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Respiratory Medicine

"RESPIRATORY VIRAL INFECTION: AN UNDERRATED ENTITY THAT NEED TO CONSIDER IN MANAGEMENT OF ACUTE EXACERBATION OF COPD"

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ABSTRACT **BACKGROUND:** Acute exacerbation of COPD (AECOPD) is one of the most common cause of hospital admission. It causes significant morbidity, mortality and inexorable decline in ling function. Many exacerbations are believed to be due to upper and/ lower respiratory tract viral infections, but the incidence of these infections in patients with COPD is still undetermined. Objectives of the study are-(a) To find out the viral etiology in patients having acute exacerbation of COPD. (b) To correlate the severity of COPD patients having exacerbations with viral etiology.

METHODS: This cross-sectional study was carried out on 70 AECOPD patients admitted in department of Respiratory Medicine, Institute of Respiratory Diseases, SMS Medical College, Jaipur during July 2019–June 2020. Demographic and clinical parameters were recorded from each patient during admission. Twin nasopharyngeal/oropharyngeal swabs were collected and are tested for Respiratory viruses via RT-PCR.

RESULTS: Respiratory viruses were detected in 15 of 70 (21.42%) patients during exacerbations of COPD. The viruses detected were influenza (10%), rhinovirus (5.71%), adenovirus (4.29%) and RSV (1.42%). Majority of the patients had exacerbations in severe COPD subgroup, had duration of hospital stay of more than or equal to 5 days, had one episode of acute exacerbation per year and 5, 9, 11 respiratory viruses were detected in this group respectively.

CONCLUSION: Viral infections seem to contribute to the exacerbations of COPD in our settings and should be strongly considered in the management of such patients. Considering appropriate antiviral therapy can timely reduce morbidity in an event of an influenza viral exacerbation.

KEYWORDS : Respiratory viruses, AECOPD, antiviral therapy, morbidity.

INTRODUCTION

Exacerbations of COPD are a leading cause of hospitalization and healthcare expenditures. It alters the health-related quality of life and the natural course of disease, increasing the risk of mortality, both during and after the acute event[(1)] So COPD exacerbations account for the greatest proportion of the total COPD burden on the health care system.

Infectious agents are recognized as a major pathogenic factor in exacerbations. In stable COPD patients and during exacerbation, the pulmonary microbiota changes its composition, and keeps changing during disease progression. Because of the alterations in quantity and functioning of cells in the COPD immune system, viruses and bacteria could present a different pathogenicity[12], and their interaction with the COPD respiratory system is a major cause of exacerbations.

Exacerbations of COPD form one of the most common medical admissions, especially during winter when respiratory viral infections are common. Exacerbations are regarded to be infective in most cases, and viruses are believed to be a common cause of exacerbations. Present study aims to correlate the severity of COPD patients having exacerbations with viral etiology apart from finding out the viral etiology in patients having acute exacerbation of COPD.

MATERIALS AND METHODS

The present study consisted of 70 acute exacerbation of COPD patients of either sex, aged >40 years who have admitted at the department of the hospital from July 2019 to June 2020.Patients were excluded based on the following criteria:(i) Clinical or lab parameters suggestive of bacterial etiology. (ii) Total leucocyte count >11000 cells/mm^3. (iii) Patient vaccinated for influenza within 1 year. Approval of the Institutional Ethical Committee was taken prior to the study.

COPD Exacerbation is recognized based on Clinical symptoms (increased shortness of breath/increased cough frequency or severity/increased sputum amount or purulence), Physical examination (use of accessory muscles of respiration, wheezing). The admitted AECOPD patients clinical data including symptoms and physical examination, Type of Hospital admission whether in ward or ICU, number of admissions with AECOPD during the 12 months prior to admission, Previous ECG records and spirometry records to grade severity of COPD were recorded. Chest Radiography, Electrocardiography (ECG) were done. Duration of hospital stay during the treatment period were also recorded.

Specimen collection and processing

Twin nasopharyngeal/oropharyngeal swabs were collected from the patients[(2)]. Nasopharyngeal sample was obtained from one nostril while an oropharyngeal swab was obtained from both sides of throat using a sterile, flexible, thin, flocked swab. Specimens were collected and stored in a collection tube with 5 mL virus preservation solution. RNA was isolated with an automatic nucleic acid extraction system(Tianlong, Xi'an, China). Individual real-time reverse transcriptase (RT-PCR) assays for the detection and subtyping of adenovirus, influenza subtypes A/B/C, human metapneumovirus, human rhinovirus, parainfluenza virus subtypes 1–4, and respiratory syncytial virus were performed. All specimens were tested for RNase P to confirm RNA integrity and monitor for PCR inhibitors. Samples were run in batches on an ABI Step One Plus 96-well real-time PCR instrument. Specimens were considered positive if the Ct value was <40 cycles.

