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Original Research Article

Impact of COPD on the Final Outcome of Patients undergoing Emergency General Surgery and Orthopaedic Procedures in a Tertiary Care Hospital

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Abstract

Background: Chronic obstructive pulmonary disease (COPD) is considered as an independent risk factor of the lung with high mortality and morbidity especially in patients undergoing Emergency Surgical or Orthopedic procedures. COPD is a common disease in India but its effect on the final outcome of emergency surgical procedures was found to be underreported.

Aim of the Study: To diagnose, evaluate and study the impact of COPD on various Emergency procedures of General Surgery and Orthopedics on patients in terms of morbidity and mortality.

Materials: 84 patients with COPD undergoing emergency surgeries of General surgery and orthopedics were included. 27 (64.28%) were males and 15 (35.71%) were females with a male to female ratio of 1.8:1 in the General surgery group. There were 31 (73.80%) male patients and 11 (26.19%) female patients with a male to female ratio of 2.8:1 in the orthopedics' group. The mean age among the General surgery group was 44.25±4.50 years and 42.35±5.15 years in the orthopedics group.

Results: Among the 84 patients with COPD undergoing emergency surgeries of General surgery and orthopedics there were 27 (64.28%) males and 15 (35.71%) females. male to female ratio was 1.8:1. There were 31 (73.80%) male patients and 11 (26.19%) female patients with a male to female ratio of 2.8:1 in the orthopedics' group. The mean age among the General surgery group was 44.25±4.50 years and 42.35±5.15 years in the orthopedics group. 03/42 patients developed stroke; (02- General surgery and 01- orthopaedics). UTI, septicemias and deep wound infections were also encountered in patients (02, 08 and 09 patients in General surgery and 03, 02 and 06 patients in orthopaedics surgeries respectively). There was a statistical significant correlation between the incidences of complications and the pulmonary function values in these patients with COPD.

Conclusions: Patients with COPD showed higher adverse events, with a risk of in-hospital morbidity and mortality after emergency General surgery and orthopaedics surgeries. Peri-

operative latest controlled protocols, optimization are a must to prevent impact of COPD on postoperative outcomes in the emergency surgeries.

Keywords: COPD, Tuberculosis, Lung function tests, Emergency procedures, General surgery, Orthopedics.

Introduction

Chronic obstructive pulmonary disease (COPD) was described as a progressive irreversible inflammatory disease involving the minor airways, alveoli, and microvasculature [1]. It was also described as preventable and treatable [2]. All over the world there are nearly 174 million patients being diagnosed regularly since 2015 [3]; in that year COPD was labeled as third commonest disease causing mortality in both genders accounting to 32 million deaths [4]. The economic loss to nations all over the world was amounting to 50 billion dollars to the Governments [5]. The interrelationship between TB and COPD is very complex. Large number patients of India are diagnosed as Tuberculosis develops post-tubercular small airway disease and labeled as or TB-associated COPD [6]. This is the most commonly reported relationship. In India Tuberculosis (TB) is presently one of the leading causes of morbidity and has become a Health Hazard due to its infectivity [7]. It is found in low-and middle-income groups of population [8] In addition patients with HIV related infections are adding up to the numbers of newly infected Tuberculosis people [9]. Both COPD and Tuberculosis increase the mortality and morbidity among the patients undergoing Emergency Surgical procedures of General surgery and orthopaedic, to name a few are: Open fractures and dislocations, Hip dislocations (risk of AVN), Neural compromise, especially with spinal injury, Acute septic arthritis and osteomyelitis, Compartment syndrome, Vascular injuries (e.g., knee dislocation), Exsanguinating pelvic fractures [10]. The emergency General surgical procedures in patients are known to have as such a high risk of death and complications [11]. They account for 50% of the mortality in surgical operations [12]. The General surgical procedures include commonly: Acute Appendicitis, Intestinal Obstruction, Intestinal perforation, Volvulus, Cellulitis limbs, Gangrene bowel, Gastric perforation and duodenal perforation [13]. The present paper was an attempt to diagnose, evaluate and study the impact of COPD on various Emergency procedures of General Surgery and Orthopedics on patients.

Materials

84 patients undergoing emergency General surgery and orthopaedic procedures were included in this study over a period of 16 months. Among the 84 patients 42 were patients admitted in the wards of General Surgery and the other 42 were the patients admitted in the wards of Orthopaedics. The Institution ethics committee approved this study and an approved proforma was used to collect the data.

