A Data-Driven Exploration of Albumin-Creatinine Ratio as a Biomarker for Myocardial Infarction Risk: A Multivariate Analysis

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Myocardial infarction, the leading cause of death in America, can be prevented by detecting risk factors early. I investigated the relationship between urine albumin-creatinine ratio (uACR) and myocardial infarction risk through various statistical procedures. Using an unweighted NHANES 2017 - March 2020 Pre-Pandemic dataset adapted for a biostatistics course, I created a subset of 7320 individuals 20 or older. With heart attack as a dichotomous dependent variable and uACR as a categorical variable, I conducted the Kruskal-Wallis test, Fisher Exact test, and Chi-Square test to obtain sample baseline characteristics values. Using normal uACR as the reference, univariable regression revealed a significant association between myocardial infarction risk and moderately increased uACR (crude Odds Ratio (OR) = 2.41; 95% CI, 1.71-3.34, $p < .0001$) as well as with severely increased uACR (crude OR = 4.91; 95% CI, 2.75-8.23, $p < .0001$). After adjusting for age, sex, liver condition, smoking, BMI, and hypertension, the relationship between myocardial infarction risk and moderately increased uACR was not significant, but its relationship with severely increased uACR was significant (adj. OR = 2.10; 95% CI, 1.12-3.70, $p = .014$), indicating that the crude OR was biased away from the null and overestimated the association. This model is accurate, boasting an Area Under the Curve (AUC) of .867, indicating that it correctly predicts heart attack cases and non-cases 86.7% of the time on average. These results illustrate uACR's potential as a predictive biomarker for identifying individuals who are susceptible to myocardial infarction early on, enabling timely interventions and improved health outcomes.

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