

Body mass index as a long-term risk factor for severe COVID-19 requiring intensive care

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INTRODUCTION

Cohort studies examining the long-term association between body mass index (BMI) and severe COVID-19 outcomes remain sparse. Few large-scale studies have provided pre-pandemic baseline measurements linked to subsequent COVID-19 outcomes in healthy individuals. This study investigates the association of BMI with the risk of COVID-19 outcomes requiring intensive care unit (ICU) admission over a 30-year follow-up period.

METHODS

Data were derived from the Vorarlberg Health Monitoring and Promotion Programme (VHM&PP) cohort, which comprised 177,384 participants who underwent standardised health examinations between 1988 and 2005. At baseline, trained health professionals measured height and weight, and fasting blood samples were collected. After a median follow-up of 30 years, 227 participants required ICU admission at the State Hospital Feldkirch and other intensive care units across Vorarlberg, Western Austria due to severe COVID-19 between 2020 and 2022. As 45,971 participants died during follow-up, competing risk analysis was used to estimate the subdistribution hazard ratios (SHRs) per unit increase in BMI (kg/m^2), with death as the competing event, adjusting for age, sex and smoking status.

RESULTS

At baseline, participants had a median age of 42 years and 54% were female. Participants who later required ICU admission for COVID-19 had a higher mean BMI than those who did not (27.2 ± 4.9 vs. $24.9 \pm 4.3 \text{ kg/m}^2$). At ICU admission, patients were on average 70 years old, and 65% were male. The adjusted SHR for ICU admission was 1.12 per kg/m^2 , 95%CI: 1.09-1.14, indicating a statistically significant positive association between BMI and the risk of ICU admission. Among the covariates, male sex in particular was associated with a higher risk of ICU admission (SHR 2.07, 95%CI: 1.56-2.75). BMI showed a stronger association in females (SHR 1.14 per kg/m^2 , 95%CI: 1.11-1.16) compared to males (SHR 1.09 per kg/m^2 , 95%CI: 1.05-1.12) with a significant interaction between sex and BMI ($p=0.029$). The association between BMI and ICU admission remained almost unchanged after additional adjustment for blood pressure, fasting glucose, triglycerides and cholesterol. Figure 1 illustrates the incidence of ICU admission, stratified by sex, at selected body mass indices (BMI) of 25 kg/m^2 and 30 kg/m^2 .

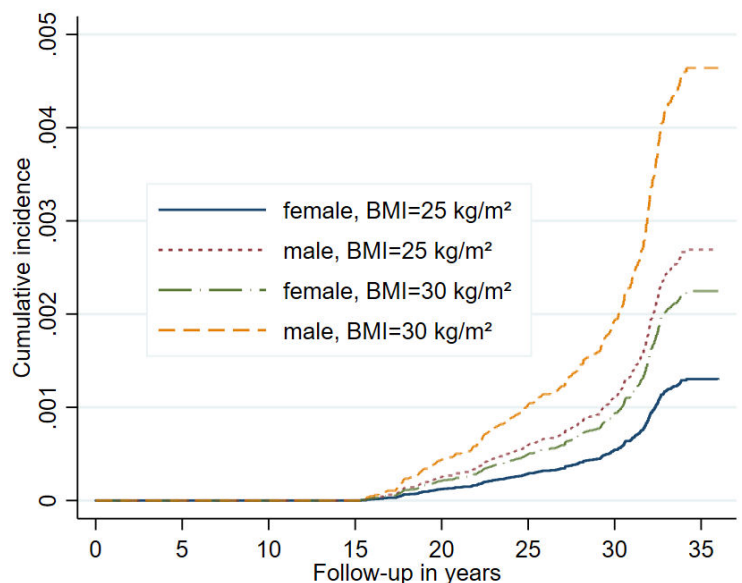


Figure 1. Cumulative incidence of severe COVID-19 requiring intensive care: Estimates of the cumulative incidence of ICU admission for severe COVID-19 from a competing risk model with death as the competing event and the predictors body mass index (BMI), age, sex and smoking status. Results are shown for both sexes at BMI= 25 kg/m^2 and BMI= 30 kg/m^2 .

CONCLUSION

Higher BMI in middle-aged adults was independently associated with an increased risk of severe COVID-19 requiring intensive care, even after 30 years of follow-up. These findings add to the evidence that obesity itself contributes to the risk of severe COVID-19 and highlight the lasting health consequences of elevated body weight over the long term.

References

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