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### **Introduction:**

Obesity is a risk factor for severe Coronavirus Disease 2019 (COVID-19) and might play a role in its pathophysiology. It is however unknown whether BMI is related to clinical outcome following Intensive Care Unit (ICU) admission, as observed in various other categories of critically ill patients. We investigated the relationship between body mass index (BMI) and in-hospital mortality in critically ill COVID-19 patients and in cohorts of ICU patients with non-SARS-CoV-2 viral pneumonia, bacterial pneumonia, and multiple trauma.

### **Methods:**

We performed a multicenter observational cohort study using data from 35.506 consecutive patients from 82 ICUs participating in the Dutch National Intensive Care Evaluation quality registry. Patient characteristics and clinical outcomes were compared between four cohorts (COVID-19, non-SARS-CoV-2 viral pneumonia, bacterial pneumonia, and trauma) and between BMI categories within cohorts. Adjusted analyses of the relationship between BMI and in-hospital mortality within each cohort were performed using multivariable logistic regression.

### **Results:**

COVID-19 patients were more likely male, had a higher BMI, lower PaO<sub>2</sub>/FiO<sub>2</sub> ratio, and were more likely mechanically ventilated during the first 24 hours in the ICU compared to the other three cohorts. COVID-19 patients had longer ICU and hospital length of stay, and higher in-hospital mortality. Odds ratios for in-hospital mortality for patients with BMI ≥ 35 kg/m<sup>2</sup> compared with normal weight in the COVID-19, non-SARS-CoV-2 viral pneumonia, bacterial pneumonia, and trauma cohorts were 1.15 [0.79-1.67], 0.64 [0.43-0.95], 0.73 [0.61-0.87] and 0.81 [0.57-1.15], respectively (Table 1).

### **Conclusion:**

The obesity paradox, which is the inverse association between BMI and mortality in critically ill patients, is not present in ICU patients with COVID-19-related respiratory failure, in contrast to ICU patients suffering from non-SARS-CoV-2 viral and bacterial respiratory infections.

### **Table:**

	COVID-19 (n=2635)	non-SARS-CoV-2 viral pneumonia (n=2940)	Bacterial pneumonia (n=14250)	Trauma (n=15681)
BMI <18.5 kg/m <sup>2</sup>	1.92 [0.51-7.13]	1.50 [0.95-2.37]	1.88 [1.57-2.25]	1.23 [0.86-1.78]
BMI 18.5-25 kg/m <sup>2</sup>	1.0 reference	1.0 reference	1.0 reference	1.0 reference

BMI 25-30 kg/m <sup>2</sup>	0.95 [0.75-1.21]	0.78 [0.61-0.99]	0.78 [0.70-0.86]	0.90 [0.78-1.03]
BMI 30-35 kg/m <sup>2</sup>	0.87 [0.65-1.16]	0.76 [0.55-1.04]	0.81 [0.70-0.93]	0.99 [0.79-1.23]
BMI ≥35 kg/m <sup>2</sup>	1.15 [0.79-1.67]	0.64 [0.43-0.95]	0.73 [0.61-0.87]	0.81 [0.57-1.15]

*Table 1. Odds ratios of in-hospital mortality of BMI categories in the multivariate logistic regression model, with BMI 18.5-25 kg/m<sup>2</sup> used as reference category. Covariates used for this analyses included sex, age, medical history (chronic diagnoses), APACHE III acute physiology score (APS), vasoactive medication and mechanical ventilation and PaO<sub>2</sub>/FiO<sub>2</sub> ratio on ICU admission.*