STATISTICAL ANALYSIS

Continuous data were assumed to be of non-parametrical distribution and results were expressed as median (range). Differences between groups were assessed by the Mann Whitney U test. For discrete variables, frequencies and percentages were reported and compared using the $\chi 2$ test or Fisher's exact test where appropriate. All significance levels were set to 5%. Data were analyzed and processed using SigmaStat Version 2.0 on a Windows 98 operating system.

RESULTS

Our study showed 59 male patients and 11 female patients with age ranging from 48 to 80 years. In male patients, 12 respiratory viruses were detected and in female patients, 3 respiratory viruses were

detected. Majority of the patients have presented with shortness of breath (64/70, 91.4%) & duration of hospital stay ranged from 3- 10 (median 5) days.

Our study showed that 38 (54.29%) patients had more than 65 years of age & 7 (18.42%) respiratory viruses were detected in this age group. 32 (45.71%) patients had less than 65 years of age & 8 (25%) respiratory viruses were detected in this age group.

Table 1 depicts that Maximum no. of cases (n=26) had exacerbation in severe COPD subgroup & 5 (19.23%) viruses were detected in this type of severity. Out of 5, influenza (7.7%), adenovirus (7.7%) & rhinovirus (3.85%) were detected. In very severe COPD patients with exacerbation (n=19, 27.14%), only influenza (21.05%) virus was detected. In moderate COPD patients with exacerbation (n=14, 20%), rhinovirus (14.28%) & adenovirus (7.14%) were detected. In mild COPD patients (n=11,15.71%), influenza virus (9.09%), rhinovirus (9.09%) & RSV (9.09%) were detected.

Table 2 depicts that 41 patients had duration of hospital stay of more than or equal to 5 days and 21.95% relative percentage of virus detection was seen. Out of 9 viruses that detected, influenza (14.63%), rhinovirus (2.44%), adenovirus (2.44%) & RSV (2.44%) were seen. 29 patients had less than 5 days stay in hospital & 20.68% relative percentage of virus detection was seen. Out of 6 viruses that detected, influenza (3.45%), rhinovirus (10.35%) & adenovirus (6.90%) were seen.

Table 3 depicts that 55 patients had one episode of acute exacerbation per year but the relative percentage of virus detection was 10.52% in this category. Out of 11 viruses, influenza (5.45%), rhinovirus (7.28%), adenovirus (5.45%) & RSV (1.81%) were detected.

Table 4 depicts that 45 patients were admitted in ward and 22.22% relative percentage of virus detection was seen. Out of 10 viruses, influenza (4.44%), rhinovirus (8.89%), adenovirus (6.67%) & RSV (2.22%) were detected. 25 patients were admitted in ICU & 20.00% relative percentage of virus detection was seen. Out of 5 viruses, only influenza virus was detected.

Table 1: Association of exacerbation with severity of COPD and pattern of respective viruses in case group

No of exacerbation per year	n (%)	Influenza n(%)	Rhinovirus n(%)	Adenovirus n(%)	RSV n (%)
1	55 (78.57)	3(5.45)	4(7.28)	3(5.45)	1(1.81)
2	14(20)	3(21.42)	0(0)	0(0)	0(0)
3	1(1.43)	1(100)	0(0)	0(0)	0(0)

Table 2: Association of duration of hospital stay with pattern of respective viruses in case group

Severity Of COPD	n (%)	Influenza n(%)	Rhinovirus n(%)	Adenovirus n(%)	RSV n (%)
Mild	11 (15.71)	1(9.09)	1(9.09)	0(0)	1(9.09)
Moderate	14(20)	0(0)	2(14.28)	1(7.14)	0(0)
Severe	26(37.15)	2(7.7)	1(3.85)	2(7.70)	0(0)
Very Severe	19 (27.14)	4 (21.05)	0(0)	0(0)	0(0)

Table 3: Association of number of exacerbation per year with pattern of respective viruses in case group

Duration of hospital stay	n (%)	Influenza n(%)	Rhinovirus n(%)	Adenovirus n(%)	RSV n (%)
Less than 5 days	29(41.43)	1(3.45)	3(10.35)	2(6.90)	0(0)
More than or equal to 5 days	41(58.57)	6(14.63)	1(2.44)	1(2.44)	1(2.44)

Table 4: Association of type of hospital admission with pattern of respective viruses in case group

Type of hospital admission	n (%)	Influenza n(%)	Rhinovirus n(%)	Adenovirus n(%)	RSV n (%)
Ward	45(64.29)	2(4.44)	4(8.89)	3(6.67)	1(2.22)
ICU	25(35.71)	5(14.63)	0(0)	0(0)	0(0)

DISCUSSION

Acute exacerbations of chronic obstructive pulmonary disease (AECOPD) are a common cause of hospital admission. Many exacerbations are believed to be due to upper and/or lower respiratory tract viral infections, but the incidence of these infections in patients with COPD is still undetermined. Bacteria, viruses and environmental agents account for the vast majority of episodes of exacerbation.

