International Surgery Journal
Durazo AMS et al. Int Surg J. 2025 Dec;12(12):2042-2046
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: https://dx.doi.org/10.18203/2349-2902.isj20253761

Original Research Article

Body mass index as a predictor of severity in burn injury: a retrospective analytical study

Adda María Sánchez Durazo, Juan Carlos Hernández Torón, Kenia Selene Avilés Palomares, Yuri Jiménez Caprielova*, Patricia Sofía Elguezabal Riojas, Carlos Francisco Morales Covarrubias

Unidad Médica de Alta Especialidad (UMAE) "Dr. Victorio de la Fuente Narváez," Instituto Mexicano del Seguro Social (IMSS), Mexico City, Mexico

Received: 26 October 2025
Accepted: 12 November 2025

***Correspondence:**
Yuri Jiménez Caprielova,
E-mail: yurijimenezcpr@gmail.com

ABSTRACT

Background: Obesity has been identified as an independent risk factor influencing outcomes in trauma and critical illness. In burn patients, excess weight may exacerbate metabolic demand, impair wound healing, and increase mortality. Objective of the study was to determine whether body mass index (BMI) serves as a predictor of severity in hospitalized burn patients and to assess whether incorporating BMI into the abbreviated burn severity index (ABSI) improves its prognostic accuracy.
Methods: A retrospective, analytical, and cross-sectional study was conducted at the Burn and Intensive Care Units of the "Dr. Victorio de la Fuente Narváez" Hospital, Instituto Mexicano del Seguro Social (IMSS), from January 2016 to January 2020. Clinical records were reviewed to obtain demographic, anthropometric, and clinical data. Sensitivity and specificity analyses were performed to determine the optimal BMI cutoff for mortality prediction.
Results: Seventy adult burn patients met inclusion criteria. The mean BMI among survivors was 26.7±3.9 kg/m² and among non-survivors 30.5±4.9 kg/m² (p=0.03). A BMI cutoff of 28 kg/m² yielded an AUC of 0.748 (95% CI 0.68-0.88; p=0.003), with 0.80 sensitivity and 0.69 specificity for mortality prediction. Mortality was significantly higher among patients with BMI ≥28 kg/m² (80%) compared to those below this threshold (32.7%; p=0.0003). The standard ABSI system maintained high predictive accuracy (sensitivity=86.6%, specificity=100%).
Conclusions: BMI ≥28 kg/m² adversely affects survival in adult burn patients. Although the ABSI remains a highly accurate tool, incorporating BMI could enhance its prognostic power.

Keywords: Burn injury, Body mass index, Obesity, Severity index, Prognosis, Mortality

INTRODUCTION

Burn injury remains one of the most severe forms of trauma, associated with high morbidity and mortality. Outcomes depend on multiple variables, including total body surface area (TBSA) burned, depth of injury, age, inhalation injury, and pre-existing comorbidities. Among these, obesity has gained recognition as a potential prognostic determinant.

Obese patients exhibit a disproportionate physiological response to thermal injury compared to non-obese individuals with similar TBSA burns. Increased adipose tissue alters fluid resuscitation requirements, thermoregulation, immune response, and wound healing.[1-3] Furthermore, obesity is associated with metabolic syndrome, diabetes, and cardiovascular disease, all of which complicate recovery and increase infection risk.[4,5]

While various scoring systems have been proposed for mortality prediction in burn patients, the abbreviated burn severity index (ABSI) remains among the most widely used due to its simplicity and accuracy.[6] However, the ABSI, developed in 1982, does not include obesity or body mass index (BMI) as prognostic variables. With the rising prevalence of obesity worldwide, it is essential to reassess predictive models to reflect contemporary patient populations.[7,8]

The present study aims to evaluate BMI as an independent predictor of severity and mortality in hospitalized burn patients and to determine whether adding BMI to the ABSI improves its sensitivity and specificity.

METHODS

Study design

An observational, cross-sectional, retrospective, and analytical study was conducted at the Burn Unit and Intensive Care Unit of the "Dr. Victorio de la Fuente Narváez" Hospital, IMSS, Mexico City.

Study period

Duration of the study was from January 1, 2016 to January 31, 2020.

Population and sample

All patients hospitalized with a diagnosis of burn injury were considered. Exclusion criteria were age under 18 years (n=380); patients with concomitant life-threatening trauma (n=500); and incomplete clinical records (n=1,650). The final sample comprised 70 adult patients.

