Prevalence and Clinical Outcomes of COVID-Associated Pulmonary Fibrosis

Andrew J Vogler, PharmD[1,2]; Anselmo Garcia, MD[2,3]; Neema Mafi, MD[2,4]; Chad M. VanDenBerg, PharmD, MS, BCPP[5]; Vanthida Huang, PharmD, BSPHM, FCCP[1,2]

[1]Midwestern University College of Pharmacy-Glendale Campus, Glendale, AZ; [2]HonorHealth John C. Lincoln Medical Center, Phoenix, AZ; [3]Arizona Critical Care Specialists (AZCCS), Phoenix, AZ; [4]Apex Physicians Group, Phoenix, AZ; [5]Midwestern University Clinical Research Services, Glendale, AZ

avogle@midwestern.edu
@avogue22

IDWeek 2022
Poster #286

BACKGROUND

Pulmonary fibrosis (PF) is a well-known consequence of severe lung disease and is associated with permanent changes as well as irreversible pulmonary dysfunction.[1,2] The development of PF in patients infected with coronavirus disease (COVID-19) has been documented in multiple studies and case reports.[3-5] Prior literature show the prevalence of COVID-19-associated PF range from 1-87%.[6-8] However, the prevalence and outcomes associated with PF have not been well established. Therefore, we sought to evaluate the clinical outcomes and prevalence of PF in patients infected with COVID-19.

METHODS

Study Design: Observational retrospective cohort from January 1, 2020 to July 31, 2022.

Inclusion Criteria	Exclusion Criteria
• Hospitalized adults diagnosed with COVID-19 with at least 2 separate computerized tomography (CT) scans.	• Patients with baseline PF identified on initial CT. • Patients with definite causes of PF other than COVID-19.

Cohorts: Adult patients (≥ 18 years) with and without PF on follow-up CT.

Primary objective: To determine the prevalence rate of PF in patients with COVID-19.

Secondary objectives: To evaluate the 30-day all-cause mortality, intensive care unit (ICU) mortality, and rate of secondary infection.

Statistical Analysis: Demographic data was analyzed using descriptive statistics (mean, median, mode). Categorical data was analyzed using Chi-square test or Fisher exact test, with a Student's T-test or Mann-Whitney U test used for continuous variables.

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RESULTS

Table 1: Baseline Demographics

	Fibrosis (n=58)	No Fibrosis (n=190)	P-Value
Mean Age, years (SD)	65 (15)	65 (16)	0.96
Male, n (%)	33 (56.9)	94 (49.5)	0.32
Caucasian, n (%)	41 (70.7)	168 (88.4)	<0.01
Other, n (%)	17 (29.3)	22 (11.6)	<0.01
APACHE-II (mean)	26.4±23.5	10.8±13.9	<0.01
Comorbidities, n (%)			
• Hematologic Disease	22 (37.9)	83 (43.7)	0.44
• Immunosuppression	5 (8.6)	7 (3.7)	0.13
• Diabetes	17 (29.3)	75 (39.5)	0.16
• Obesity	17 (29.3)	54 (28.4)	0.90
• Cardiovascular Disease	40 (69.0)	123 (64.7)	0.55
• Respiratory Disease	21 (36.2)	55 (29.0)	0.29
• Renal Disease	18 (31.0)	75 (39.5)	0.25
• Prior History of Smoking	28 (48.3)	79 (41.6)	0.37

Table 2: Admission Characteristics

	Fibrosis (n=58)	No Fibrosis (n=190)	P-Value
ICU Admission, n (%)	26 (44.8)	33 (17.4)	<0.01
Length of Stay, means days (SD)	21.5 (16.5)	11.2 (12.8)	<0.01
Mechanical Ventilation, n (%)	13 (22.4)	16 (8.4)	<0.01
Vasopressor n (%)	16 (27.6)	5 (2.6)	<0.01
Renal Replacement n (%)	20 (34.5)	17 (9.0)	<0.01
COVID-19 Therapy, n (%)			
Remdesivir	24 (41.4)	32 (16.8)	<0.01
Dexamethasone	35 (60.3)	71 (37.4)	<0.01
Interleukin-6 inhibitor	7 (12.1)	1 (0.5)	<0.01
Janus kinase inhibitor	2 (3.5)	0 (0)	0.01
Monoclonal antibody	1 (1.7)	0 (0)	0.07
Vaccination Status, n (%)			
Complete Vaccination	1 (1.7)	10 (5.3)	0.25
Received at least 1 vaccination	3 (5.2)	9 (4.7)	0.89

RESULTS

Figure 1: COVID-19 Pulmonary Fibrosis Mortality

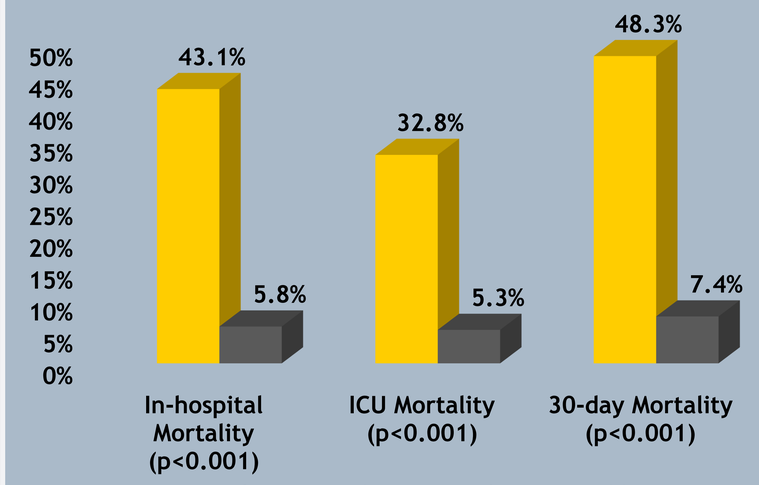

Table 3: Secondary Bacterial Infection

	Fibrosis (n=21)	No Fibrosis (n=39)	P-Value
Nosocomial n(%)	14 (66.7)	21 (53.9)	0.01
Source of Infection, n (%)			
Blood	5 (23.8)	11 (28.2)	0.44
Respiratory	12 (57.1)	8 (20.5)	<0.01
Intra-abdominal	0 (0)	2 (5.1)	0.43
Urine	4 (19.1)	18 (46.2)	0.55
Pathogen, n (%)			
Acinetobacter baumannii	2 (9.5)	0 (0)	0.05
Enterobacterales	6 (28.6)	18 (46.2)	0.18
Staphylococcus aureus	6 (28.6)	7 (18.1)	0.34
• Methicillin-Resistant	4 (19.1)	5 (12.8)	0.52
Pseudomonas aeruginosa	0 (0)	2 (5.1)	0.29

CONCLUSION

Prevalence of PF among hospitalized COVID-19 patients was 23% and is associated with high mortality. Patients with severe COVID-19 at baseline are predisposed to develop PF, required higher level of care. Further investigation into the role of vaccination, secondary bacterial infection, and PF prevention is warranted.