

Temporal Relationship Between Acute Respiratory Distress Syndrome and the Development of Acute Kidney Injury – Systematic Review and Meta-Analysis

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Introduction

- Acute kidney injury (AKI) affects above 45% of acute respiratory distress syndrome (ARDS) patients and is associated with adverse outcomes.
- Still, the literature on the spatiotemporal relationship between AKI and ARDS is limited.
- It remains unclear which one develops first or if the timing of developing AKI affects the patient outcomes.
- Knowing the temporal relationship between AKI and ARDS could lead to a better understanding of pathogenesis and is essential for identifying treatment options, better management, and prognostication in critically ill patients.
- This systematic review aims to assess the incidence, timing, and mortality of patients who developed AKI after diagnosis of ARDS

Methods

- A literature review was conducted in six databases through June 2022.
- We included retrospective and prospective cohort studies that reported the development of AKI after ARDS.
- We excluded studies that did not clarify the timing of developing AKI related to ARDS onset time or only reported AKI before ARDS.
- Our outcomes were: incidence of AKI after ARDS, mortality of patients who developed AKI after ARDS, and timing of AKI after ARDS and mortality based on timing of AKI.

Results

- Out of 3,208 studies identified and screened, 16 studies with 10855 ARDS patients met all eligibility criteria and were included in the analysis

Figure 1. Prevalence of AKI after ARDS

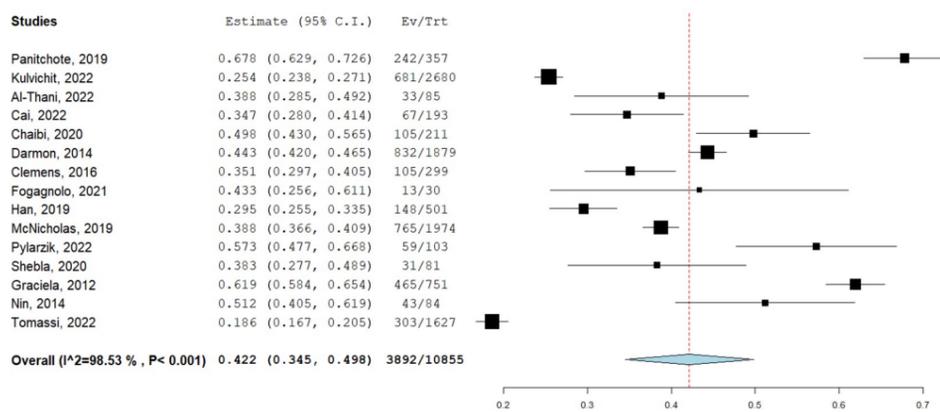


Figure 2. Mortality of AKI after ARDS

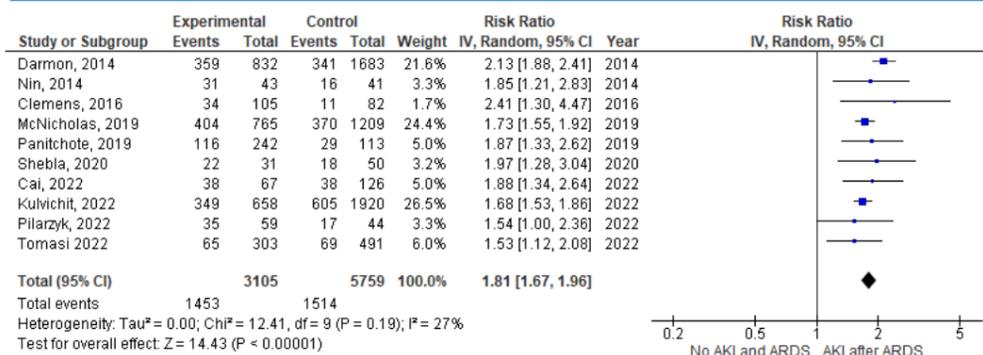
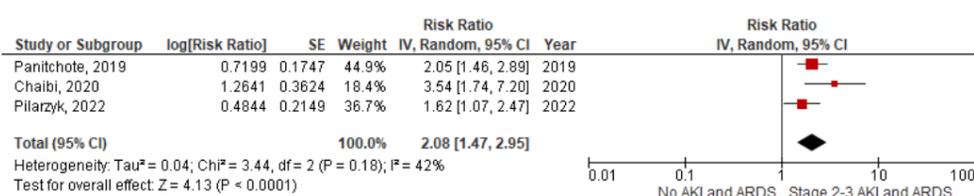