Variables

Demographic data (age, sex), anthropometric measures (weight, height, BMI), TBSA burned, inhalation injury, comorbidities, ABSI score, and mortality outcome were recorded.

Statistical analysis

Descriptive statistics summarized patient characteristics. Continuous variables were expressed as mean±SD. Receiver operating characteristic (ROC) curve analysis identified the optimal BMI cutoff for predicting mortality. Sensitivity, specificity, and area under the curve (AUC) were calculated. Comparisons between survivors and non-survivors used Student's t-test and Chi-square test, with significance at $p<0.05$ (SPSS v25).

Ethical considerations

Approved by the Institutional Research and Ethics Committee, UMAE "Dr. Victorio de la Fuente Narváez," IMSS (Registry R-2020-3401-016). The study adhered to the principles of the Declaration of Helsinki.

RESULTS

A total of 70 adult patients were analyzed. The mean BMI of the overall population was 27.4±4.2 kg/m². The most frequent mechanism of injury was flame burn (60%), followed by scalding (27%) and electrical burns (13%). The mean TBSA affected was 29±10%.

Fifteen patients (21.4%) died during hospitalization. Mean BMI among survivors was 26.7±3.9 kg/m² compared to 30.5±4.9 kg/m² in non-survivors (p=0.03). ROC curve analysis identified BMI=28 kg/m² as the best cutoff for mortality prediction (AUC=0.748, 95% CI 0.68–0.88, p=0.003) with sensitivity=0.8 and specificity =0.69.

Patients with BMI ≥28 kg/m² had an 80% mortality rate versus 32.7% among those with lower BMI (p=0.0003). The ABSI maintained high predictive accuracy (sensitivity=86.6%, specificity=100%).

Table 1: General characteristics of hospitalized burn patients (n=70).

Variable	Category	N	%
Sex	Male	45	64.3
	Female	25	35.7
Mean age (years)	—	41.2±16.8	—
Mechanism of injury	Flame burn	42	60.0
	Scalding	19	27.1
	Electrical burn	9	12.9
Burn surface area (TBSA)	—	29.0±10.1	—
Inhalation injury	Present	8	11.4
	Absent	62	88.6
Comorbidities	Diabetes mellitus	10	14.3
	Hypertension	8	11.4
	None	52	74.3
Mean BMI (kg/m²)	—	27.4±4.2	—
Survival outcome	Survived	55	78.6
	Deceased	15	21.4

Table 2: Comparison between survivors and non-survivors according to BMI and ABSI.

Variables	Survivors (n=55)	Non-survivors (n=15)	P value
Mean BMI (kg/m²)	26.7±3.9	30.5±4.9	0.03*
BMI ≥28 kg/m²	18 (32.7%)	12 (80.0%)	0.0003*
Mean ABSI score	6.2±1.8	9.5±2.1	<0.001*
Mortality predicted by ABSI (%)	86.6 (sensitivity)	100 (specificity)	—
Mortality predicted by BMI ≥28 kg/m² (%)	80 (sensitivity)	69 (specificity)	—

*Statistical significance at p<0.05.

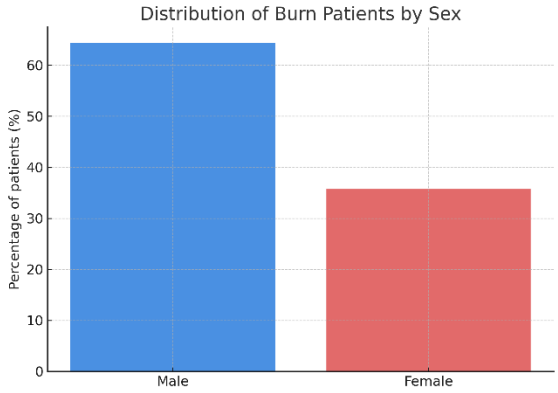

Figure 1: Distribution of burn patients by sex.

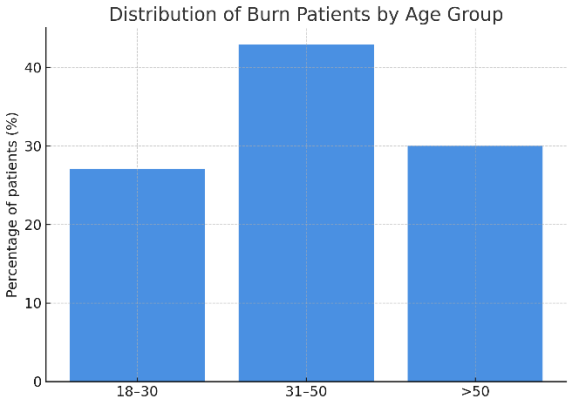

Figure 2: Distribution of burn patients by age group.

