



Body Mass Index >35 as Independent Predictor of Mortality in Severe Traumatic Brain Injury

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■ **OBJECTIVE:** Severe traumatic brain injury (TBI) has a major influence on polytrauma outcome. The aim of this study was to evaluate the impact of body mass index (BMI) on mortality and early neurologic outcome in patients suffering from severe TBI with a special focus on obesity classes II and III (BMI ≥ 35).

■ **METHODS:** A retrospective cohort analysis of patients suffering from a leading, at least severe TBI and registered in the TraumaRegister DGU was conducted. Patients alive on admission with full status documentation on Glasgow Coma Scale, height, and weight were classified into 4 BMI subgroups. Early neurologic outcome was classified using the Glasgow Outcome Scale.

■ **RESULTS:** A total of 1634 patients met the inclusion criteria. Lowest mortality was documented for BMI group 1 (15.2%, BMI 25.0–29.9/18.5). Highest mortality was found in BMI group 5 (25.6%, BMI ≥ 35). BMI ≥ 35 was an independent predictor of mortality with an odds ratio of 3.15 (95% confidence interval [1.06–9.36], $P = 0.039$). Further independent mortality predictors were >65 years of age, a Glasgow Coma Scale of ≤ 13 , an Abbreviated Injury Scale_{head} ≥ 5 , prehospital cardiopulmonary resuscitation, and a prehospital blood pressure of <90 mm Hg. In terms of good early

neurologic outcomes, no differences were recorded between the BMI groups (range 59.0%–62.6%, $P = 0.087$).

■ **CONCLUSIONS:** In this study a BMI ≥ 35 is an independent predictor of mortality and is associated with an inferior early functional neurologic outcome.

INTRODUCTION

Traumatic brain injury (TBI) remains one of the major causes of disability and death after trauma, especially in younger patients.^{1,2} Obesity is widely acknowledged to be a leading public health threat and is commonly associated with multiple comorbidities. The prevalence of obesity is increasing in not only high-income countries but also low- and middle-income countries.^{3–7} Body mass index (BMI) is an anthropometric index of weight for height. It is defined as the weight in kilograms divided by the square of the height in meters (kg/m^2) and represents a widely accepted grading system for obesity.⁸

The general impact of BMI on trauma is discussed controversially. Recent studies demonstrated that morbid obesity is associated with a higher mortality risk while Mica et al⁹ demonstrated a lower mortality in polytrauma patients with a BMI ≥ 30 . Finally, Majdan et al^{9–12} found no association between

Key words

- Body mass index
- Mortality
- Obesity
- Outcome
- Traumatic brain injury

Abbreviations and Acronyms

- AIS:** Abbreviated Injury Scale
BMI: Body-mass-index
BP: Blood pressure
CI: Confidence interval
CPR: Cardiopulmonary resuscitation
DGU: Deutsche Gesellschaft für Unfallchirurgie (German Trauma Society)
GCS: Glasgow Coma Scale
GOS: Glasgow Outcome Scale
ICU: Intensive care unit
ISS: Injury Severity Score
OR: Odds ratio
RISC: Revised Injury Severity Classification, Sektion NIS Committee on Emergency Medicine, Intensive Care and Trauma Management of the German Trauma Society

SMR: Standardized Mortality Ratio

TBI: Traumatic brain injury

TR-DGU: TraumaRegister Deutsche Gesellschaft für Unfallchirurgie

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