



Retrospective Study to Compare Corona Virus Disease (COVID-19) in Hypertension and Diabetes

Patience Obih, Innocent Ituah, Elizabeth Howard, and Susan Olet

Xavier University College of Pharmacy, New Orleans, LA

Ochsner-Xavier Institute for Health Equity and Research, New Orleans, LA



OBJECTIVES

Corona virus disease (COVID-19), according to World Health Organization (WHO), is an infectious disease caused by the SARS-Cov-2 virus which emerged in December 2019. In some cases, this infection can lead to mild COVID-19 illness, and others have no symptoms at all. In some cases, however, COVID-19 can lead to respiratory failure, lasting lung and heart muscle damage, nervous system problems, kidney failure or death. Both hypertension and diabetes mellitus (DM) have been reported as some of the comorbidities for disease progression and mortality due to COVID-19.

The objectives of this study are: 1) To investigate the relationship between prior hypertension and/or diabetes comorbidities and COVID-19 vaccination status among patients admitted to the hospital (in-patient services) with a COVID-19 diagnosis. 2) To investigate the relationship between prior hypertension and diabetes comorbidities and severity of COVID-19 infection.

METHODS

A retrospective cohort study of 19,331 adult patients diagnosed with COVID-19 and admitted to in-patient services at Ochsner Health between March 1, 2020 and March 31, 2022 was conducted. All data, including demographics, comorbidities, laboratory results, COVID-19 vaccination status, and severity of disease were collected from the electronic health record. The primary outcome was severity of disease assessed by length of in-patient stay (in days), severity of illness (minor, moderate, major, extreme) and risk of mortality (minor, moderate, major, extreme). Patient characteristics are presented as mean ± SD, median and quartiles, or counts and proportions, where appropriate. Comparisons were performed using the chi-square test or Fisher exact test for categorical variables and the Wilcoxon rank sum test for continuous variables.

RESULTS

Table 1. Descriptive characteristics of adult patients admitted to an Ochsner hospital (in-patient) with a COVID-19 diagnosis between March 1, 2020 and March 31, 2022, overall and by diabetes and hypertension status (N=17,624).

Characteristics	Overall	Diabetes	No Diabetes	p-value	Hypertension	No Hypertension	p-value
		n(%)	n(%)		n(%)	n(%)	
Demographics							
Age (years), mean±SD	60.4±16.9	63.9±14.1	58.5±17.9	<.0001	64.9±14.5	54.3±18.0	<.0001
Sex, n (%)				0.779			0.056
	Female	8807(50.0)	3096(35.2)	5711(64.9)	5131(58.3)	3676(41.7)	
	Male	8815(50.0)	3081(35.0)	5734(65.1)	5010(56.8)	3805(43.2)	
Race, n (%)				<.0001			<.0001
	African American	6271(36.3)	2536(40.4)	3735(59.6)	3994(63.7)	2277(36.3)	
	White	10,411(60.3)	3332(32.0)	7079(68.0)	5734(55.1)	4677(44.9)	
	Other	596(3.5)	203(34.1)	393(65.9)	249(41.8)	347(58.2)	
Ethnicity, n (%)				0.284			<.0001
	Non-Hispanic or Latino/a	16,357(94.7)	5761(35.2)	10596(64.8)	9610(58.8)	6747(41.3)	
	Hispanic or Latino/a	911(5.3)	305(33.5)	606(66.5)	358(39.3)	553(60.7)	
Marital Status, n (%)				<.0001			<.0001
	Married/Significant Other	8109(47.5)	2818(34.8)	5291(65.3)	4662(57.5)	3447(42.5)	
	Divorced/Legally Separated/Widowed	3949(23.1)	1614(40.9)	2335(59.1)	2699(68.4)	1250(31.7)	
	Single	5033(29.5)	1600(31.8)	3433(68.2)	2536(50.4)	2497(49.6)	
Insurance Type, n (%)				<.0001			<.0001
	Commercial	6220(35.3)	2014(32.4)	4206(67.6)	3376(54.3)	2844(45.7)	
	Medicaid	1486(8.4)	503(33.9)	983(66.2)	747(50.3)	739(49.7)	
	Medicare	5095(28.9)	2147(42.1)	2948(57.9)	3550(69.7)	1545(30.3)	
	Self-pay	4473(25.4)	1411(31.5)	3062(68.5)	2325(52.0)	2148(48.0)	
	Other	350(2.0)	103(29.4)	247(70.6)	143(40.9)	207(59.1)	
Comorbidities							
Diabetes Mellitus, n(%)	6,178(35.1)	n/a	n/a	n/a	4385(71.0)	1793(29.0)	<.0001
Hypertension, n(%)	10,141(57.5)	4385(43.2)	5756(56.8)	<.0001	n/a	n/a	n/a
Hyperlipidemia, n (%)	5620(31.9)	2824(50.3)	2796(49.8)	<.0001	4281(76.2)	1339(23.8)	<.0001
Congestive Heart Failure, n (%)	827(4.7)	436(52.7)	391(47.3)	<.0001	610(73.8)	217(26.2)	<.0001
Asthma, n (%)	992(5.6)	316(31.9)	676(68.2)	0.030	574(57.9)	418(42.1)	0.833
COPD, n (%)	1692(9.6)	697(41.2)	995(58.8)	<.0001	1174(69.4)	518(30.6)	<.0001
COVID-19 Vaccination Status							
Vaccinated, n (%)	2239(12.7)	937(41.9)	1302(58.2)	<.0001	1501(67.0)	738(33.0)	<.0001
Unvaccinated, n (%)	15,385(87.3)	5241(34.1)	10,144(65.9)		8640(56.2)	6745(43.8)	

