

# Clinical characteristics of COVID-19 in oncology patients: Case control design- Pilot study

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## ABSTRACT

A pilot study to test the feasibility of a matched pair case-control study to explore what clinical characteristics, treatment outcomes, and epidemiological characteristics of adult oncology patients hospitalized with COVID-19 infection. The study was conducted at the University of Texas MD Anderson Cancer Center using the charts of patients hospitalized from March, 2020 to August 2020. Each patient who tested positive for COVID-19 (case) was matched for age, gender, and cancer diagnosis with a control who tested negative for COVID-19. Total of 21 case-control pairs (n=42), were included in this study. Data was collected on Palantir platform using the Core Case Record Form and Supplemental Case Record Form.

The clinical characteristics associated with COVID-19 were found to be symptoms of fever, cough, sore throat, myalgia, arthralgia, fatigue, headache, and abdominal pain (p <.001); development of acute lung injury and use of antihypertergics (p <.05). The risk factors associated with the diagnosis of COVID-19 were higher weight, increased body mass index, obesity as defined by clinical staff, as well as Hispanic and African American ethnicities (p <.05). There was no significant difference between the cases and controls in the length of hospital stay, death at the time of discharge, or 30-day readmission. This study validates the feasibility of main study and provides preliminary findings to guide future research.

## BACKGROUND

Coronavirus disease 2019 (COVID-19) is novel disease known to humans for only a period of under one year. While COVID-19 is a pandemic that has affected over 200 countries of the world, the knowledge base on the nature of the disease and on effective treatments of the patients is limited and is constantly evolving as there are more and more data becomes available from scientific studies (Coronaviridae Study Group of the International Committee on Taxonomy of Viruses, 2020). Cancer patients are at increased risk of developing severe illness from COVID-19, and every patient affected by this disease provides valuable information to the understanding of the disease. Patients with cancer are a unique population who have several risk factors for morbidity and mortality due to their cancer diagnosis and the related treatments. Therefore, it is essential to understand the clinical course of COVID-19 in patients with cancer. Understanding the clinical course of these patients will provide the insight necessary for health care providers in the early diagnosis, effective management, and prevention of complications of the patients with cancer with COVID-19 infection. Additionally, the study results can guide clinical researchers to conduct prospective studies in this regard. The proposed study is important to nursing because, nurses in primary nursing roles and advanced nursing practice roles are at the forefront of managing patients with COVID-19. In the study setting, many advanced practice registered nurses (APRNs) in collaboration with the physicians are directly involved in diagnosing and treating oncology patients with COVID-19. The findings of the study would be a valuable in their understanding of the disease as well as managing these patients effectively.

## RESEARCH QUESTIONS

1. What clinical characteristics of hospitalized adult oncology patients are associated with COVID-19 diagnosis?
2. What treatment outcomes of hospitalized adult oncology patients are associated with COVID-19 diagnosis?
3. What risk factors of hospitalized adult oncology patients are associated with COVID-19 diagnosis?

## RESEARCH DESIGN

A matched pair case-control study using retrospective chart review was used to explore what clinical characteristics, treatment outcomes, and risk factors of adult oncology patients hospitalized with COVID-19 infection. In the ratio of 1:1, each patient who tested positive for COVID-19 (case) was matched for age, gender, and current cancer diagnosis- in terms of cancer history, cancer site, and disease behavior- with a control patient who tested negative for COVID-19. The study was conducted in collaboration with Data-Driven Determinants for COVID-19 Oncology Discovery Effort (D3CODE) which is an IRB approved and activated protocol that supports and oversees studies done on COVID-19.

