

A Prospective Cohort Study Investigating Biomarkers as Predictors of Mortality after Geriatric Hip Fractures

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INTRODUCTION: Hip fractures are a major source of morbidity, mortality, and healthcare costs in the aging population. While prior studies identified non-modifiable risk factors for poor prognosis and increased resource utilization, biomarkers may offer opportunities for early intervention. This prospective study evaluates pre-operative laboratory values as predictors of one-year mortality in geriatric hip fracture patients.

METHODS: This study was conducted at a Level I academic medical center from September 2022 to February 2025. Patients aged ≥ 50 years with low-energy hip fractures were enrolled at admission. Univariate analysis compared survivors and non-survivors using Fisher's exact tests for categorical variables and t-tests for continuous variables. Variable selection used least absolute shrinkage and selection operator (LASSO) regression. Modified Poisson regression with robust variance estimators estimated relative risks (RR) and 95% confidence intervals (CI). Model performance was assessed using the area under the curve (AUC).

RESULTS: 91 patients were included (mean age 76.6 ± 9.1 years, 37.4% male). One-year mortality was 25.3%. Deceased patients had higher Charlson Comorbidity Index (CCI) (6.00 vs. 3.49, $p = 0.001$), lower albumin (3.33 vs. 3.87 g/dL, $p < 0.001$), and elevated inflammatory markers. C-reactive Protein was significantly higher in non-survivors (86.81 ± 69.03 vs. 27.38 ± 43.72 mg/L, $p < 0.001$), as were Neutrophil-to-Lymphocyte Ratio (15.27 ± 21.48 vs. 7.01 ± 5.24 , $p = 0.005$) and Systemic-Inflammation Response Index (SIRI) (10.22 ± 8.61 vs. 4.80 ± 3.81 , $p < 0.001$). In multivariable analysis, CCI (RR = 1.19, 95% CI: 1.07–1.32), SIRI (RR = 1.05, 95% CI: 1.02–1.07), and low albumin (RR = 4.35, 95% CI: 1.94–9.73) independently predicted mortality. The final model demonstrated excellent discrimination (AUC = 0.87).

DISCUSSION AND CONCLUSION: Prospectively enrolled patients with pre-operative hypoalbuminemia (≤ 3.5 g/dL), increased markers of systemic inflammation, and higher comorbidities had a significantly increased risk of mortality at 1 year. These results can have a significant impact on pre-operative counseling, indicate patients that require closer monitoring, and may lead to interventions to improve patient outcomes.