Incidence and Outcomes of Community Acquired Pneumonia in Patients with Chronic Obstructive Pulmonary Disease at King Abdulaziz Medical City, Riyadh.

ABSTRACT (ARIAL, BOLD, 11 FONT, LEFT ALIGNED, CAPS)

Aims: The aim of the study was to estimate the incidence of Community-acquired pneumonia (CAP) among patients with chronic obstructive pulmonary disease (COPD).

Study design: A retrospective cohort study

Place and Duration of Study: King Abdulaziz Medical City in Riyadh between January 2016 to March 2018

Methodology: From the medical file, we identified patients with COPD diagnosis who admitted to the hospital. Then we identified the patient who develop CAP after the diagnosis date of the COPD. Other variables such as demographic factors, clinical outcome, comorbidity disease, length of stay in the hospital, and mortality were identified for each patient using their electronic medical file.

Results: Out of 363 COPD patients, 122 (33%) had developed CAP after the date of COPD diagnosis. Based on patient characteristics, the mean age of them was 75.39 years SD was 9.76 and 65% of the patients were female. The available evidence indicates that the mortality rate was n=22 (18.0%). Among those patient, 33 patients were admitted to ICU (27.0%) the rest of patients either wards n= 59 (48.4%) or both n=28 (23.0%). (97.4%) had hypertension, (88.6%) of the patients had diabetes, and (28.9%) had renal failure. The patients on Non-invasive ventilation and tracheostomy were n=94 (77.0%) and n=7 (5.7%) respectively.

Conclusion: This study has been shown that COPD patients had increased risk of CAP. Patients who have multiple comorbidity diseases and got CAP with COPD have a higher risk of morbidities and mortality rate, especially elderly patients. Mention the design of the study here.

*Keywords: [*Community-acquired pneumonia**,** chronic obstructive pulmonary disease, King Abdulaziz Medical City

* Tel.: +xx xx 265xxxxx; fax: +xx aa 462xxxxx.
E-mail address: xyz@abc.com.

1. INTRODUCTION (ARIAL, BOLD, 11 FONT, LEFT ALIGNED, CAPS)

Community acquired pneumonia (CAP) is a major cause of hospitalization, complications, and death among adults in United State (US) especially oldest people whose immune system are often insufficient [1, 2]. The World Health Organization (WHO) estimates that lower respiratory tract infection is the most common cause of death due to infection with almost 3.5 million deaths yearly [1]. CAP is acute infection of pulmonary parenchyma in a patient who has acquired the infection from the community and occurs outside hospital due to bacteria, virus, fungi and continues to be a leading cause of death worldwide and major public health challenge [3-5]. Streptococcus pneumoniae is the most common pathogen that causes CAP, followed by Pseudomonas aeruginosa, Chlamydia pneumonia, and Haemophilus influenzae [6]. Elderly people have an increased risk of developing CAP than other age groups and incidence of CAP is four times than in younger people [7]. CAP occurs commonly in patients with chronic obstructive pulmonary disease (COPD) as a result of impairment in lung defense. A recent population database analysis showed that patients with COPD especially those patients whose age >60 years are at increased risk to have CAP [8]. A COPD is a lung disease characterized by impaired and progressive airflow limitation with worsening symptoms over time especially if the patient continues to expose to noxious particles such as the toxin, fumes, and smoking. COPD affected approximately 20 million Americans and it is considered as one of the most frequently reported as a comorbid condition and that increases the risk of hospitalization in CAP patients [9-11]. COPD patients can be affected by CAP which may lead to worsening outcomes especially in elderly patients such as morbidity, high mortality rate, increased length of stay in (ICU) and invasive mechanical ventilation [12].

Many studies have examined the association between CAP and COPD, however there is little have been done regarding identifying the risk factor for COPD patients to develop CAP [13-16]. Although COPD patients are considered a risk factor for the development of CAP and may contribute in increasing morbidity and mortality, it has not been identified as a risk factor for mortality in some studies [16-18] and some studies exhibited higher mortality rates and morbidity for COPD patients with CAP than patients without COPD [12,19,20].The aim of this study therefore, was to identify the reasons and risk factors of CAP among COPD patients and to know the epidemiology of CAP in COPD in King Abdulaziz Medical City (KAMC) at Riyadh.