Inclusion Criteria: Patients with surgical and orthopaedic emergency conditions admitted for surgical management were included. Patients of both genders were included. Patients aged above 18 years and below 65 years were included. Patients willing to be included in the study were included. Patients admitted with COPD with or without Tuberculosis were included. Patients admitted and undergone surgery and stayed in the Hospital till suture removal were included. Patients with ASA grading

from I to IV were included. Patients with emergency General Surgery conditions like Acute Appendicitis, Intestinal Obstruction, Intestinal perforation, Volvulus, Cellulitis limbs, Gangrene bowel, Gastric perforation and duodenal perforation were included. Patients with orthopaedic conditions like Open fractures and dislocations, Hip dislocations (risk of AVN), Neural compromise, especially with spinal injury, Acute septic arthritis and osteomyelitis, Compartment syndrome, Vascular injuries (e.g., knee dislocation), Exsanguinating pelvic fractures were included.

Exclusion Criteria: Patients below 18 years and above 65 years were excluded. Patients without COPD or tuberculosis were excluded. Patients not willing to be included in the study were excluded. Patients with co-morbidities like diabetes mellitus, hypertension and chronic renal disease were excluded. Patients with immune deficiency disease were excluded. All the patients were elicited for past history of COPD, treatment followed for both COPD and Tuberculosis were elicited and noted. Patients were subjected to thorough history taking eliciting the age, smoking history, presenting complaints like dyspnea, cough, and history of co-morbidities. A thorough clinical examination and surgical profile tests like Hemoglobin levels, total and differential counts, fasting blood glucose level, liver and renal function tests, INR and prothrombin activity. E.C.G., plain X-ray chest PA and lateral views, CT scan chest were done for all patients. Pre-anaesthetic check-up was done and ASA grading was done in all patients. Treatment protocols involved in each surgical emergency was noted and recorded. All the patients were diagnosed as COPD based on the Global Initiative for Obstructive Lung Disease (GOLD) classification. All the patients had a post-bronchodilator FEV1/FVC ratio of less than 0.70. All the patients were stable having no exacerbation for the previous 4 weeks. All the patients were operated upon as per the General surgery and orthopaedics protocols for various surgeries encountered in the study. All the data was analyzed suing the standard statistical methods.

Statistical Analysis

Standard statistical methods such as percentage mean and standard deviation used to denote the common variables. Variables with significance were expressed by using univariate analysis whereas known risk factors like age, gender, body mass index (BMI), American Society of Anesthesiologists (ASA) physical status score were evaluated by using multivariate analysis. Statistical analyses were performed by using Statistical Package for the Social Sciences® Version 22.0. Correlation of values of variables was done using chi square test and p was taken as significant at <0.05.

Results

84 patients with COPD who were undergoing emergency surgeries of General surgery and orthopedics were included in this study. There were 27 (64.28%) male patients and 15 (35.71%) female patients with a male to female ratio of 1.8:1 in the General surgery group. There were 31 (73.80%) male patients and 11 (26.19%) female patients with a male to female ratio of 2.8:1 in the orthopedics' group.

The mean age among the General surgery group was 44.25±4.50 years and 42.35±5.15 years in the orthopedics group. In the General surgery group there were 04 (09.52%) patients in the age group of 18 to 25 years, 06 (14.28%) patients in the age group of 26 to 35 years, 09 (21.42%) patients in the age group of 36 to 45 years, 07 (16.66%) patients in the age group of 46 to 55 years, 14 (33.33%) patients in the age group of 56 to 65 years and 09 (21.42%)

