Does the BUN/Cr Ratio Confer a Worse Prognosis in All Ejection Fraction Spectra?

Giovanni Possamai Dutra[1] *and Bruno Ferraz de Oliveira Gomes*[1,2]

Hospital Barra D'Or,[1] *Rio de Janeiro, RJ – Brazil*

Universidade Federal do Rio de Janeiro,[2] *Rio de Janeiro, RJ – Brazil*

Short Editorial related to the article: Relationship between BUN/Cr and Prognosis of HF Across the Full Spectrum of Ejection Fraction

Neurohormonal activation is one of the most relevant pathophysiological features in Heart Failure (HF), promoting long-term deleterious effects that contribute to the development of cardiorenal syndrome. This hyperactivation is associated with the prognosis of acute heart failure; therefore, it is plausible to hypothesize that its activity is associated with the prognosis of heart failure.[1]

The current universal classification of heart failure, updated in 2021, modified the classification of HF according to ejection fraction (EF), replacing the mid-range EF (HFmrEF) with mildly reduced EF for those with an EF of 41% to 49%, maintaining the classification of reduced ejection fraction (HFrEF) for those with EF less than 40% and preserved (HFpEF) for patients with EF above 50%.[2] The most used classification system today is based on this categorization of patients into groups based on left ventricular ejection fraction (LVEF), and this model has become the main model used by guidelines to provide recommendations for treatment.[3]

HF and renal dysfunction frequently coexist, sharing many risk factors (diabetes, hypertension, and hyperlipidemia), contributing to worsening the prognosis.[4,5] The cardiorenal syndrome is characterized by worsening renal function during hospitalization for heart failure, or soon after discharge, despite symptomatic improvement by treatment with diuretics and maintenance of adequate intravascular volume.[5] Creatinine, blood urea nitrogen (BUN), and glomerular filtration rate (GFR) are the markers traditionally used in clinical practice to assess decompensated HF. Neurohormonal activity in heart failure greatly affects the magnitude of BUN reabsorption. Therefore, the BUN to creatinine ratio (BUN/Cr) is generally regarded as a relevant neurohormonal activity metric.[6]

Thus, the study "Relationship between BUN/Cr and prognosis of HF across the full spectrum of ejection fraction"[7] provided important information on this topic. This retrospective study included 2255 patients with symptomatic HF (NYHA class III-IV) who measured BUN and creatinine on admission. The BUN / Cr ratio was evaluated dichotomized (cutoff point = 25.5) in subgroups according to the ejection fraction (EF). Study outcomes were defined as HF readmission, cardiovascular death, and all-cause death, assessed at 3, 12 and 24 months, respectively.

In the reduced EF population, patients with an elevated BUN/creatinine ratio (>25.5) exhibited an increased risk of cardiovascular death at 3, 12, and 24 months and all-cause death at 3 months. On the other hand, in patients with HFmrEF, no significant difference was observed in outcomes. Finally, in patients with HFpEF, a high BUN/Cr ratio increased the risk of re-hospitalization for HF at 12 and 24 months and the risk of death from all causes.

Previous studies have already demonstrated the prognostic value of the BUN/creatinine ratio in patients with HF, especially those with renal dysfunction.[8,9] In addition, Parrinelo demonstrated that this relationship might be correlated with the degree of systemic congestion, justifying its increase in patients hospitalized with decompensated HF.[10] Finally, in this same scenario, the presence of a high BUN/Cr ratio on admission identifies patients likely to show recovery of renal function with treatment,[8] demonstrating that several mechanisms can explain how this ratio will impact mortality.

Some studies have shown no difference in mortality according to the classification based on the ejection fraction in the short and long term.[11] However, we know that pathophysiological differences exist in these EF spectra, which may justify the prognostic value of the BUN/Cr ratio, especially in HF with reduced EF, since these patients exhibit greater systemic congestion. This factor would justify the increase in this ratio.

