post operative pulmonary complications are ARDS followed by atelectasis(7%) and pneumonia(4%) which is comparable to other studies.

Chi-square testing was used to find links between possible risk factors and post-surgery lung complications.

The association between smoking status and PPCs was statistically significant ($p = 0.0069$), indicating a strong correlation between smoking and the risk of developing PPCs. Similarly, the duration of surgery showed a statistically significant relationship with PPCs ($p = 0.0074$), with longer surgeries being associated with higher complication rates.

On the other hand, no statistically significant associations were observed between age group (>40 vs ≤40 years) ($p = 0.7973$) and gender ($p = 0.7681$) with PPCs. These findings suggest that while older age and male gender are frequently reported as risk factors, in this cohort they did not reach statistical significance.

These insights support targeted perioperative strategies focusing on modifiable risk factors

But we found a positive correlation with increase in age, increased duration of surgery. Males are found to undergo more laparotomy and also found to develop more post op pulmonary complications compared to females.

Although statistical analysis did not reveal a significant association between age or gender and the development of PPCs, a greater frequency of complications was observed among male patients. Moreover, male patients comprised the majority of those undergoing emergency laparotomy in this cohort. These observations, while not statistically significant, may still have clinical relevance and warrant further investigation in studies with larger sample sizes.

CONCLUSION

This study concludes that PPCs continue to significantly impact patient outcomes following emergency laparotomies.

Preoperative risk factors like smoking, pre-existing lung disease, older age, long duration operation and midline incision are the factors that can increase the risk of PPC.

Early identification and aggressive treatment goes a long way to tide over the progress to a life-threatening state.

REFERENCES

1. He, Q., Lai, Z., Peng, S., Lin, S., Mo, G., Zhao, X., et al. (2024). Postoperative pulmonary complications after major abdominal surgery in elderly patients and its association with patient-controlled analgesia. BMC Geriatrics, 24(1), 751. https://doi.org/10.1186/s12877-024-04835-5
2. Miskovic, A., & Lumb, A. B. (2017). Postoperative pulmonary complications. British Journal of Anaesthesia, 118(3), 317–334. https://doi.org/10.1093/bja/aew478
3. Smetana, G. W., Lawrence, V. A., & Cornell, J. E. (2006). Preoperative pulmonary risk stratification for noncardiothoracic surgery: Systematic review for the American College of Physicians. Annals of Internal Medicine, 144(8), 581–595. https://doi.org/10.7326/0003-4819-144-8-200604180-00009
4. Lakshminarasimhachar, A., & Smetana, G. W. (2016). Preoperative evaluation: Estimation of pulmonary risk. Anesthesiology Clinics, 34(1), 71–88. https://doi.org/10.1016/j.anclin.2015.10.004