Our study showed that respiratory viruses were detected in sputum and nasal/ throat swabs in 15 of 70 (21.42%) patients during exacerbations of COPD which is comparable to results obtained by Ko FW et al[3] who found that the presence of viruses in COPD airways was roughly 20%.but less than the findings of Seemungal et al. (39.2%)[4] , Beckham et al. (41.8%)[5] and Rohde et al. (56%).[6]

In our study, influenza (10%), rhinovirus (5.71%), adenovirus (4.29%) and RSV (1.42%) pathogens were detected. In a recent systematic review[7] of 19 studies involving 1728 patients with AECOPD, rhino/enteroviruses was found to be the most common (16.39%) pathogens involved followed by RSV (9.90%), influenza (7.83%) coronaviruses (4.08%), PIV (3.35%), adenovirus (2.07%), hMPV (2.78%), and bocaviruses (0.56%).

Our study showed that the 38 (54.29%) patients had more than 65 years of age & 7 (18.42%) respiratory viruses were detected in this age group. The recruited patients included 59 male and 11 female. A study done by Parvaiz A Koul et al[2] reported that out of the 233 recruited patients, 152 were male and 81 were female patients with age ranging from 40 to 100 (median 65) years. McManus TE et al[8] found no associations were seen between viral infection and patient sex or medication.

Our study showed that the maximum no. of cases (n=26) had exacerbation in severe COPD subgroup & 5 (19.23%) viruses were detected in this type of severity. McManus TE et al[8] concluded that viruses were more commonly detected in those with more severe airways disease.

Our study showed that 41 patients had duration of hospital stay of more than or equal to 5 days and 21.95% relative percentage of virus detection was seen. Out of 9 viruses, influenza (14.63%), rhinovirus (2.44%), adenovirus (2.44%) & RSV (2.44%) were detected. 29 patients had less than 5 days stay in hospital & 20.68% relative percentage of virus detection was seen. Out of 6 viruses, influenza (3.45%), rhinovirus (10.35%) & adenovirus (6.90%) were detected which was similar to the study conducted by McManus TE et al[8]

Our study showed that the 55 patients had one episode of acute exacerbation per year but relative percentage of virus detection was 10.52% in this category. Out of 11 viruses, influenza (5.45%), rhinovirus (7.28%), adenovirus (5.45%) & RSV (1.81%) were detected. McManus TE et al[8] found a respiratory virus was more frequently detected during exacerbations in patients with more severe airways disease, $p < 0.05$.

Our study showed that 45 patients were admitted in ward and 22.22% relative percentage of virus detection was seen. Out of 10 viruses, influenza (4.44%), rhinovirus (8.89%), adenovirus (6.67%) & RSV (2.22%) were detected. 25 patients were admitted in ICU & 20.00% relative percentage of virus detection was seen. Out of 5 viruses, only influenza virus was detected. Rohde G et al[6] concluded that viral respiratory pathogens are found more often in respiratory specimens of hospitalized patients with AE-COPD than in control patients.

CONCLUSION

Viral infections seem to contribute to the exacerbations of COPD in our settings and should be strongly considered in the management of such patients. Considering appropriate antiviral therapy can timely reduce morbidity in an event of an influenza viral exacerbation.

REFERENCES

1. Soriano JB, Brusasco V, Dinh-Xuan AT. The European Respiratory Journal makes COPD a priority. Eur Respir J 2011; 38: 999–1001.
2. Koul PA, Khan UH, Asad R, Yousuf R, Broor S, Lal RB, et al. Contribution of influenza to acute exacerbations of chronic obstructive pulmonary disease in Kashmir, India, 2010-2012. Influenza Other Respir Viruses 2015;9:40-2.
3. Ko FW, Ip M, Chan PK, Chan MC, To KW, Ng SS, Chau SS, Tang JW, Hui DS: Viral etiology of acute exacerbations of COPD in Hong Kong.Chest 2007, 132:900-908.
4. Seemungal T, Harper-Owen R, Bhowmik A, Moric I, Sanderson G, Message S, Maccallum P, Meade TW, Jeffries DJ, Johnston SL, Wedzicha JA: Respiratory viruses, symptoms, and inflammatory markers in acute exacerbations and stable chronic obstructive pulmonary disease. *Am J Respir Crit Care Med* 2001; 164 (9):1618-1623.
5. Beckham JD, Cadena A, Lin J, Piedra PA, Glezen WP, Greenberg SB, et al. Respiratory viral infections in patients with chronic, obstructive pulmonary disease. J Infect 2005; 50(4):322e30

6. Rohde G, Wiethege A, Borg I, Kauth M, Bauer TT, Gillissen A, et al. Respiratory viruses in exacerbations of chronic obstructive pulmonary disease requiring hospitalisation: a case-control study. Thorax 2003;58(1):37e42.
7. Zwaans WA, Mallia P, van Winden ME, Rohde GG. The relevance of respiratory viral infections in the exacerbations of chronic obstructive pulmonary disease – A systematic review. J Clin Virol 2014;61:181-8.
8. McManus TE, Marley AM, Baxter N, Christie SN, O'Neill HJ, Elborn JS, Coyle PV, Kidney JC: Respiratory viral infection in exacerbations of COPD. Respir Med 2008;102:1575-1580.