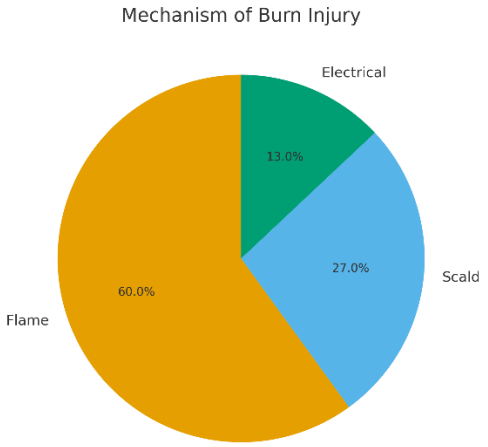

Figure 3: Mechanism of burn injury.

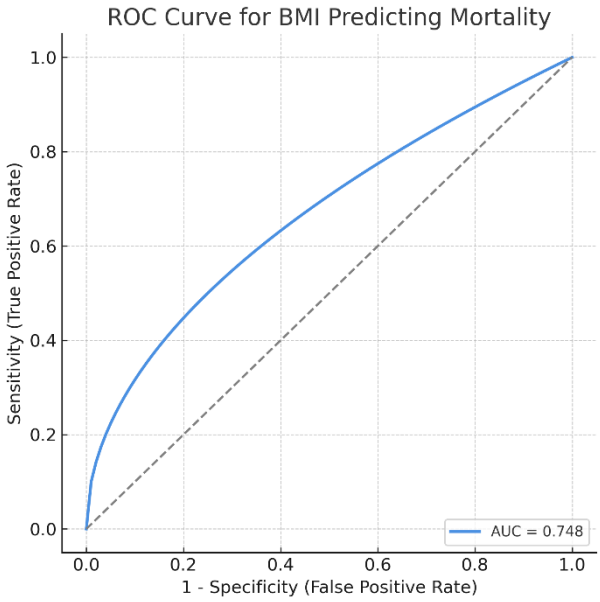

Figure 4: ROC curve for BMI predicating mortality.

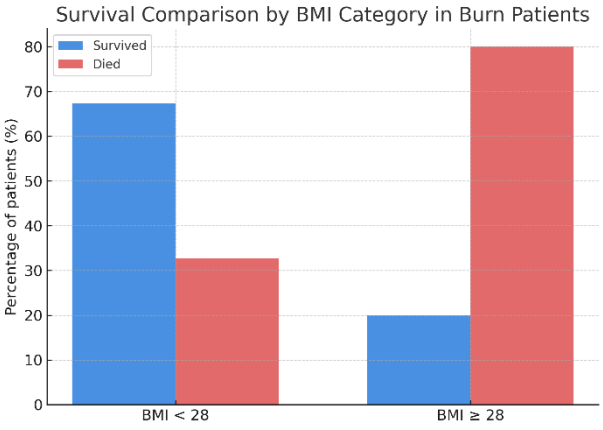

Figure 5: Survival comparison by BMI category in burn patients.

DISCUSSION

This study demonstrates that body mass index is a significant prognostic factor in burn injury mortality, independent of classical predictors such as age, sex, and TBSA. Patients with BMI ≥28 kg/m² had nearly triple the mortality risk compared to those below this threshold.

Obesity and burn physiology

Obesity alters systemic responses to trauma and infection. Increased adipose tissue impairs oxygen diffusion, decreases capillary density, and promotes chronic inflammation, all of which delay wound healing.[9] Furthermore, obese patients experience altered pharmacokinetics, greater difficulty in airway management, and increased risk of sepsis and respiratory failure.[10,11]

Predictive value of BMI

The identified cutoff (BMI ≥28 kg/m²) in our cohort suggests that even overweight individuals—below the standard obesity threshold of 30 kg/m²—are at higher risk of mortality. This aligns with studies showing a J-shaped association between BMI and burn outcomes, where both underweight and overweight patients exhibit increased mortality.[12–14]

Integration into prognostic models

The ABSI has been validated for decades, but its exclusion of BMI may underestimate risk in modern populations, where obesity prevalence has increased globally.[15] Incorporating BMI could enhance discrimination of high-risk patients and refine triage decisions.

