

## Obesity and its Implications for COVID-19 Mortality

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**TO THE EDITOR:** A recent *Journal of the American Medical Association* viewpoint regarding fatalities in Italy associated with the new coronavirus (COVID-19) pandemic failed to mention obesity as one of the preexisting diseases associated with death (1). It seems likely that the increased prevalence of obesity in older adults in Italy compared with China may account for the differences in mortality between the two countries. Furthermore, the rising prevalence of obesity in the United States and prior experience of the impact of obesity on mortality from H1N1 influenza should increase the sensitivity of clinicians caring for patients with obesity and COVID-19 to the need for aggressive treatment of such patients.

Between April 2009 and January 2010, the Centers for Disease Control and Prevention estimated that 41 to 84 million people were infected with the H1N1 influenza virus and that between 180,000 and 370,000 infected patients were hospitalized, with 8,000 to 17,000 deaths (2). Several reports from around the world identified obesity and severe obesity as risk factors for hospitalization and mechanical ventilation. For example, in California between April and August 2009, 1,088 patients with H1N1 influenza either were hospitalized or died (2). Of 268 patients  $\geq 20$  years old in whom BMI was

calculated, 58% had obesity (BMI  $\geq 30$ ), and 67% of those had severe obesity (BMI  $\geq 40$ ) (3). Sixty-six percent of those with obesity also had underlying diseases, such as chronic lung disease, including asthma, cardiac problems, or diabetes. Among hospitalized patients in New Mexico in 2009 (4), 46% had obesity, and 56% of those requiring mechanical ventilation had severe obesity. Rates of H1N1 hospitalizations were significantly greater among American Indians, African Americans, and Hispanics than among non-Hispanic whites, possibly reflecting the increased prevalence of obesity in those populations. The distribution of obesity among hospitalized patients in California and New Mexico exceeded the 35% prevalence of obesity in US adults in 2009 to 2010.

The disproportionate impact of H1N1 influenza and now COVID-19 in patients with obesity and severe obesity is not surprising given the impact of obesity on pulmonary function. Obesity is associated with decreased expiratory reserve volume, functional capacity, and respiratory system compliance. In patients with increased abdominal obesity, pulmonary function is further compromised in supine patients by decreased diaphragmatic excursion, making ventilation more difficult. Furthermore, increased inflammatory cytokines associated with obesity may contribute to the increased morbidity associated with obesity in COVID-19 infections.

Although the effects of COVID-19 on patients with obesity have not yet been well described, the H1N1 influenza experience should serve as a caution for the care of patients with

obesity and particularly patients with severe obesity. The prevalence of adult obesity and severe obesity in 2017 to 2018 has increased since 2009 to 2010 and is now 42% and 9%, respectively (5). These observations suggest that the proportion of patients with obesity, severe obesity, and COVID-19 infections will increase compared with the H1N1 experience, and the disease will likely have a more severe course in such patients. These observations also emphasize the need for increased vigilance, priority on detection and testing, and aggressive therapy for patients with obesity and COVID-19 infections. 

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