## DISCUSSION

This pilot study validates the feasibility of the study in terms of subject eligibility, matching procedure, data collection, and analysis. This study has several methodological advantages. Use of individually matched case-control design controls the influence of age, gender, and current cancer diagnosis. The case-control design also decreases the variance in the clinical characteristics, outcomes, and risk factors of the oncology patients admitted with COVID-19, and thus improve statistical efficiency. Consistent with current evidence (Lighter, et al., 2020; Hur, et al., 2020; Simonnet, et al., 2020; Kalligeros, et al., 2020; Palaodimos, et al., 2020; Petrilli, et al., 2020; Ko, et al., 2020; Tartof, et al., 2020), this study found that higher weight, increased body mass index, and obesity are significant risk factors associated the diagnosis of COVID-19 among hospitalized oncology population. Unlike the existing evidence for the association of smoking (Zheng, et al., 2020; Lippi & Henry, 2020; Patanavichai & Glantz, 2020; Guo, 2020; Zhao, et al., 2020; Aliqahani, et al., 2020; Li, et al., 2020; Farsalinos, Barbouri, Poulas, Poulos, Caponnetto, & Nisura, 2020) and type 2 diabetes mellitus (Richardson, et al., 2020; Chen, et al., 2020; Fardini, Morieri, Longato, & Avogaro, 2020; Barron, et al., 2020) with COVID-19 diagnosis and severity of illness in general population, this study did not find significant association of smoking or type 2 diabetes mellitus with the hospitalized oncology population. The current study, finding significant association of black and Hispanic ethnicity with COVID-19 hospitalization among oncology population, is in line with existing evidence. Similar to this pilot study, other studies (Li, et al., 2020; Menni, et al., 2020; Saedd, Selveillo, Young, Sandbaek, Glomsaker, & Mala, 2020; Matar, et al., 2020) have also documented fever, cough, sore throat, myalgia, arthralgia, fatigue or malaise, headache, abdominal pain, conjunctivitis, and skin rash as presenting symptoms of COVID-19 in general population. However, only limited evidence is available (Mousaese, Kourie, & Ghosn, 2020; Kuderer, et al., 2020; Zhang, et al., 2020) to characterize the clinical manifestation of COVID-19 in oncology population. In contrast to other studies (Mehta, et al., 2020; Afshar, et al., 2020; et al., 2020; Meyrowitz-Katz & Merone, 2020; 2020; Lee, et al., 2020; Roblotto, et al., 2020; Miyashita, et al., 2020; Mehta, et al., 2020; Dai, et al., 2020; Docherty, et al., 2020; Richardson, et al., 2020; Goyal, et al., 2020; Deng, et al., 2020; Guan, et al., 2020), this study did not find any significant differences in the discharge outcomes or 30-day mortality for the oncology population hospitalized with COVID-19 and those who tested negative for COVID-19.

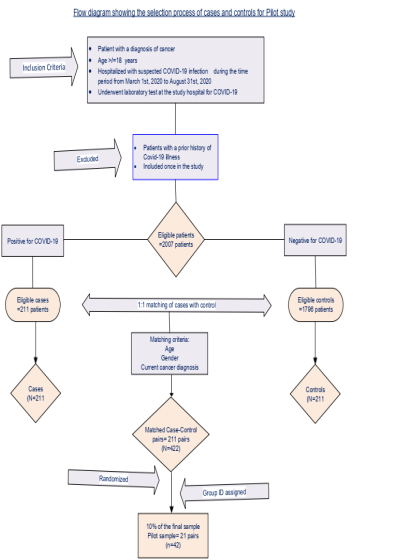
## RESEARCH SETTINGS

The study is conducted at the University of Texas MD Anderson Cancer Center which is a comprehensive cancer care hospital that provides cancer care to all different types of cancers. The study subjects are patients admitted to the hospital during the six-month period from March 1st, 2020, to August 31st, 2020. Patient charts for hospital admission prior to March 1st was not reviewed for this study.

## POPULATION AND SAMPLING

The current study is a pilot study conducted on 10% of the samples of the major study. 21 cases who tested positive for COVID-19 and the 21 matched pair controls who tested negative for COVID-19 are included in this retrospective chart review done on the Palantir platform (Palantir Foundry, n.d.). Please refer to Figure 1 for the sample selection process for the pilot study.

Figure 1. Sample selection process for the Pilot Study



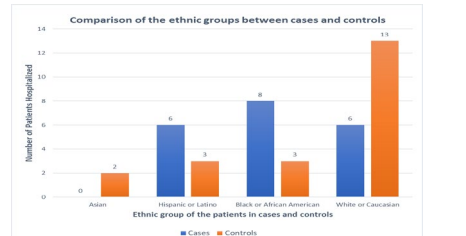
## DATA COLLECTION AND ANALYSIS

The Core Case Record Form and the Supplemental Case Record Form of the ISARIC-WHO Severe Acute Respiratory Infection Clinical Characterization Tools developed by the International Severe Acute Respiratory and Emerging Infection Consortium (ISARIC) were used for data collection (International Severe Acute Respiratory and Emerging Infection Consortium, 2020). All data was collected and analyzed on the Palantir platform using the coding languages R and Python. For the numeric data, mean, standard deviation, and median were calculated. Independent t-test and Mann Whitney test to confirm the results of numerical data and Fisher's exact test for categorical variables were used for assessing the statistical significance of differences in categorical variables.