patients in the age group above 56 to 65 years. (Table 1) BMI was 25 to 30 in 12/42 (28.57%) patients, 30 to 35 in 16/42 (47.61%) patients and above 35 in 14/42 (33.33%) patients. History of smoking was noted in 25/42 (59.52%) patients and no smoking habit in 17/42 (40.47%) patients of the General surgery group. History of exercise was noted in 20/42 (47.61%) patients and no exercise habits in 22/42 (52.38%) patients of the General surgery group. Socio-economic status was low in 24/42 (57.14%) patients, middle in 12/42 (28.57%) and high in 06/42 (14.28%) patients. (Table 1) Univariate analysis of the common risk factors showed a correlation between the incidence and the COPD. (p value was 0.001; p significant at <0.05). In the orthopaedics group there were 05 (11.90%) patients in the age group of 18 to 25 years, 08 (119.04%) patients in the age group of 26 to 35 years, 07 (16.66%) patients in the age group of 36 to 45 years, 16 (38.09%) patients in the age group of 46 to 55 years, 06 (14.28%) patients in the age group of 56 to 65 years and 09 (21.42%) patients in the age group above 56 to 65 years. (Table 1) BMI was 25 to 30 in 15/42 (35.71%) patients, 30 to 35 in 11/42 (26.19%) patients and above 35 in 16/42 (38.09%) patients. History of smoking was noted in 27/42 (64.28%) patients and no smoking habit in 17/42 (35.71%) patients of the General surgery group. History of exercise was noted in 23/42 (54.76%) patients and no exercise habits in 19/42 (45.23%) patients of the General surgery group.

Socio-economic status was low in 20/42 (47.61%) patients, middle in 17/42 (40.47%) and high in 05/42 (11.90%) patients. (Table 1) Univariate analysis the common risk factors showed a correlation between the incidence and the COPD. (p value was 0.001; p significant at <0.05), (Table 1).

Table 1: Showing the demographic data of the subjects (n-84).

Observations	General Surgery- 42	%	Orthopaedics- 42	%	P value
Age					
18 to 25	04	09.52	05	11.90	0.144
26 to 35	06	14.28	08	19.04	
36 to 45	09	21.42	07	16.66	
46 to 55	14	33.33	16	38.09	
56 to 65	09	21.42	06	14.28	
Gender					
Male	27	64.28	31	73.80	**0.001**
Female	15	35.71	11	26.19	
BMI					
25 to 30	12	28.57	15	35.71	0.254
30 to 35	16	38.09	11	26.19	
>35- 16	14	33.33	16	38.09	
Smoking					
Yes	25	59.52	27	64.28	0.361
No	17	40.47	15	35.71	
Exercise					
Yes	20	47.61	23	54.76	0.422
No	22	52.38	19	45.23	
Socio economic status					
Low	24	57.14	20	47.61	0.114

Middle	12	28.57	17	40.47	
High	06	14.28	05	11.90	

Among the General surgery emergencies encountered in this study Acute Appendicitis was noted in 05/42 (11.90%) patients, Intestinal obstruction was noted in 04/42 (09.42%) patients, Intestinal perforation in 08/42 (19.04%) patients, Volvulus was seen in 02/42 (04.76%) patients, cellulitis limbs was noted in 09/42 (21.42%), Gangrene bowel was noted 01/42 (02.38%) patients, Gastric perforation was noted in 06/42 (14.28%) patients and duodenal perforation was noted in 07/42 (16.66%) patients, (Table 2).

Among the orthopedics emergencies encountered in this study open fractures was noted in 07/42 (16.66%) patients, Acute Appendicitis was noted in 05/42 (11.90%) patients, Intestinal obstruction was noted in 04/42 (09.42%) patients, Intestinal perforation in 08/42 (19.04%) patients, Volvulus was seen in 02/42 (04.76%) patients, cellulitis limbs was noted in 09/42 (21.42%), Gangrene bowel was noted 01/42 (02.38%) patients, Gastric perforation was noted in 06/42 (14.28%) patients and duodenal perforation was noted in 07/42 (16.66%) patients, (Table 2). There was good correlation between the incidence of various General surgery conditions requiring surgery and the type of conditions (Table 2).

Table 2: Showing the incidence of General surgery emergencies in the study (n-42).

General Surgery Emergencies-42	Total Number	%	Male	Female	P value
Acute Appendicitis	05	11.90	03	02	0.001
Intestinal Obstruction	04	09.52	03	01	
Intestinal perforation	08	19.04	06	02	
Volvulus	02	04.76	01	01	
Cellulitis limbs	09	21.42	06	03	
Gangrene bowel	01	02.38	01	00	
Gastric perforation	06	14.28	05	01	
duodenal perforation	07	16.66	06	02	

