

Obesity in patients younger than 60 years is a risk factor for Covid-19 hospital admission

Authors: Jennifer Lighter<sup>1,2</sup>, MD, Michael Phillips<sup>2,3</sup>, MD, Sarah Hochman<sup>2,3</sup>, MD, Stephanie Sterling<sup>2,3</sup>, MD, Diane Johnson<sup>2,3</sup>, MD, Fritz Francois<sup>3</sup>, MD, Anna Stachel<sup>2</sup>, MPH

<sup>1</sup>Department of Pediatrics, Division of Pediatric Infectious Diseases; <sup>2</sup>Department of Infection Prevention and Control; <sup>3</sup>Department of Medicine, Division of Infectious Diseases

NYU School of Medicine/NYU Langone Health, New York NY

Corresponding Author:

Jennifer Lighter, MD

New York University Langone Health

545 First Avenue

Greenberg Hall, SC1-174

New York, NY 10016

Telephone: 212-263-5454

Fax: 212-263-0523

[Jennifer.Lighter@nyumc.org](mailto:Jennifer.Lighter@nyumc.org)

Dear Editor,

Risk factors for infectious disease severity are determined by the pathogen, host and environment[1]. Covid-19 disease, caused by SARS-CoV-2 infection includes a spectrum of illness; from asymptomatic infection [2] to severe pneumonia characterized by acute respiratory injury in about 20% of patients presenting to medical care[3]. The risk factors associated with disease severity, included increased age, diabetes, immune suppression and organ failure[3]. Recognition of risk factors for morbidity and mortality is important to determine prevention strategies as well as to target high-risk populations for potential therapeutics.

We performed a retrospective analysis of BMI stratified by age in Covid-19-positive symptomatic patients who presented to a large academic hospital system in New York City. Patients presented to the ED with signs of respiratory distress were admitted to the hospital. Critical care was defined based on intensive care accommodation status or invasive ventilator documentation in our electronic health record. Patients who were PCR-positive for Covid-19 during March 4, 2020-April 4, 2020 were extracted from our electronic health record system and analyzed with a chi-square Wald test using SAS v9.4 (SAS Institute, Care NC).

Of the 3,615 individuals who tested positive for Covid-19, 775 (21%) had a body mass index (BMI) 30-34, and 595 (16% of the total cohort) had a BMI  $\geq 35$ . There were 1,853 (51%) patients discharged from the ED, 1,331 (37%) were admitted to the hospital in acute care and 431 (12%) were either directly admitted or transferred to the ICU during admission. During analysis we found significant difference in admission and ICU care only in patients <60 years of age with varying BMIs (Table 1)

Patients aged <60 years with a BMI between 30-34 were 2.0 (95% 1.6-2.6,  $p < 0.0001$ ) and 1.8 (95% CI 1.2-2.7,  $p = 0.006$ ) times more likely to be admitted to acute and critical care, respectively, compared to individuals with a BMI <30 (Table 1). Likewise, patients with a BMI  $\geq 35$  and aged <60

years were 2.2 (95% CI 1.7-2.9,  $p < .0001$ ) and 3.6 (95% CI 2.5-5.3,  $p < .0001$ ) times more likely to be admitted to acute and critical care compared to patients in the same age category who had BMI  $< 30$ .

Though patients aged  $< 60$  years are generally considered a lower risk group of Covid-19 disease severity, based on data from our institution, obesity appears to be a previously unrecognized risk factor for hospital admission and need for critical care. This has important and practical implications, where nearly 40% of adults in the US are obese with a BMI  $\geq 30$  [4]. The BMI range of individuals in this study appears representative of the nation, as 36% of the patients have a BMI  $\geq 30$ . There is geographic variation in reported mortality, as South Korea, China and Italy report case fatality rates of 0.8, 2.3 and 7.2, respectively [5] and regional risk factors such as prevalence of smoking, pollution or aging population has been cited. Unfortunately, obesity in people  $< 60$  years is a newly identified epidemiologic risk factor which may contribute to increased morbidity rates experienced in the US.

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Table 1: Adult patients who tested positive for Covid-19 March 3-April 4, 2020 (N= 3,615)

<b>Age ≥ 60 years</b>	<b>N (%)</b>	<b>Admission to acute (vs discharge from ED)</b>	<b>P-value</b>	<b>N (%)</b>	<b>ICU Admission (vs discharge from ED)</b>	<b>P-value</b>
<b>BMI 30-34</b>	141 (19%)	0.9 (95% CI 0.6-1.2)	0.39	57 (22%)	1.1 (95% CI 0.8-1.7)	0.57
<b>BMI ≥ 35</b>	99 (14%)	0.9 (95% CI 0.6-1.3)	0.59	50 (19%)	1.5 (95% CI 0.9-2.3)	0.10
<b>Age &lt; 60 years</b>						
<b>BMI 30-34</b>	173 (29%)	2.0 (95% 1.6-2.6)	<.0001	39 (23%)	1.8 (95% CI 1.2-2.7)	0.006
<b>BMI ≥ 35</b>	134 (22%)	2.2 (95% CI 1.7-2.9)	<.0001	56 (33%)	3.6 (95% CI 2.5-5.3)	<.0001