

Acute Kidney Injury and Fluid Accumulation Following Neonatal Sepsis

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INTRODUCTION

- Neonatal Acute Kidney Injury (nAKI) is associated with increased morbidity and mortality
- In pediatric populations and adults, AKI in sepsis is known to be associated with increased mortality risk
- Data regarding nAKI and fluid accumulation (FA) following sepsis are sparse in the Neonatal Intensive Care Unit (NICU)

METHODS

- Retrospective cohort of neonates from June 2020 - June 2021
- Admitted to the Cincinnati Children's Hospital Medical Center and University of Cincinnati NICUs
- Positive Blood Culture Sepsis (defined as: clinical sepsis with positive blood culture treated with minimum 5 days of antibiotics)
- Exclusion criteria: < 5 days of antibiotics, no serum creatinine (SCr) data, or a congenital kidney anomaly with dialysis dependence
- Primary outcomes:
 - Incidence of AKI defined by the neonatal modified Kidney Diseases Improving Global Outcomes definition (Table 1)
 - FA defined as FA = cumulative net fluid balance for 7 days after positive culture (L)/dry weight (kg) and was not adjusted for insensible losses.
 - Early FA was defined as FA>10% on day 1
- Secondary outcome
 - Mortality defined as death prior to hospital discharge

RESULTS

- 49 neonates had 54 episodes of sepsis
- Demographics are described in Table 1

Table 1. Characteristics of the Cohort

Variable	AKI (n=18)	No AKI (n=36)	p value
1. Male Sex	6 (33%)	21 (58%)	0.083
2. Race			0.594
o Black	8 (44%)	12 (33%)	
o White	9 (50%)	23 (64%)	
o Others	1 (6%)	1 (3%)	
3. Birth Gestational Age (weeks)	26 [IQR: 24,36]	28 [IQR: 26,37]	0.242
4. Corrected Gestational Age (weeks)	31 [IQR: 28,43]	35 [IQR: 28, 39]	0.370
5. Small for Gestational Age	3 (17%)	6 (17%)	>0.999
6. Nephrotoxic Antibiotic Exposure			
o Vancomycin	8 (44%)	19 (53%)	0.564
o Aminoglycoside	4 (22%)	5 (14%)	0.439
7. Caffeine Exposure	9 (50%)	17 (47%)	0.847
8. Early Fluid Accumulation (day 1)	8 (50%)	5 (15%)	0.008
9. Vasopressor Exposure	10 (55%)	9 (25%)	0.027

RESULTS Continued

AKI

- **Incidence of AKI was 33% (n=18)**
- Definitions met: SCr alone: 22% (n=12), UOP: 2% (n=1), both: 11% (n=6)
- Severe AKI (stage ≥ 2) = 55% (n=10)
- No subjects received renal replacement therapy
- **Subjects with AKI were more likely to require vasopressor support (55% vs 25%, OR:3.7, 95%CI 1.1-12.4, p=0.027) and had more SCr measurements (7 [IQR: 3,8] vs. 3 [IQR: 2,5], p=0.013).**

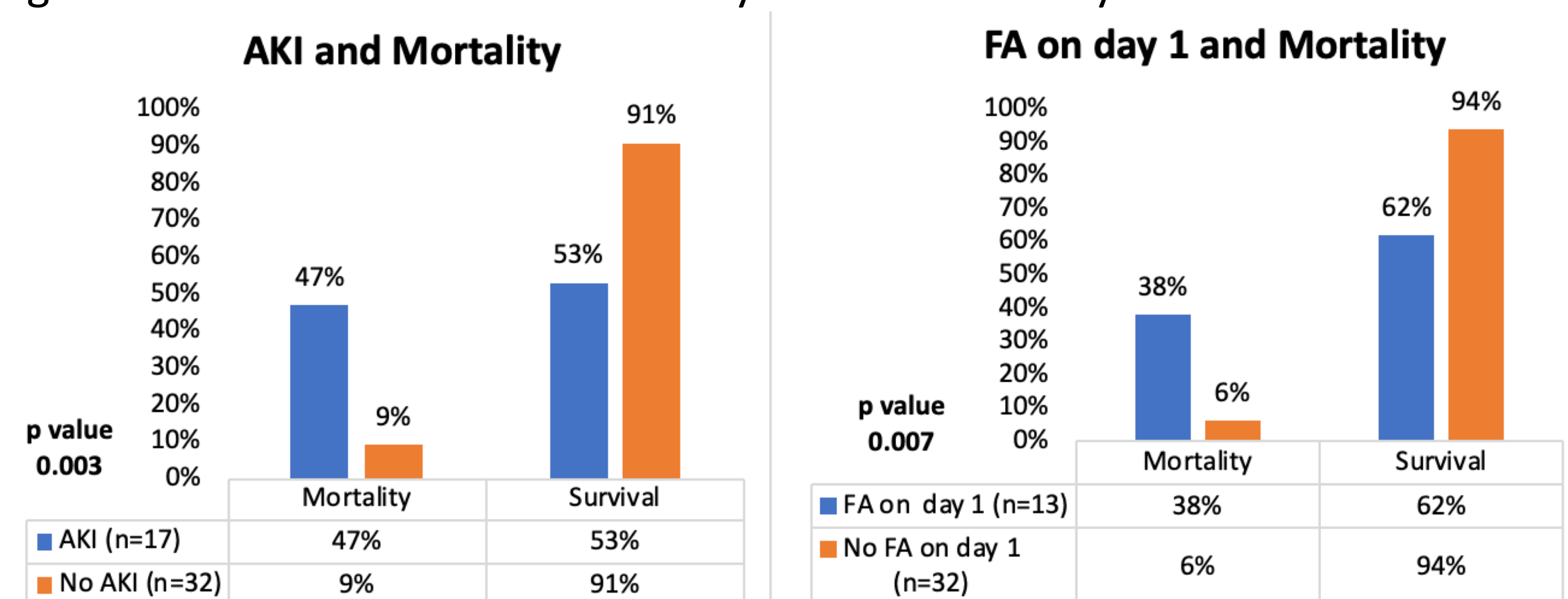
Fluid Accumulation

- **Incidence of FA>10% occurring on day 1 was 29% (n=13/45)**
- Four subjects experienced death prior to 48 hours and were excluded from further FA analysis.
- **FA >10% occurring on day 1 was associated with AKI (50% vs. 15%, OR 5.8, 95% CI 1.5-22.7, p=0.008).**

Mortality

- **Mortality risk was increased in subjects with any AKI (47% vs 9%, OR 8.5, 95%CI 1.9-39.4, p=0.003) and FA >10% occurring on day 1 (38% vs 6%, OR: 9.4, 95%CI 1.5-57.6, p=0.007) (figure 1).**
- Multivariable logistic regression model including AKI, gestational age at birth, birthweight, sex, and race showed that AKI retained association with mortality, aOR 15.9, 95% CI 1.8-137.3, p 0.01.

Figure 1. Associations of AKI and Early FA with Mortality



DISCUSSION

- Presence of AKI and early FA are associated with increased mortality in neonatal sepsis like pediatric and adult sepsis.
- The results are limited by the small size and the retrospective nature of the study
- Focus on AKI and FA prevention could potentially mitigate some of the mortality with sepsis.

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