## RESULTS

There was no significant difference between cases and controls in any of the matching variables such as age, gender, cancer history, cancer site, and cancer behavior. The clinical characteristics associated with COVID-19 diagnosis were found to be the presenting symptoms of fever, cough, sore throat, myalgia, arthralgia, fatigue, headache, and abdominal pain; development of respiratory distress during the hospitalization, and the use of red blood cell transfusions and antihypertergics. History of fever, cough, sore throat, myalgia, arthralgia, fatigue or malaise, headache, abdominal pain were the most frequently reported signs and symptoms at the time of admission; and each of these symptoms was significantly (p <.001) associated with the diagnosis of COVID-19. Development of respiratory distress during the hospitalization was the most frequent (57.1% in cases vs 4.8% in controls) complication developed by the patients who tested positive for COVID-19 and was found to be significantly (p <.001) associated with the diagnosis of COVID-19. Use of red blood cell transfusion was lower among the cases (9.5% in cases vs 42.9% in controls) and was found to be significantly (p <.05) associated with the patients who tested negative for COVID-19. Please see Table 1 for the comparison of clinical characteristics between cases and controls. The risk factors associated with COVID-19 diagnosis were found to be body weight, BMI, obesity, ethnicity, and chronic neurological disorder. Higher weight, increased body mass index, as well as obesity as defined by clinical staff were significantly (p <.05) associated with the diagnosis of COVID-19. Please see Table 2 for the comparison of risk factors between cases and controls. While patients of Hispanic ethnicity (38.1% cases and 14.3% controls) and African American ethnicity (28.6% cases and 14.3% controls) had higher association with COVID-19 diagnosis, patients of Asian ethnicity (0% cases and 9.5% controls) and Caucasian ethnicity (28.6% of cases and 61.9% controls) had comparatively lower association with COVID-19 diagnosis. Please see Figure 2 for the comparison of the ethnic groups between cases and controls. There was no significant difference between the cases and controls in the length of hospital stay, discharge status or destination, death during hospitalization, death within 30 days of discharge, death within 90 days of discharge, or readmission within 30 days of discharge. Please see Table 3 for the comparison of outcomes between cases and controls.

Figure 2. Comparison of the Ethnic Groups Between Cases and Controls



## CLINICAL CHARACTERISTICS OF COVID-19

Table 1. Comparison of the Clinical Characteristics of Cases and Controls

Comparison of the Clinical Characteristics Between Cases and Controls			
Signs and symptoms at the time of admission	Cases (n=21)	Controls (n=21)	P
History of fever	14 (66.7%)	6 (28.6%)	.029
Cough	14 (66.7%)	0 (0%)	<.001
Bloody sputum/hemoptysis	2 (9.5%)	1 (4.8%)	.999
Sore throat	12 (57.1%)	0 (0%)	<.001
Runny nose (Rhinorrhea)	1 (4.8%)	0 (0%)	.999
Nasal congestion	2 (9.5%)	0 (0%)	.999
Chest pain	12 (57.1%)	3 (14.3%)	<.001
Muscle aches (Myalgia)	12 (57.1%)	0 (0%)	<.001
Joint pain (Arthralgia)	12 (57.1%)	0 (0%)	<.001
Fatigue / Malaise	8 (38.1%)	1 (4.8%)	.020
Shortness of Breath (Dyspnea)	14 (66.7%)	8 (38.1%)	.121
Headache	12 (57.1%)	0 (0%)	<.001
Complications Developed During Hospitalization			
Bacterial pneumonia	1 (4.8%)	1 (4.8%)	.999
Acute respiratory distress syndrome	12 (57.1%)	1 (4.8%)	<.001
Respiratory failure	8 (38.1%)	3 (14.3%)	.159
Altered mental status	1 (4.8%)	1 (4.8%)	.999
Endocarditis/Myocarditis/Pericarditis	1 (4.8%)	0 (0%)	.999
Cardiac arrhythmia	4 (19.0%)	3 (14.3%)	.999
Coagulation Disorder	1 (4.8%)	3 (14.3%)	.606
Acute Renal injury	2 (9.5%)	4 (19.0%)	.663
Hepatomegaly	1 (4.8%)	0 (0%)	.999
Deep venous thrombosis	1 (4.8%)	0 (0%)	.999
Acidosis	2 (9.5%)	2 (9.5%)	.999
Treatment received any time during hospitalization			
ICU admission	6 (28.6%)	4 (19.0%)	.481
Oxygen Therapy	19 (90.5%)	19 (90.5%)	.999
Invasive ventilation (any)	3 (14.3%)	3 (14.3%)	.999
Red blood cells	2 (9.5%)	9 (42.9%)	.032
Medications administered during hospitalization			
Anticoagulants	19 (90.5%)	19 (90.5%)	.999
Antihypertergics	20 (95.2%)	14 (66.7%)	.045
Cardiovascular drugs	13 (61.9%)	11 (52.4%)	.756