2. MATERIAL AND METHODS

A cohort study was conducted during the period of January 2016 –March 2018 at King Abdualziz Medical city (KAMC) in Saudi Arabia. All female and male COPD patients older than 40 years old were included. We excluded patients. patients with life-threatening diseases (advanced malignant tumor, tuberculosis, head injury) patient with other types of pneumonia such as health care-associated pneumonia, ventilator-associated pneumonia, hospital -acquired pneumonia) and patients with restrictive lung diseases.

2.1 Study variables: The main target of this study was the incidence of CAP. Patient medical files were searched for documented diagnosis of CAP among patients who met our inclusion criteria. Demographic data such as age, gender, weight, height, and history of smoking were collected from medical record of each patient. Other clinical data were also collected related to their ICU stay and the type of ventilator and the setting of the ventilator. Any comorbid conditions such as hypertension, diabetes and other chronic disease were documented. Other information related to tracheostomy rate, the CAP admission wards or ICU, length of stay in ICU, medications were also extracted for each medical file.

2.2 analysis plan: The collected data entered in Microsoft Excel and exported to SPSS version 22 for statistical analysis .Results represented in tables and figure forms. For normally distributed continuous variables, the results expressed as mean and standard deviation (SD) whereas in case where the variables are not distributed normally, the result

expressed as Median and Interquartile Range (IQR). The results expressed as percentage and frequency if it is the categorical variable. We estimated the incidence of CAP be dividing the number of patients who had CAP over the total number of COPD patients in specific time period.

3. RESULTS AND DISCUSSION

Based on the data from Best Care in KAMC, the number of COPD patients was 363 patients diagnosed with COPD during the period January 2016- March 2018. Out of 363 COPD patients, there are 122 patients (33.60%) diagnosed with CAP. Table 1 demonstrate the basic characteristics of our study population

Table 1.Demographic and characteristics data of patients:

Characteristics of patients	**Number (percentage %)**
Gender	
Male	42 (34.4%)
Female	80 (65.5%)
Age in years	
Mean	75.39
Standard deviation ± SD	9.80
Weight (kg)	
Mean	81.54 kg
Standard deviation ± SD	24.95
Height (cm)	
Mean	155.44 cm
Standard deviation ± SD	10.84
BMI (body mass index)	
Mean	34.5
Standard deviation± SD	13.8
Smoking history:	**Number (percentage %)**
Yes	28 (23.0%)
No	94 (77%)

The results showed that female COPD patients had greater incidence of community-acquired pneumonia than male patients. Female were 80 (65.6%) out of 122 on the other hand, males were 42 (34.4%) respectively. Their mean age was 75.39 years, the minimum age was 53, and maximum age was 97 years. The mean weight was 81.54, and the mean height was 155.44 cm. The mean for BMI was 34.5 and SD 13.8, as in the table 1. We noticed that most of patient did not have

Table 2: Different parameters assessed for COPD patients

Ventilator type:	**Number (percentage %)**
Invasive	28 (23.0%)
Non-invasive	94 (77.0%)
Tracheostomy done:	Number (percentage %)
Yes	7 (5.7%)
No	115 (94%)
Admission type:	Number (percentage %)
Ward	59 (48.4%)
ICU	33 (27.0%)
Both	28 (23.0%)
Emergency	2 (1.6%)
Ward	59 (48.4%)
Hospital outcomes:	Number (percentage %)
Discharge	99 (81.1%)
Died	22 (18.0%)
Still in hospital	1 (.8%)

In table 2 the data showed that most of COPD patients when get the CAP they did not need an invasive procedures such as intubation. 77.0% of CAP-COPD patients just needed non-invasive through CPAP, BIPAP or oxygen by different types of oxygen devices depended on the condition of patient while 28 out of 122 (23.0%) need invasive ventilator. In addition, most of COPD-CAP have less chance to get tracheostomy procedure. 115 of 122 (94%) patients never have tracheostomy procedure, while 7out of 122 (5.7%) patients had tracheostomy. The data results showed that most of COPD-CAP patients were admitted to the ward 48.4% because there was a not exacerbation in their condition and just need continuous care in the ward after they admitted to emergency room. 27% of them were admitted to intensive care unit because of exacerbation especially if patient had another comorbidities disease while only 2% of them admitted to emergency room and treated as an outpatient.

