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Risk factors and prognosis of acute kidney injury in hospitalized HIV-positive patients: a case-control study

BACKGROUND & OBJECTIVES

➢ Acute Kidney Injury (AKI) is common in hospitalized patients and is associated with short and long-term morbidity and mortality. It increases the risk of cardiovascular disease and chronic kidney disease (CKD). AKI is more common in HIV-positive patients than in the general population.

➢ Previous studies have identified risk factors of AKI in HIV-positive patients:
  • Similar risk factors as in the general population: male sex, age > 40 years, hypertension, diabetes, CKD, cirrhosis and hepatitis C
  • Specific to HIV: AIDS-related event, low CD4+ T-cells count and high viral load

➢ Objectives: to assess the risk factors and main causes of AKI and to evaluate its impact on the hospitalization outcome and short-term mortality

MATERIAL & METHODS

Case-control design: study approved by the local Ethics Committee

1st step: cases selection: recruitment 2007-2016
➢ Inclusion criteria:
  • AKI during hospitalization (defined by creatinine criteria of KDIGO)
  • Hospitalization duration > 3 days, ≥ 18 years

➢ Exclusion criteria:
  • Unknown baseline creatinine
  • CKD treated by dialysis

Definition of AKI according to KDIGO guidelines1: - Serum creatinine (SrCr): 1.5-1.9 times baseline OR ≥ 0.3 mg/dl increase - Urine output: < 0.5 ml/kg/h for 6-12 hours

RESULTS

The study has involved 412 patients (206 cases – 206 controls)

1. Main causes and stages of AKI

   Figure 1. AKI causes

   5% Functional
   9% Organic
   16% Multifactorial
   45% Obstructive
   25% Hypovolaemia (55%)
   26% Sepsis (68%)
   21% Septic shock (21%)
   16% Contrast product (46%)
   12% Nephrostic drug (42%)
   5% HIV (3%)
   5% CTX treated by dialysis

Stages of severity (KDIGO)
➢ Stage 1: 64% (SrCr 1.5-1.9 x baseline OR ≥ 0.3 mg/dl increase)
➢ Stage 2: 21% (SrCr 2-2.9 x baseline)
➢ Stage 3: 15% (SrCr 3 x baseline OR ≥ 4 mg/dl OR dialysis initiation)

2. Hospitalization and short-term outcomes

➢ Mortality:
  • In-hospital mortality: 16% of cases vs 0% of control (p<0.001)
  • Mortality at one year: no statistical difference

➢ Patients with AKI: 12% of dialysis (CVH), 5% of progression to CKD

➢ Re-hospitalization within the year: 38% of cases vs 13% of control (p<0.001)

Figure 2. Re-hospitalization within the year

3. Risk factors of AKI

Table 1. Assessment of the AKI risk factors in the baseline and hospitalization characteristics of controls and cases

<table>
<thead>
<tr>
<th>CASES</th>
<th>CONTROL</th>
</tr>
</thead>
<tbody>
<tr>
<td>N = 206 (%)</td>
<td>N = 206 (%)</td>
</tr>
<tr>
<td>Age ≥ 40 years</td>
<td>141 (68.45)</td>
</tr>
<tr>
<td>Sex (male)</td>
<td>118 (57.28)</td>
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| Comorbidities
  - Hypertension | 57 (27.67) | 29 (14.08) | 0.0001 | 0.0196 | 4.42 | [1.27-15.42] |
  - Diabetes | 45 (21.84) | 17 (8.25) | 0.0001 | 0.0069 | 9.32 | [1.85-47.08] |
  - Chronic kidney disease | 18 (8.74) | 6 (2.91) | 0.0116 | 1.062 | 3.9 | [0.57-26.8] |
| HIV characteristics
  - CD4+ before hospitalization | 113 (54.85) | 138 (66.99) | 0.0116 | 0.5814 | 0.69 | [0.19-3.56] |
  - Viral load ≤ 50 copies/ml | 68 (34.34) | 91 (48.66) | 0.0043 | 0.7555 | 1.21 | [0.36-4.12] |
  - >100000 copies/ml | 59 (28.98) | 31 (16.58) | 0.0022  | 0.8954 | 1.13 | [0.28-4.61] |
  - Nadir CD4+ T-cells count + 200/mm³ | 158 (74.88) | 96 (45.93) | <0.0001 | 0.6340 | 0.77 | [0.27-2.23] |
  - AIDS-related event before hospitalization | 104 (50.69) | 60 (29.13) | <0.0001 | 0.1226 | 2.11 | [0.84-5.3] |
| Hospitalization characteristics
  - AIDS-related event | 70 (33.98) | 26 (12.68) | <0.0001 | 0.7259 | 1.4 | [0.21-9.35] |
  - Infectious non related to AIDS | 69 (33.5) | 49 (23.9) | 0.0316 | 0.0504 | 2.86 | [0.89-7.96] |
  - Recent (<months) CD4+ T-cells count + 200/mm³ | 119 (58.91) | 36 (18.65) | <0.0001 | 0.0040 | 6.06 | [1.78-20.65] |
  - AIDS-related event during hospitalization | 90 (43.69) | 30 (14.56) | <0.0001 | 0.0782 | 6.42 | [0.01-50.82] |
  - ICU admission | 75 (36.41) | 11 (5.47) | <0.0001 | 0.0001 | 10.6 | [0.75-80.99] |

DISCUSSION

➢ No effective therapeutics improve the long-term prognosis of AKI. Hence, it is essential to avoid the development of AKI with preventive measures particularly for patients at increased risk of AKI, as found by our study

➢ Primary prevention: control of the risk factors as in the general population and specifically for the HIV-positive patients; we should evaluate the renal function at the time of diagnosis and early cART initiation in order to increase or preserve CD4+ T-cells count

➢ Secondary prevention: early detection of AKI to prevent the evolution towards irreversible lesions

➢ Tertiary prevention: follow-up 3 months after the episode of AKI regardless of the stage of severity

CONCLUSION

➢ Our study identifies 5 independent risk factors of AKI in hospitalized HIV-positive subjects: male sex, hypertension, diabetes, low CD4+ T-cells count within the 6 months before the hospitalization and ICU admission

➢ The general recommendations mentioned above should be applied in particular with regards to patients with these risk factors