Note: Vaccinated defined as >= 1 COVID-19 vaccine

Chi-square test or t-test used to compute p-values, as appropriate

Row percentages are presented.

n/a = not applicable

CONCLUSION

In the unadjusted analysis, diabetes and hypertension were statistically significant predictors of major/extreme SOI ($p < 0.0001$) and ROM ($p < 0.0001$). However, after age and vaccination adjustment, they were no longer significant predictors of severity of COVID-19 infection. Age and vaccination status were significant ($p < 0.0001$), but the strength of association was weak: as age increases, severity of illness (SOI) increases (RR=1.00(1.00-1.00)) and COVID-19 vaccination was weakly protective of major/extreme SOI (RR=0.98(0.97-0.99)). Length of hospital stay was significantly longer for patients with diabetes after controlling for age and prior vaccination status ($p < 0.0001$). Our study shows that patients with diabetes or hypertension comorbidities were more likely to be vaccinated prior to admission than those without the comorbidity. However, having these diagnoses may worsen the outcome of COVID-19 infection.

REFERENCES

- <https://www.cdc.gov/coronavirus/2019-ncov/your-health/about-covid-19.html#>
- WHO Director-General's opening remarks at the media briefing on COVID-19 World Health Organization - January, 2022 - cir.nii.ac.jp. Acta Biomed. 2020; 91(1): 157-160.
- Centers for Disease Control and Prevention. COVID data tracker. 2020 [cited 2021 Dec 22]. <https://covid.cdc.gov/covid-data-tracker/#data-tracker-home>
- Panell, P, Dhanani, B, Franz (2022). A meta-analysis of COVID-19 vaccine attitudes and demographic characteristics in the United States. Public Health, Volume 207, June 2022, pages 31-38. Review article.

Table 2. The unadjusted and adjusted association between prior comorbidities (diabetes mellitus and hypertension) and severity of COVID-19 infection among patients admitted to the hospital with COVID-19.

	Severity of COVID-19 Infection											
	Severity of Illness			Ris: of Mortality n(%)						Length of Stay		
	major/extreme	minor/moderate	P-value	major/extreme	minor/moderate	P-value	RR (95%CI)	aRR (95%CI)	major/extreme	minor/moderate	P-value	P-value*
Overall	16,549(95.4)	803(4.6)	-	15,072(86.9)	2280(13.1)	-	-	-	5.1(3.1-9.1)	-	-	-
Diabetes Mellitus												
Yes	5905(35.7)	212(26.4)	<0.0001	5496(36.5)	624(27.2)	<0.0001	1.02(1.01-1.03)	1.01(1.00-1.02)	1.05(1.04-1.07)	1.04(1.03-1.05)	<0.0001	<0.0001
No	10,644(64.3)	591(73.6)		9576(63.5)	1659(72.8)							
Hypertension												
Yes	9597(58.0)	414(51.6)	0.0004	8807(58.4)	1204(52.8)	<0.0001	1.01(1.01-1.02)	1.00(0.99-1.00)	1.03(1.02-1.04)	0.99(0.98-1.00)	<0.0001	0.4463
No	6952(42.0)	389(48.4)		6265(41.6)	1076(47.2)							

Chi-square and Wilcoxon rank sum produced the proportions and medians, as appropriate.

SOI categories, n(%): minor, 159(0.9); moderate, 644(3.7); major, 7684(44.3); extreme, 8867(51.1).

ROM categories, n(%): minor, 258(1.5); moderate, 2024(11.7); major, 6047(34.8); extreme, 9025(52.0).

Unadjusted and adjusted log-binomial regression models were fit for each binomial outcome (SOI and ROM). A linear regression model was fit for length of stay (LOS).

The adjusted model included the two predictors of interest (hypertension and diabetes) and two variables identified *a priori* to be associated with the predictor and the outcome: age and COVID-19 vaccination status prior to in-patient admission.

*p-value from adjusted regression model.