The data showed that majority of patients improved and got discharge 99 (81.1%) while 22 (18.0%) of patients died, 1 (.8%) patient still in hospital due to exacerbation of condition. Data results showed that 97 (79.5%) out of 122 patients use oxygen devices at home, while 25 (20.5%) do not use oxygen devices at home. The most common oxygen device according to data analysis is oxygen 75 (77.3%). Eight (8.2%) of patients use BIPAP and 12 (12.4%) use CPAP. The rest of patients 2 (2.1%) use O2+CPAP.

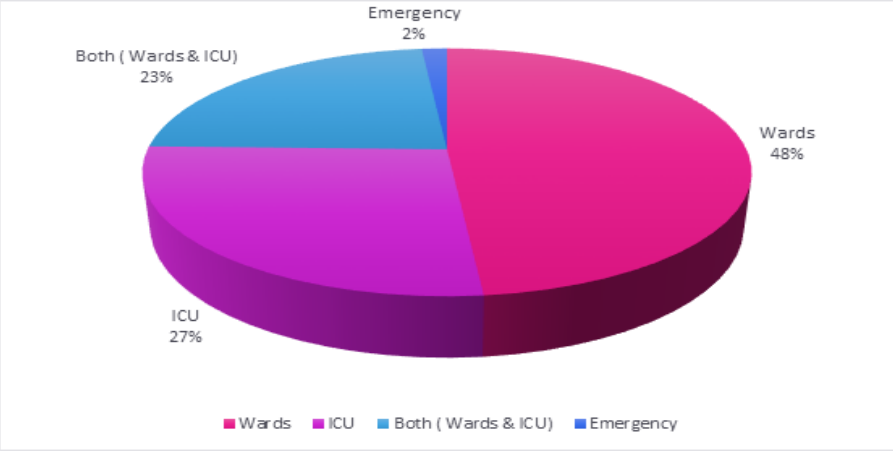

Fig 1: Pie diagram showing the admission type in hospital of CAP-COPD patients

The ABGs results are presented in table 3. There is decreasing in Pao2 from 69.77 to 60.33 mmHg due to the infection and may there was exacerbation in their condition, but their saturation SpO2 is approximately 90 % which mean normal according to COPD patients (88-90%). Other results (PH, Paco2, HCO3) are approximately normal.

Table 3 Pre and Post ABGs

ABGs	Mean	Standard deviation
Pre-PH	7.3464	.09245
Post-PH	7.3672	.07008
Pre-pco2	61.0048	17.09443
Post-pco2	61.4673	56.52273
Pre-po2	69.7769	60.23703
Post-po2	60.3394	18.18513
Pre-HCO3	35.0709	35.01057
Post-HCO3	31.2971	7.57046

It is found that patients having CAP with COPD have co-morbidities associated with their condition. Among those morbidities, the majority have hypertension 111 (97.4%), diabetes *mellitus* is 101(88.6%), and renal failure is 33(28.9%). 94 out of 122 (77.0%) CAP-COPD patients do not have history of smoking while 28 out of 122 (23.0%) have smoking history.

