

Metabolomics analysis and classic biomarkers to Predict Mortality in patients with Acute Kidney Injury and Replacement Therapy

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Abstract

1. KIM-1 was the best predictor of mortality.
2. p-cresol glucuronide was the metabolite present in the highest amounts among the deceased.

Introduction

Acute kidney injury (AKI) requiring renal replacement therapy (RRT) is associated with bad outcomes.

At the beginning of the RRT, serum metabolic biomarkers and markers of tubular damage might differentiate patients with a high risk of mortality.

In this study, we investigated the performance of 4 urinary biomarkers as well as metabolic analysis and 3 serum biomarkers in predicting mortality in patients with severe AKI and requiring renal replacement therapy (RRT).

Methods and Materials

Patients



-Prospective cohort study of patients with critical COVID-19 in intensive care unit (ICU) with invasive mechanical ventilation (IMV) and who required RRT.

-Mexico City (Mar 2020 - Feb 2022).

*Patients with CKD stages 4 or 5 and kidney transplant were excluded.

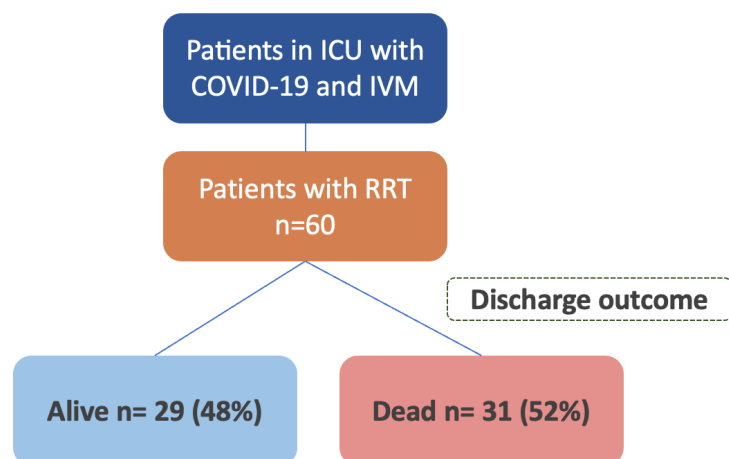
Samples



SerpinA3, KIM-1, nGAL and HSP-72 were measured in urine on day 0 (start of RRT) and metabolomics analysis, IL-6, IL-10, and TNF-alpha in serum on day 0.

Results

1. Consort diagram of the studied population.



Results

2. Clinical characteristics.

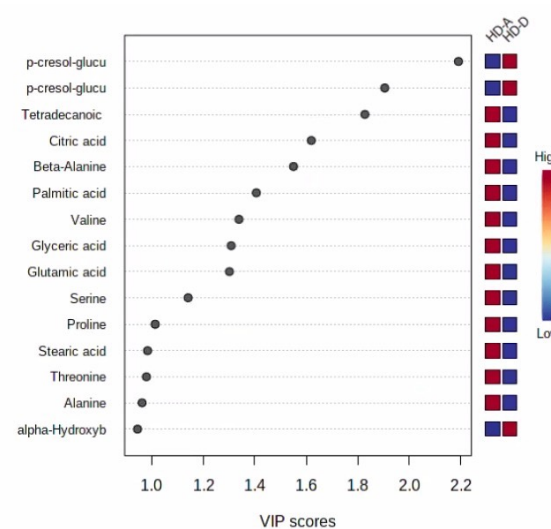
	Alive (n=29)	Dead (n=31)	p-Value
Demographics			
Age, years	51 ± 12.2	56 ± 12.2	0.085
Male, n (%)	20 (69)	26 (84)	0.173
Body mass index, kg/m ²	31 (29-35)	29 (27-38)	0.240
Charlson index, n (%)	1 (0-2)	2 (0-3)	0.323
SOFA score	10 (9-11)	10 (9-11)	0.542
Kidney function			
Baseline SCr, mg/dL	1 (0.8-1.2)	1 (0.9-1.2)	0.823
Urine output at RRT initiation, ml	612 (280-1347)	994 (250-2112)	0.416
Laboratory at RRT initiation			
Leukocytes, x 1000/mm ³	12 (9-15)	12 (8-17)	0.784
C-reactive protein, mg/dL	16.2 (10.3-27)	19 (7.6-29.3)	0.906
Creatine kinase, U/L	369 (69-1049)	1013 (302-1852)	0.023
Lactate dehydrogenase, U/L	433 (313-552)	482 (335-586)	0.608
Ferritin, ng/mL	939 (532-1689)	1202 (613-1855)	0.276
PaO ₂ /FIO ₂ ratio	144 (113-170)	123 (96-154)	0.141

3. Area under the receiver-operating characteristics curve of biomarkers for predicting mortality.

Biomarker	AUC (95% CI)	p-value
Urine biomarker		
KIM-1, µg/mg	0.68 (0.53-0.84)	0.03
HSP-72, µg/mg	0.51 (0.34-0.68)	0.32
NGAL, µg/mg	0.63 (0.47-0.79)	0.12
SerpinA3*, DPl/mg	0.52 (0.36-0.69)	0.78
SerpinA3**, µg/mg	0.64 (0.48-0.80)	0.10
Urine output >500ml	0.51 (0.37-0.66)	0.86
Urine output >1L	0.59 (0.44-0.73)	0.25
Plasma biomarker		
IL-6, pg/ml	0.57 (0.43-0.72)	0.31
IL-10, pg/ml	0.64 (0.50-0.79)	0.06
TNF-alpha, pg/ml	0.52 (0.37-0.67)	0.83

Abb. AUC, area under the curve.

4. VIP schematic scores of partial least squares-discriminatory analyses (PLS-DA) for HD-A (alive) vs HD-D (dead).



Conclusions

- In this study we observed that KIM-1 was the best predictor of mortality.
- In the metabolomics analysis, p-cresol glucuronide was the metabolite present in the highest amounts among the deceased.



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