Clinical implications

Recognizing BMI as a severity marker allows for individualized resuscitation, nutritional planning, and early mobilization strategies. Moreover, given the increasing prevalence of obesity in Mexico, our results carry significant implications for regional burn care systems.

Limitations

The main limitations of this study are its retrospective design, single-center nature, and modest sample size. Functional outcomes and long-term follow-up were not assessed. Nevertheless, the statistical strength and biological plausibility of BMI's association with mortality underscore its relevance.

CONCLUSION

For our population, the ABSI remains a precise and reliable tool for predicting burn mortality. However, BMI ≥28 kg/m² independently worsens survival, suggesting that incorporating BMI into the ABSI model may improve its sensitivity and specificity for contemporary patient populations.

ACKNOWLEDGEMENTS

The authors would like to thank the Burn Unit team for their collaboration in data collection and patient care.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Porter C, Herndon DN, Borsheim E, Chao T, Reidy PT, Borack MS, et al. Uncoupled skeletal muscle mitochondria contribute to hypermetabolism in severely burned adults. Am J Physiol Endocrinol Metab. 2014;307(5):E479-87.
2. Sheridan RL, Rue LW 3rd, McManus WF, Pruitt BA Jr. Burns in morbidly obese patients. J Trauma. 1992;33(6):818-20.
3. Cromwell PM, Reynolds IS, Heneghan HM, Glasgow SM. Obesity and outcomes in trauma - a systematic review and meta-analysis. Injury. 2023;54(2):469-80.
4. Sayampanathan AA. Systematic review and meta-analysis of complications and outcomes of obese patients with burns. Burns. 2016;42(8):1634-43.
5. Borrell LN, Samuel L. Body mass index categories and mortality risk in US adults: the effect of overweight and obesity on advancing death. Am J Public Health. 2014;104(3):512-9.
6. Tobiasen J, Hiebert JM, Edlich RF. The Abbreviated Burn Severity Index. Ann Emerg Med. 1982;11(5):260-2.
7. Christ A, Staud CJ, Krotka P, Resch A, Neumüller A, Radtke C. Revalidating the prognostic relevance of the Abbreviated Burn Severity Index (ABSI): A twenty-year experience examining the performance of the ABSI score in consideration of progression and advantages of burn treatments from a single center in Vienna. J Plast Reconstr Aesthet Surg. 2024;94:160-8.
8. Mrad MA, Al Qurashi AA, Shah Mardan QNM, Al Jabr FA, Almenhali AA, Bamakhrama B, et al. Risk Models to Predict Mortality in Burn Patients: A Systematic Review and Meta-analysis. Plast Reconstr Surg Glob Open. 2022;10(12):e4694.
9. Liodaki E, Senyaman Ö, Stollwerck PL, Möllmeier D, Mauss KL, Mailänder P, Stang F. Obese patients in a burn care unit: a major challenge. Burns. 2014;40(8):1738-42.
10. Pauzenberger R, Radtke C, Ederer IA, Hacker S, Waldmann A, Sternat N, et al. Does obesity impact the outcome of severely burned patients? Int Wound J. 2020;17(2):380-6.
11. Ayalon I, Bodilly L, Kaplan J. The Impact of Obesity on Critical Illnesses. Shock. 2021;56(5):691-700.

12. Dhanasekara CS, Cole TJ, Bayouth J, Shaw C, Dissanaike S. Impact of elevated body mass index on burn injury-associated mortality in a representative US sample. Surgery. 2023;173(6):1508-12.
13. Yazıcı H, Uçar AD, Namdaroğlu O, Yıldırım M. Mortality prediction models for severe burn patients: Which one is the best? Ulus Travma Acil Cerrahi Derg. 2022;28(6):790-5.
14. Saadat GH, Toor R, Mazhar F, Bajani F, Tatebe L, Schlanser V, et al. Severe burn injury: Body Mass Index and the Baux score. Burns. 2021;47(1):72-7.
15. Tolley PD, McClellan JM, Butler D, Stewart BT, Pham TN, Sheckter CC. Burn Outcomes at Extremes of Body Mass Index: Underweight Is as Problematic as Morbid Obesity. J Burn Care Res. 2022;43(5):1180-5.

Cite this article as: Durazo AMS, Torón JCH, Palomares KSA, Caprielova YJ, Riojas PSE, Covarrubias CFM. Body mass index as a predictor of severity in burn injury: a retrospective analytical study. Int Surg J 2025;12:2042-6.