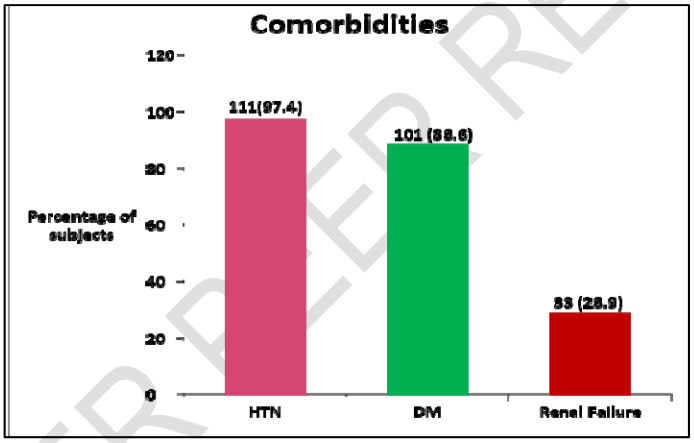

Figure 2: Bar diagram showing the distribution of comorbidities among the subjects.

4. CONCLUSION

The results of this study showed that out of 363 COPD patients, the incidence of CAP was 36.30% (122 patients). We noted that most of the patients who got CAP was female populations n= 80 (65.6%) while male populations were n= 42 (34.4%) and the average age of the patients was 75 years. The majority of patients when they get CAP, their condition was not exacerbation and just need either oxygen therapy 77.3 % or non-invasive ventilation.

Many studies have been carried out that examined the association between CAP and COPD to compare our results to their findings. One of the studies conducted at had showed increasing in morbidity and mortality rate [13].This study concluded that overall ICU mortality was 23.9%. While noninvasive ventilation, shorter length of stay in ICU were associated with lower rate mortality and longer duration of invasive mechanical ventilation is associated with increased risk of mortality in COPD-CAP patients [13]. In our study we noted that most of the patients just coming as outpatient clinics and taking antibiotics

medications or admitted to ward. Patients when get CAP was no exacerbation on their condition. On the other side, there are more articles found that COPD- CAP patients do not lead to mortality (6) . They did not found any evidence that CAP in COPD patient leads to increase the rate of mortality but the most frequent reported with co-morbidities. While in our study the mortality rate was n=22(18.0%) out of 122.
As this study is observational in nature, there is many limitation of this study. One of our limitations in this study is pulmonary function test-which help to determine the severity of COPD either mild, moderate, or severe and was one of our variables in data collection, but we did not find pulmonary function test for each subject in the best care which is the database provided by KAMC. Other limitations is pre and post ABGs not all the samples in our study have pre-post ABGs in their flow sheet or the values were not completed in electronic medical records Also, P/F ratio which is one of the parameters for ABGs was not collected due to that not all patients have this ratio. P/F ratio is important to explain why the patients get worse outcomes according to oxygenation level in the blood.

In conclusion, CAP is common in patients with COPD especially in older patients. The results showed that as comparing with other researchers, the morbidity and mortality rate, invasive ventilations, and ICU admission were low. More researches in the future recommended to determine the mortality rate in COPD patients without CAP as comparing with our study and what is the most common morbidity disease that related to CAP-COPD patients. Our recommendations is to manage COPD patients when got CAP because they easily can deteriorate and develop critical conditions especially significant elderly patients. Therefore, elderly COPD patients should take care of themselves because they have high chance to get CAP many times.

COMPETING INTERESTS

non

CONSENT (WHERE EVER APPLICABLE)

No patients consent were needed for this study

ETHICAL APPROVAL

This study have been approved by King Abdullah International Medical Research center IRB approval committee.

REFERENCES

1. Jain S, Self WH, Wunderink RG, Fakhran S, Balk R, Bramley AM, et al. Community-Acquired Pneumonia Requiring Hospitalization among U.S. Adults. N Engl J Med. 2015;373(5):415–27.

2. Cilli A, Erdem H, Karakurt Z, Turkan H, Yazicioglu-Mocin O, Adiguzel N, et al. Community-acquired pneumonia in patients with chronic obstructive pulmonary disease requiring admission to the intensive care unit: risk factors for mortality. J Crit Care. 2013 Dec 1

3. Zaroukian MH. Comorbidity, but not age, predicted hospital and 2-year mortality for patients hospitalized with community-acquired pneumonia. ACP J Club. 1993;119:86. doi: 10.7326/ACPJC-1993-119-3-086

4. Cecere LM, Rubenfeld GD, Park DR, Root RK, Goss CH. Long-term survival after hospitalization for community-acquired and healthcare-associated pneumonia. Respiration. 2009;79(2):128–36.