Among the General surgery emergencies encountered in this study Acute Appendicitis was noted in 05/42 (11.90%) patients, Intestinal obstruction was noted in 04/42 (09.42%) patients, Intestinal perforation in 08/42 (19.04%) patients, Volvulus was seen in 02/42 (04.76%) patients, cellulitis limbs was noted in 09/42 (21.42%), Gangrene bowel was noted 01/42 (02.38%) patients, Gastric perforation was noted in 06/42 (14.28%) patients and duodenal perforation was noted in 07/42 (16.66%) patients, (Table 2). Among the orthopedics emergencies encountered in this study open fractures was noted in 07/42 (16.66%) patients, Upper limb joint dislocations were noted in 02/42 (04.76%) patients, Hip dislocations were noted in 03/42 (07.14%) patients, Fractures with Neural compromise were noted in 02/42 (04.76%) patients, spinal injuries were noted in 03/42 (07.14%) patients, Acute septic arthritis and osteomyelitis was reported in 02/42 (04.76%) patients, Compartment syndrome was noted in 03/42 (07.14%) patients, vascular injuries were noted in 04/42 (09.52%) patients, Exsanguinating pelvic fractures were noted in 04/42 (09.52%) patients and fracture neck of femur was noted in 11/42 (26.19%) patients. There was good correlation between the incidence of various General surgery conditions requiring surgery and the type of conditions, (Table 2).

Table 3: Showing the incidence of Orthopaedic emergencies in the study (n-42).

Orthopaedics Emergencies	Total Number	%	Male	Female	P value
Open fractures	07	16.66	05	02	0.001
Upper limb joint dislocations	02	04.76	01	01	
Hip dislocations	03	07.14	02	01	
Fractures with Neural compromise	02	04.76	01	01	
spinal injury	03	07.14	02	01	
Acute septic arthritis and osteomyelitis	02	04.76	01	01	
Compartment syndrome	03	07.14	02	01	
Vascular injuries (e.g., knee dislocation)	04	09.52	02	02	
Exsanguinating pelvic fractures	05	11.90	02	03	
Fractures of the Neck of the femur	11	26.19	06	05	

The values of pulmonary function tests were analyzed using univariate logistic regression method and found that the overall morbidity was 66.66% among the General surgery patients and 59.52% among the orthopedics patients. Risk factors found to be at playing their role were nature of surgery, gender, extremes of age, (>65 years) and grades of $FEV_{1\%}$ predicted and FVC % predicted. There were 28/42 (66.66%) patients with lower FEV1 values (moderately severe to very severe) and 30/42 (71.42%) orthopedics patients with lower FEV1 values (moderately severe to very severe). FVC values below 80% was noted in 33/42 (78.57%) and 31/42 (73.80%) patients of General surgery and orthopedics respectively (Table 3). Lower TLC values below 80% was noted in 24/42 (57.14%) and 36/42 (85.71%) of the General surgery and orthopedics patients respectively (Table 2). Evaluation of the correlation between these values and risk factors was found to be 0.001 (p significant at <0.05).

Table 3: Showing the Mean pulmonary function tests values and their incidences in the study (n-84).

Observations	Number		Number	%	P value
	G.S	%	Ortho	%	
Mean Pulmonary function tests values					
FEV1					
FEV1 >70%- mild	06	14.28	08	19.04	**0.001**
FEV1 60-69%- moderate	08	19.04	04	09.52	
FEV1 50-59%- moderately severe	10	23.80	12	28.57	
FEV1 35-49%- severe	09	21.42	10	23.80	
FEV1<35%- very severe	09	21.42	08	19.04	
FVC					
80 to 120%	09	21.42	11	26.19	**0.001**
<80%	33	78.57	31	73.80	
TLC					
80 to 120%	08	19.04	06	14.28	**0.001**
<80%	24	57.14	36	85.71	
DLCO					
Normal: >75% to 140%	07	16.66	05	11.90	**0.001**
Mild: 60% to LLN	13	30.95	15	35.71	
Moderate: 40% to 60%	12	28.57	14	33.33	
Severe: <40%	10	23.80	08	19.04	

Table 3: Showing the Mean pulmonary function tests values and their incidences in the study (n-84). (G.S- General Surgery), (LLN: lower limit of normal).

