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Obesity: An independent risk factor for COVID-19 severity?

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High body-mass index (BMI) may be an under-recognised and under-reported risk factor for severe disease and death resulting from COVID-19 infection. The most common conditions related to COVID-19 severity are strongly related to obesity, including hypertension, cardiovascular disease, and diabetes mellitus[1]. Whether obesity is an independent risk factor is not yet well-established.

Several initial reports of COVID-19 patient cohorts did not report patient BMI[2–4]. Although the UK government and United States Centers for Disease Control and Prevention (CDC) do currently include individuals with a BMI over 40 in their vulnerable risk groupings[5,6], emerging evidence suggests that high BMI may be an independent risk factor for COVID-19 severe disease and mortality.

Recent reports of hospitalised COVID-19 patients have found obesity to be a risk factor for severe disease and death. The Intensive Care National Audit and Research Centre (ICNARC) report on 2621 patients in intensive care units in England reported that case fatality rate (CFR) in those with BMI≥30 was higher than patients with BMI<25 (57.5% vs 46.4%)[7]. The International Severe Acute Respiratory & emerging Infection Consortium (ISARIC) International report (No.2) of 1123 patients with confirmed or suspected COVID-19 found that obesity was the 5th most common comorbidity in hospitalised patients—only slightly less common than widely-reported 'high-risk' conditions such as asthma and chronic pulmonary disease[8].

A retrospective study of 112 patients with underlying cardiovascular disease from a Chinese hospital found that patients who had severe disease had a higher BMI than those who did not (25.5, [95% CI 23-27.5] vs 22, [95% CI 20-24]), whilst 88% of patients who died had BMI>25[9]. In a study of 30 healthcare workers infected with COVID-19, higher BMI was observed in those who developed severe disease (BMI 27 vs 22)[10]. Retrospective analyses of hospitalised COVID-19 patients in New York found that in those age<60 years, those with a BMI of 30-34 were 2.0 (95% CI 1.6-2.6) times more likely to be admitted to acute care and 1.8 (1.2 to 2.7) times more likely to require critical care. Those with a BMI of >35 were even more likely to require acute and critical care (2.2 and 3.6, respectively)[11]. Elevated BMI has recently been shown to be associated with invasive mechanical ventilation (IMV) requirement, with an odds ratio of 7.36 (95% CI 1.63-33.14) for IMV in patients with BMI>35 compared to patients with BMI<35[12].

Although many studies of COVID-19 patients have not reported measures of BMI or obesity directly, the most common underlying comorbidities are obesity-related. A US CDC report analysing 7162 patients found that the 3 most common underlying comorbidities were hypertension, diabetes mellitus and chronic lung disease[13]. Similarly, in a study of 1591 COVID-19 patients admitted to ICUs In Italy, hypertension was the most common underlying comorbidity (49%), followed by cardiovascular disease (21%) and hypercholesterolemia (18%); conditions which are related to or exacerbated by obesity[14].

Obesity was identified as a risk factor for severe disease in the H1N1 pandemic, causing compromised immune responses and reduced pulmonary function[15]. Given the high global prevalence of obesity and its potential impact on COVID-19 disease course and severity, further studies of its impact as an independent risk factor are urgently needed. Current data suggest an increased risk of poor outcomes if obese and hospitalised with COVID-19 but further work is also needed to establish if obesity is a risk factor for hospitalisation.

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