The values are reported as number and percentage. P value < .05 is considered significant.

## RISK FACTORS OF COVID-19

Table 2. Comparison of the Risk Factors of Cases and Controls

Comparison of the Risk Factors Between Cases and Controls			
Demographics	Cases (n=21)	Controls (n=21)	P
Weight in Kg			
Mean (SD)	96.7 (25.0)	82.4 (18.9)	.044
Median [Min, Max]	91.0 [56.0, 155]	82.0 [53.0, 131]	
BMI			
Mean (SD)	33.5 (7.06)	29.1 (6.64)	.047
Median [Min, Max]	31.0 [24.0, 48.0]	28.0 [18.0, 49.0]	
BMI by Group			
Underweight <18.5	0 (0%)	1 (4.8%)	.274
Normal weight 18.5- <25	1 (4.8%)	3 (14.3%)	
Overweight >=25-30	7 (33.3%)	9 (42.9%)	
Obese >=30	13 (61.9%)	8 (38.1%)	
Ethnic group			
Asian	0 (0%)	2 (9.5%)	.048
Hispanic or Latino	8 (38.1%)	3 (14.3%)	
Black or African American	8 (38.1%)	3 (14.3%)	
White or Caucasian	6 (28.6%)	13 (61.9%)	
Other	1 (4.8%)	0 (0%)	
Comorbidities and Risk factors			
Chronic cardiac disease (not hypertension)	14 (66.7%)	18 (85.7%)	.277
Chronic kidney disease	5 (23.8%)	7 (33.3%)	.734
Moderate or severe liver disease	3 (14.3%)	9 (42.9%)	.085
Hemiplegia/paraplegia	2 (9.5%)	0 (0%)	.488
Obesity (as defined by clinical staff)	5 (23.8%)	10 (47.6%)	.048
Diabetes with complications	3 (14.3%)	4 (19.0%)	.999
Hypertension	17 (81.0%)	15 (71.4%)	.719
COPD	1 (4.8%)	1 (4.8%)	.999
Asthma	5 (23.8%)	4 (19.0%)	.999
Smoking			
Current smoking	8 (38.1%)	1 (4.8%)	.999
Former smoking	7 (33.3%)	8 (38.1%)	.999
Never smoked	15 (71.4%)	11 (52.4%)	.341

The values are reported as number and percentage. P value < .05 is considered significant.

## OUTCOMES OF COVID-19

Table 3. Comparison of the Outcomes of Cases and Controls

Comparison of the Outcomes Between Cases and Controls			
Outcomes of hospitalization	Cases (n=21)	Controls (n=21)	P
Length of hospital stay			
Mean (SD)	10.0 (9.77)	7.14 (6.03)	.254
Median [Min, Max]	7.00 [3.00, 40.0]	4.00 [1.00, 25.0]	
Alive at discharge	20 (95.2%)	19 (90.5%)	.999
Home with self-care/family caregiver	16 (76.2%)	17 (81.0%)	.999
Home with home health or physical therapy	3 (14.3%)	1 (4.8%)	.606
Hospice	0 (0%)	1 (4.8%)	.999
Acute care hospital	1 (4.8%)	0 (0%)	.999
Died at discharge	1 (4.8%)	2 (9.5%)	.999
Readmission within 30 days	15 (71.4%)	19 (90.5%)	.238
Death within 30 days	2 (9.5%)	4 (19.0%)	.663
Death within 90 days	2 (9.5%)	6 (28.6%)	.238

The values are reported as number and percentage. P value < .05 is considered significant.

