Factors Associated with Severe COVID-19 among Patients Hospitalized in Rhode Island

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BACKGROUND

To better understand patient factors that impact clinical outcomes in COVID-19, we performed a retrospective cohort study of patients hospitalized with COVID-19 in Rhode Island to identify patient and clinical characteristics associated with severe disease.

METHODS

We analyzed 259 patients admitted to our academic medical center during a three month period with confirmed COVID-19. Clinical data was extracted via chart review and lab results within the first 24 hours of admission were extracted directly from electronic medical records. Patients were divided in two groups based upon the highest level of supplemental oxygen (O2) required during hospitalization: severe COVID-19 (high flow O2, non-invasive, or invasive mechanical ventilation) and non-severe COVID-19 (low flow O2 or no supplemental O2). SAS 9.4 (Cary, NC) was used for statistical analyses. Chi-square or Fisher's exact tests for categorical variables and the Student's t-test for continuous variables were used to compare demographics, baseline comorbidities, and clinical data between the severe and non-severe groups.

RESULTS

Of 259 patients, 166 (64%) had non-severe disease, and 93 (36%) severe disease; median age [IQR] was 62 [51,73]. There were 138(53%) males and 75 (29%) Hispanics. Among non-Hispanics,124(48%) were White, 48(19%) African Americans, and 12(5%) other races. Sixty (23%) were admitted from a nursing facility and the in-hospital mortality rate was 15% (38/259). Severe COVID-19 was associated with older age (p=0.02), admission from nursing facility (p=0.009), increased BMI (p=0.03), diabetes mellitus (p=0.0002), and COPD (p=0.03).

At the time of presentation, severe COVID-19 was associated with tachypnea, hypoxia, hypotension (all p< 0.0001), elevated BUN (p=0.002) and AST (p=0.001), and acute or chronic kidney injury (p=0.01). Median hospital stay [IQR] was 11 days [7,18] in the severe vs. 6 days [3,11] in the non-severe group. In the severe group, 72% required ICU admission and 39% died.

CONCLUSION

In this cohort of patients with COVID-19, specific comorbidities, and vital signs at presentation were associated with severe COVID-19. These findings help clinicians with early identification and triage of high risk patients.

Table 1: Demographics

	n (%) or median [IQR]			
	All patients n=259	Non severe n=166 (%)	Severe group n=93 (%)	p-value
Median [IQR] age in years	62[51,73]	61[49,72]	65[56,74]	0.0254*
Gender				0.5251
Male	138	86(51.8)	52(55.9)	
Female	121	80(48.2)	41(44.1)	
Race/Ethnicity				0.1142
NH African Americans	48	24 (14.5)	24 (25.8)	
NH White Caucasians	124	82 (49.4)	42 (45.2)	
NH Others	12	7 (4.2)	5 (5.4)	
Hispanic / Latino#	75	53 (31.9)	22 (23.7)	
Health care worker				0.5057
Yes	15	11(6.6)	4(4.3)	
No	178	116(69.9)	62(66.7)	
Unknown	66	39(23.5)	27(29.0)	
SNF				0.0094*
Yes	60	30(18.1)	30(32.3)	
No	199	136(81.9)	63(67.7)	

SNF: Rehabilitation and skilled nursing facility; NH: Non- Hispanics; *p-values of <0.05
#5 African Americans also identified themselves as Hispanic/ Latino. They were excluded from NH African American group and included in Hispanic/ Latino group only.

Table 2: Medical comorbidities

	n (%) or median [IQR]			
	All patients n=259	Non severe n=166(%)	Severe group n=93(%)	p-value
Smoking (ever)	93	59(35.5)	34(36.6)	0.8700
Median BMI# [IQR]	30[26,34]	29[25,34]	30[27,35]	0.0347*
BMI≥30 kg/m2	114	66(39.8)	48(51.6)	0.0652
Hypertension	164	100(60.2)	64(68.8)	0.1695
Diabetes mellitus	100	50(30.1)	50(53.8)	0.0002*
Pre-diabetes	38	27(16.3)	11(11.8)	0.3330
Hyperlipidemia	134	84(50.6)	50(53.8)	0.6253
Coronary artery disease	38	27(16.3)	11(11.8)	0.3330
Peripheral vascular disease	10	5(3.0)	5(5.4)	0.3434
COPD	25	11(6.6)	14(15.1)	0.0276*
Asthma	30	20(12.0)	10(10.8)	0.7546
Chronic kidney disease	46	27(16.3)	19(20.4)	0.4001
Congestive heart failure	37	20(12.1)	17(18.3)	0.1692
Chronic liver disease	16	11(6.6)	5(5.4)	0.6885
Neurological diseases	53	30(18.1)	23(24.7)	0.2026
Autoimmune disease	10	8(4.8)	2(2.2)	0.2849
Organ transplant	10	6(3.6)	4(4.3)	0.7832
HIV	5	1(0.61)	4(4.4)	0.0650
Malignancy	29	18(10.8)	11(11.8)	0.8095
Immunosuppression secondary to medications	25	13(7.8)	12(12.9)	0.1848

#BMI was only reported in 248, out of which 156 were non-severe and 92 were severe.

Table 3: Presenting symptoms and signs in the first 48 hours of admission

	n (%) or median [IQR]			
	All patients n=259	Non severe n=166(%)	Severe group n=93(%)	p-value
Subjective				
GI symptoms	127	86(51.8)	41(44.1)	0.2331
Respiratory symptoms	223	138(83.1)	85(91.4)	0.0651
Systemic symptoms	209	134(80.7)	75(80.7)	0.9879
Objective				
Fever	153	94(56.6)	59(63.4)	0.2846
Hypothermia	30	15(9.0)	15(16.1)	0.0871
Tachycardia	138	83(50.0)	55(59.1)	0.1573
Tachypnea	191	107(64.5)	84(90.3)	<.0001*
Hypoxia	202	112(67.5)	90(96.8)	<.0001*
Hypotension	44	14(8.4)	30(32.3)	<.0001*

Fever was defined as the highest temp of >38C; hypothermia as the lowest temp of <36C; tachycardia was defined as having a heart rate of >100 beats per minute; tachypnea was defined as having a respiratory rate of >20 breaths per minute; hypoxia was defined as having an O2 saturation of <95% on room air; hypotension was having a systolic blood pressure of <90mm Hg.
Symptoms of cough, shortness of breath, chest pain, sore throat, and congestion were grouped as respiratory; GI symptoms were nausea, vomiting, diarrhea, abdominal pain; systemic symptoms were fever, myalgias, rash, encephalopathy, dizziness.
*p-values of <0.05

Table 4: Basic labs in the first 24 hours

	n (%) or median [IQR]			
	All patients n=259	Non severe n=166(%)	Severe group n=93(%)	p-value
Leukocytosis	37	19(11.6)	18(19.6)	0.1157
Leucopenia	25	14(8.5)	11(12.0)	
Normal WBC	194	131(79.9)	63(68.5)	
Elevated BUN	80	38(23.2)	42(45.7)	0.0002*
AKI/ CKD	68	35(21.3)	33(35.9)	0.0116*
ALT> 42 IU/L#	51	30(22.1)	21(26.9)	0.4215
AST> 45 IU/L#	62	29(21.3)	33(42.3)	0.0011*

Leukocytosis is defined as WBC> 11x10exp9/L; leucopenia is defined as WBC< 3.5x10exp9/L; elevated BUN defined as >24 mg/dl; AKI/ CKD defined as serum creatinine >1.27 mg/dl
#ALT, AST in first 24 hours was only available for 214 patients. WBC count was missing in 3 patients.
*p-values of <0.05

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