Predictors of Mortality in Tumor Lysis Syndrome Hospitalizations Associated With Hematologic Malignancies

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Introduction

Tumor lysis syndrome (TLS) is an oncologic emergency frequently observed in hematologic malignancies (HM) characterized by rapid malignant cell breakdown, leading to severe metabolic derangements and organ dysfunction. Although tumor lysis syndrome (TLS) is a well-known and extensively researched clinical entity, the factors influencing mortality among TLS-related hospitalizations remain poorly defined. This study aims to identify demographic and clinical predictors of mortality in hospitalized patients with HM-associated TLS.

Significance and Innovation

AKI, hyperkalemia, and hypocalcemia are linked to poor outcomes in TLS, but their mortality impact at a national level is unclear. Additionally, demographic variables, such as female sex or obesity, may paradoxically offer some survival protection. Racial disparities have emerged across cancer care, and their role in TLS mortality remains underexplored.

This study is one of the largest database analyses of TLS mortality in HM patients. It goal is to aid in the integration of clinical, demographic, and racial variables so that providers can better triage risk and personalize early management strategies.

Methods

We conducted a retrospective cohort study using the NIS database (2016-2020). The analysis included adult TLS patients (age >18 years), examining predictors of mortality. These predictors included basal demographics (age, race, gender), comorbidities (diabetes, obesity, alcohol use, smoking, coronary artery disease [CAD], HIV) and the development of complications (acute kidney injury [AKI], hyperkalemia, hypocalcemia, arrhythmia, acute heart failure [HF]). Statistical significance ($p < 0.05$) was determined using survey-weighted logistic regression.

Results

67,450 TLS hospitalizations were identified with a mean age of 63 years, 37% were females ($p<0.001$). TLS patients had higher odds of mortality compared to the general population (Adjusted odds ratio [aOR]: 4.90, 95% Confidence Interval [CI]: 4.67-5.14, $p<0.001$).

Among the predictors studied, the following were identified to be statistically significant predictors of mortality:

- Age (aOR: 1.028, CI: 1.028-1.029, $p< 0.001$)
- Female gender (aOR: 0.82, CI: 0.81-0.83, $p<0.001$)
- Alcohol use (aOR: 1.31, CI: 1.29-1.33, $p<0.001$)
- Smoking (aOR: 0.79, CI: 0.78-0.80, $p<0.001$)
- Obesity (aOR: 0.66, CI: 0.65-0.69, $p<0.001$)
- HIV (aOR 1.75, CI 1.69-1.82, $p< 0.001$)
- AKI (aOR: 3.72, CI 3.68-3.76, $p<0.001$)
- Arrhythmia (aOR: 1.66, CI 1.65-1.67, $p<0.001$)
- CHF (aOR: 1.30, CI: 1.28-1.31, $p<0.001$)
- Hyperkalemia (aOR: 1.99, CI 1.97-2.01, $p<0.001$)
- Hypocalcemia (aOR: 1.97, 1.93-2.00, $p<0.001$)

Compared to whites, African-Americans and Hispanics had higher odds of mortality [aOR 1.04, CI 1.02-1.05, $p< 0.001$ and aOR: 1.10, CI: 1.08-1.12, $p<0.001$ respectively].

Predictors of Mortality in TLS Hospitalizations

Predictor	Adjusted OR (95% CI)	P-value	Interpretation
Mortality vs General Population	4.90 (4.67–5.14)	<0.001	Higher mortality in TLS
Age	1.028 (1.028–1.029)	<0.001	Older age increases mortality
Female Gender	0.82 (0.81–0.83)	<0.001	Females have lower mortality
Alcohol Use	1.31 (1.29–1.33)	<0.001	Increases mortality
Smoking	0.79 (0.78–0.80)	<0.001	Associated with lower mortality
Obesity	0.66 (0.65–0.69)	<0.001	Protective effect
HIV	1.75 (1.69–1.82)	<0.001	Higher mortality
AKI	3.72 (3.68–3.76)	<0.001	Strong predictor of mortality
Arrhythmia	1.66 (1.65–1.67)	<0.001	Higher mortality
CHF	1.30 (1.28–1.31)	<0.001	Higher mortality
Hyperkalemia	1.99 (1.97–2.01)	<0.001	Higher mortality
Hypocalcemia	1.97 (1.93–2.00)	<0.001	Higher mortality
African-American vs White	1.04 (1.02–1.05)	<0.001	Higher mortality
Hispanic vs White	1.10 (1.08–1.12)	<0.001	Higher mortality

Discussion

The study revealed critical racial disparities and predictors of worse mortality outcomes in TLS hospitalizations, like alcohol use, HIV status, and in-hospital complications.

In contrast, some predictors such as smoking, obesity, and female sex were associated with improved mortality outcomes. Future research should validate these findings and explore interventions targeting these significant predictors.

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