The role of the BUN/Cr ratio as a metric of neurohormonal activity, therefore, needs further study. It is necessary to understand its role in the spectrum of ejection fraction classification and all clinical practice, thus justifying its routine use in clinical practice.

Keywords

Heart Failure; Blood Ureia Nitrogen; Stroke Volume/pysiology; Kidney Diseases/complications; Hospitalization; Mortality

Mailing Address: Bruno Ferraz de Oliveira Gomes •
Rede D'Or Sao Luiz – Cardiologia – Av. Ayrton Senna, 3079. Postal Code 22775-002, Rio de Janeiro, RJ – Brazil
E-mail: : drbrunoferraz@gmail.com

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References

1. Gardner RS, McDonagh TA. The prognostic value of anemia, right-heart catheterization and neurohormones in chronic heart failure. Expert Rev Cardiovasc Ther 2006; 4(1):51-7. Doi: 10.1586/14779072.4.1.51
2. Bozkurt B, Coats AJS, Tsutsui H, Adamopoulos s, Abdelhamid M, Albert n, et al. Universal Definition and Classification of Heart Failure A Report of the Heart Failure Society of America, Heart Failure Association of the European Society of Cardiology, Japanese Heart Failure Society and Writing Committee of the Universal Definition of Heart Failure. J Card Fail.2021;27(4);S1071-9164(21)000506. Doi: org/10.1016/j.cardfail.2021.01.022
3. Greenberg B, O`Connor CM, Felker M. Classifying heart failure in the 21st century. JACC Heart Fail.2021;9(10):771-3. Doi:10.1016/j.jch.2021.08.004
4. Damman K, Voors AA, O'Connor CM, Van Veldhuisen DJ, Hillege HL. Renal impairment, worsening renal function, and outcome in patients with heart failure: an updated meta-analysis.: Eur Heart J. 2014;35(7):455–69. Doi:10.1093/euheartj/eht386
5. Filippatos G, Farmakis D, Parissis J. Renal dysfunction and heart failure: things are seldom what they seem.: Eur Heart J .2014;35(7):416–8. Doi: 10.1093/euheartj/eht515
6. Bock J, Gottlieb SS. Cardiorenal syndrome. News perspectives. Circulation.2010;121(23):2592-600. Doi:10.1161/CIRCULATIONAHA.109.886473
7. Jorge MS, Rodrigues AJ, Vicente WVA, Evora PRB. nfective Endocarditis Surgery. Insights from 328 Patients Operated in a University Tertiary Hospital. Arq Bras Cardiol. 2023; 120(3):e20220608.
8. Brisco MA, Coca SG, Chen J, Owens AT, McCauley BD, Kimmel SE, et al. Blood urea nitrogen/creatinine ratio identifies a high-risk but potentially reversible form of renal dysfunction in patients with decompensated heart failure. Circ Heart Fail. 2013 Mar;6(2):233-9. doi: 10.1161/CIRCHEARTFAILURE.112.968230.
9. Murata A, Kasai T, Matsue Y, Matsumoto H, Yatsu S, Kato T, et al. Relationship between blood urea nitrogen-to-creatinine ratio at hospital admission and long-term mortality in patients with acute decompensated heart failure. Heart Vessels. 2018 Aug;33(8):877-85. doi: 10.1007/s00380-018-1135-.3
10. Parrinello G, Torres D, Testani JM, Almasio PL, Bellanca M, Pizzo G, et al. Blood urea nitrogen to creatinine ratio is associated with congestion and mortality in heart failure patients with renal dysfunction. Intern Emerg Med. 2015 Dec;10(8):965-72. doi: 10.1007/s11739-015-1261-1
11. Dutra GP, Gomes BFO, Carmo Jr PR, Petriz JLF, Nascimento EM, Pereira BB, et al. Mortalidade por insuficiência cardíaca com fração de ejeção intermediária. Arq Bras Cardiol. 2022;118(4):694-700. Doi: 10.36660/abc.20210050