5. Restrepo MI, Faverio P, Anzueto A. Long-term prognosis in community-acquired pneumonia. Current opinion in infectious diseases. 2013;26(2):151-158. doi:10.1097/QCO.0b013e32835ebc6d.

6. Snijders D, Van Der Eerden M, De Graaff C, Boersma W. The influence of COPD on mortality and severity scoring in community-acquired pneumonia. Respiration. 2009;79(1):46–53

7. Janssens JP, Krause KH. Pneumonia in the very old. Vol. 4, Lancet Infectious Diseases. 2004. p. 112–24.

8. Lin S-H, Perng D-W, Chen C-P, Chai W-H, Yeh C-S, Kor C-T, et al. Increased risk of community-acquired pneumonia in COPD patients with comorbid cardiovascular disease. Int J Chron Obstruct Pulmon Dis. 2016;Volume 11:3051–8.

9. Farr BM, Bartlett CLR, Wadsworth J, Miller DL. Risk factors for community-acquired pneumonia diagnosed upon hospital admission. Respir Med. 2000;94(10):954–63.

10. Dai R-X, Kong Q-H, Mao B, Xu W, Tao R-J, Wang X-R, et al. The mortality risk factor of community acquired pneumonia patients with chronic obstructive pulmonary disease: a retrospective cohort study. BMC Pulm Med. 2018;18(1):12.

11. Fine MJ, Smith MA, Carson CA, Mutha SS, Sankey SS, Weissfeld LA, et al. Prognosis and outcomes of patients with community-acquired pneumonia. A meta-analysis. J Am Med Assoc. 1996;275(2):134–41.

12. Restrepo MI, Mortensen EM, Pugh JA, Anzueto A. COPD is associated with increased mortality in patients with community- acquired pneumonia. Eur Respir J .2006;28(2):346–51.

13. Erdem H, Turkan H, Cilli A, Karakas A, Karakurt Z, Bilge U, et al. Mortality indicators in community-acquired pneumonia requiring intensive care in Turkey. Int J Infect Dis. 2013;17(9).

14. Dai R-X, Kong Q-H, Mao B, et al. The mortality risk factor of community acquired pneumonia patients with chronic obstructive pulmonary disease: a retrospective cohort study. BMC Pulmonary Medicine. 2018;18:12.doi:10.1186/s12890-018-0587-7.

15. Dionne C.W. Braeken, MSc1 2, Frits M.E. Franssen, MD P, Hartwig Schütte, MD P, Robert Bals, MD P, Mathias W. Pletz, MD P, Peter Martus P, et al. Increased Severity and Mortality of CAP in COPD: Results from the German Competence Network, CAPNETZ. Chronic Obstr Pulm Dis COPD Found. 2015;2(2):131–40.

16. Snijders D, Van Der Eerden M, De Graaff C, Boersma W. The influence of COPD on mortality and severity scoring in community-acquired pneumonia. Respiration. 2009;79(1):46–53

18. Marcos MA, Mensa J, Bello S, Liapikou A, Polverino E, Ewig S, et al. Severity and outcomes of hospitalised community-acquired pneumonia in COPD patients Eur Respir J. 2012;39(4):855–61.

19. Müllerova H, Chigbo C, Hagan GW, Woodhead MA, Miravitlles M, Davis KJ, et al. The natural history of community-acquired pneumonia in COPD patients: A population database analysis. Respir Med. 2012;106(8):1124–33.

20. Rello J, Rodriguez A, Torres A, Roig J, Sirvent JM. Implications of COPD in patients admitted to the intensive care unit by community- acquired pneumonia. Eur Respir J . 2006;27(6):1210–6.