Figure 3. Mortality of stage 2-3 AKI after ARDS



Results

Figure 4. Average time of AKI development after ARDS

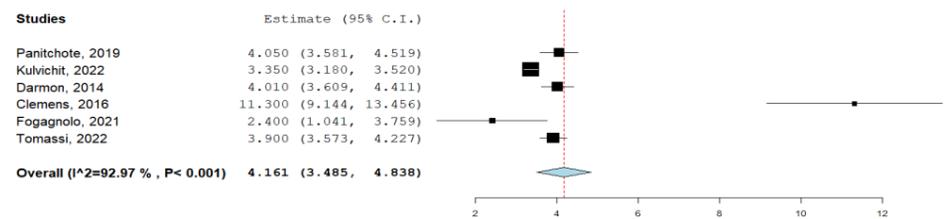


Figure 5. Mortality of AKI before vs after ARDS

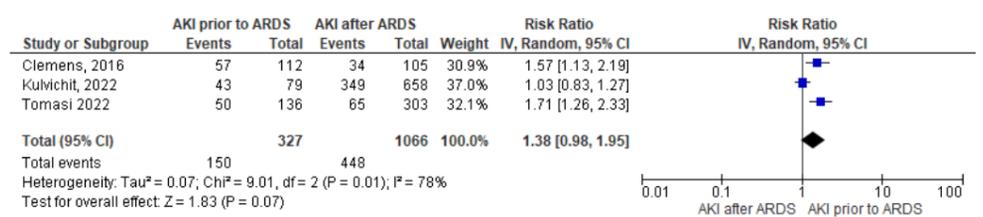
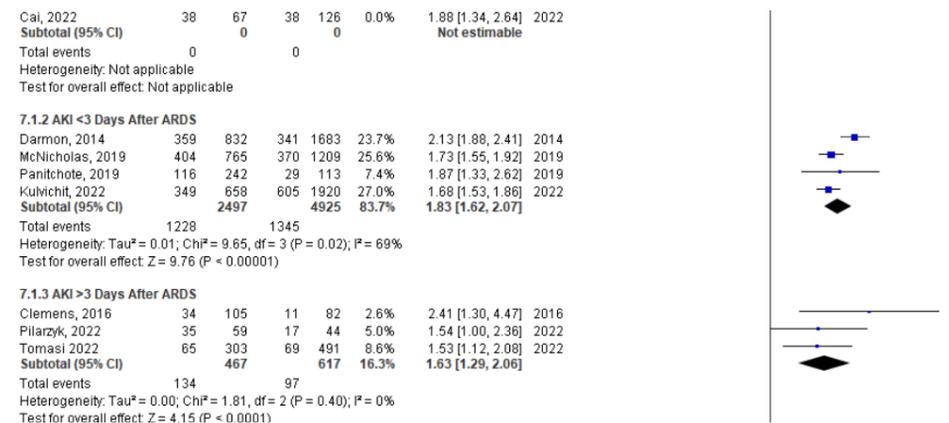


Figure 6. Mortality of AKI after ARDS based on time of development of AKI. Early AKI (<3days) vs late AKI (>3days) after ARDS



Discussion

- Our systematic review demonstrated that AKI frequently develops after ARDS.
- Development of AKI after ARDS is associated with increased mortality and directly related to the AKI severity.
- Mortality was high regardless of timing of AKI development after ARDS, and there was no significant difference in mortality in patients who developed AKI before versus after ARDS.
- Average time of development of AKI was 4 days, however analysis showed significant heterogeneity between studies.
- High heterogeneity is a limitation of this study. It can be explained by variations in the definitions of timing in relation to diagnosis of ARDS and variations in definitions of AKI as well as ARDS. Additionally, it needs to be considered that creatinine elevation lags 24-48 hours after development of kidney injury that might delay detection of AKI and affect defining appropriate temporal relationship with ARDS.

Conclusions

- AKI frequently develops after ARDS and is associated with increased mortality regardless of timing of AKI.
- We identified a significant knowledge gap in the literature regarding the spatiotemporal relationship between AKI and ARDS.
- More studies are required to address these gaps as understanding underlying risk factors and Lung-Kidney 'cross-talk' is essential to improving outcomes in these patients.

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