Multivariable logistic regression was done to assess the incidence of complications and risk factors and corresponding pulmonary function values in the study and observed that the independent risk factors for postoperative infectious complications were Age, Gender, smoking, type of surgeries, hospital stay, ICU stay and pulmonary function values (Table 3). There was a statistical significant correlation between the incidences of complications and the pulmonary function values in these patients with COPD. (p value was 0.001, p significant at <0.05)

Table 4: Showing the complications, Hospital stay and Prognosis of patients in the study (n-84)

Complications	General Surgery- %	Orthopaedics- %	P value
Pneumonia	04- 09.52	03- 07.14	0.001
Septicemia	02- 04.76	03- 07014	
Acute renal failure	03- 07.14	05- 11.90	
Pulmonary embolism	01-02.38	0-0	
Stroke	02- 04.76	01- 02.38	
UTI	08- 19.04	02- 07.14	
Deep wound infection	09- 21.42	06- 14.28	
Ac MI	01- 02.38	0-0	
Extended ICU stay	07- 16.66	03- 09.52	
Mean duration of Hospital stay in Days	18.45±3.50	17.30±3.80	
Mortality	02- 07.14	03- 4.76	
Morbidity	28- 66.66	25- 59.52	

Discussion

This study was an attempt to understand the impact of COPD lung disease on postoperative adverse outcomes in General surgery and orthopaedic surgeries in a tertiary care Hospital. There was a use of propensity pulmonary function values matched to the procedure undertaken in patients with COPD receiving conventional treatment. It was observed that there was statistically significant association between the risk factors, COPD and increased risk of postoperative outcomes such as pneumonia, septicemia, acute renal failure, pulmonary embolism, stroke, urinary tract infection, and subsequent 30-day in-hospital morbidity. The hospital stays were prolonged and longer stays in the ICU, increasing the medical expenditure to the patient and his /her family. Similar earlier studies were conducted in different parts of the world, but they were limited to certain specialties with very small numbers [15-18]. In the present study except open thorax surgeries in the General surgery category and multiple comminuted fractures in orthopedics all other surgeries were undertaken. Among the 84 COPD patients included in these study patients with co-morbid conditions (hypertension, mental disorder, ischemic heart disease, diabetes, heart failure, Parkinson's disease, chronic kidney disease, hyperlipidemia, liver cirrhosis and renal dialysis) were avoided so that the impact of COPD on the included subjects was properly and correctly assessed. But there are other studies which

included the co-morbid diseases [19,20]. To minimize the possibility of bias from the risk factors like age, Gender, socio economic groups, type of surgery we used a multivariate regression matching procedure in this study. In similar study by Berry MF, Villamizar-Ortiz N *et al* [21]. pneumonia, respiratory failure and prolonged intubation were the common conditions observed during and after the emergency surgeries of general surgery and orthopedics.

They contemplated that altered gas exchange; airway inflammation were the possible causes of the increased chances of pulmonary complication in COPD patients undergoing major surgeries. Cerfolio RJ, Bryant AS *et al* and Liptay MJ, Basu S *et al* [22,23]. observed increased risk of Cerebro-vascular stroke; their contention was that the mechanism was not fully studied. In this study 03/42 patients developed stroke; (02- General surgery and 01- orthopaedics), (Table 4). In majority of the patients the complications are due to initial trigger by airway infection followed by systemic inflammation [24]. The inflammatory mediators included fibrinogen, C reactive protein. Another explanation given was absence of physical activity in the life of these COPD patients [25] In this study UTI, septicemias and deep wound infections were also encountered in patients (02, 08 and 09 patients in General surgery and 03, 02 and 06 patients in orthopaedics surgeries), (Table 4). Similar reports were published showing Lung-specific and systemic immune dysfunctions resulting in same complications by Win T, Jackson A *et al* [26]. Pulmonary embolism was observed in 01 patient belonging to the general surgery group. Nakagawa T, Tomioka Y, Toyazaki T, *et al* reported that Pulmonary embolism was frequently seen in COPD patients with acute exacerbations following major surgeries [27]. Acute renal failure was observed in 08 patients (02 in general surgery and 03 in the orhtpaedics group of patients) with COPD This observation was consistent with other similar studies by Olsen GN, Weiman DS *et al* after non-cardiac surgeries [28]. Patients undergoing emergency surgery were reported as having higher rates of mortality as well as respiratory failure than non-emergency surgery patients [29,30].

Conclusions

Patients with COPD showed more adverse events, with a risk of in-hospital morbidity and mortality after emergency General surgery and orthopaedics surgeries. Peri-operative latest controlled protocols, optimization are a must to prevent impact of COPD on postoperative outcomes in the emergency surgeries. Pulmonary function tests should be made compulsory in assessing the severity of COPD in the patients undergoing Emergency surgeries.

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