## REFERENCES

Afshar, Z. M., Dayani, M., Naderi, M., Ghanbarineisi, F., Shiri, S., & Rajati, F. (2020). Fatality rate of COVID-19 in patients with malignancies: a systematic review and meta-analysis. *The Journal of Infection*, 81(2), e114–e116. <https://doi.org/10.1016/j.jinf.2020.05.062>

Coronavirus Study Group of the International Committee on Taxonomy of Viruses (2020). The species Severe acute respiratory syndrome-related coronavirus: classifying 2019-nCoV and naming it SARS-CoV-2. *Nature microbiology*, 5(4), 536–544. <https://doi.org/10.1038/s41564-020-0695-z>

International Severe Acute Respiratory and Emerging Infection Consortium. (2020, January 7). ISARIC-WHO Severe Acute Respiratory Infection Clinical Characterization Tools. Retrieved July 17, 2020, from [https://media.tghn.org/medialibrary/2016/06/ISARIC-WHO-SARI\\_Case\\_Record\\_Form\\_7JAN16.pdf](https://media.tghn.org/medialibrary/2016/06/ISARIC-WHO-SARI_Case_Record_Form_7JAN16.pdf)

Kuderer, N.M., Choueiri, T.K., Shah, D.P., Shyr, Y., Rubinstein, S.M., Rivera, D.R., Shete, S., Hsu, C.Y., Desai, A., de Lima Lopes Jr, G. and Grivas, P. (2020). Clinical impact of COVID-19 on patients with cancer (CCC19): a cohort study. *The Lancet*. [https://doi.org/10.1016/S0140-6736\(20\)3187-9](https://doi.org/10.1016/S0140-6736(20)3187-9)

Li, L. Q., Huang, T., Wang, Y. Q., Wang, Z. P., Liang, Y., Huang, T. B., Zhang, H. Y., Sun, W., & Wang, Y. (2020). COVID-19 patients' clinical characteristics, discharge rate, and fatality rate of meta-analysis. *Journal of medical virology*, 92(6), 577–583. <https://doi.org/10.1093/jtm/taaa015>

Lighter, J., Phillips, M., Hochman, S., Sterling, S., Johnson, D., Francois, F., & Stachel, A. (2020). Obesity in patients younger than 60 years is a risk factor for Covid-19 hospital admission. *Clinical Infectious Diseases*. <https://doi.org/10.1093/cid/ciaa415>

Lippi, G., & Henry, B. M. (2020). Chronic obstructive pulmonary disease is associated with severe coronavirus disease 2019 (COVID-19). *Respiratory medicine*, 167, 105941. <https://doi.org/10.1016/j.rmed.2020.105941>

Meyerowitz-Katz, G., & Merone, L. (2020). A systematic review and meta-analysis of published research data on COVID-19 infection fatality rates. *International journal of infectious diseases : IJID : official publication of the International Society for Infectious Diseases*, 101, 138–148. Advance online publication. <https://doi.org/10.1016/j.ijid.2020.08.1464>

Palantir Foundry. (n.d.). Retrieved November 22, 2020, from <https://www.palantir.com/palantir-foundry/>

Patanavichai, R., & Glantz, S. A. (2020). Smoking Is Associated With COVID-19 Progression: A Meta-analysis. *Nicotine & tobacco research : official journal of the Society for Research on Nicotine and Tobacco*, 22(9), 1653–1656. <https://doi.org/10.1093/ntr/ntaa082>

Simonnet, A., Chetbon, M., Poissy, J., Raverdy, Y., Duhamel, A., Labrecque, J., Mathieu, D., Pattou, F., Jourdain, M., and Lile COVID-19 and Obesity study group. (2020). High prevalence of obesity in severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) requiring invasive mechanical ventilation. *Obesity*, 28(7), 1200–1204. <https://doi.org/10.1002/oby.22831>

Zhao, Q., Meng, M., Kumar, R., Kumar, Y., Huang, J., Lian, N., Deng, Y., & Lin, S. (2020). The impact of COPD and smoking history on the severity of COVID-19: A systemic review and meta-analysis. *Journal of medical virology*, 10.1002/jmv.25889. Advance online publication. <https://doi.org/10.1002/jmv.25889>