

Acute Kidney Injury in Pediatric Patients: Analysis of the Pediatric Health Information System (PHIS) Database

Aadi Pandya¹, Nikhita Kumar¹, Isabelle Mawby², Dr. Rupesh Raina^{1,3}

¹ Department of Nephrology, Akron Nephrology Associates/Cleveland Clinic Akron General Medical Center, Akron, OH

² College of Medicine, Northeast Ohio Medical University, Rootstown, OH

³ Department of Nephrology, Akron Children’s Hospital, Akron, OH

Introduction

- AKI is associated with longer intensive care unit (ICU) stays, prolonged hospitalization and an increased risk of early rehospitalization among hospitalized patients [1-3].
- The worldwide incidence of AKI among children ranges from 19.3% to 24.1% and mortality rates range between 30% to 50% in critically ill children receiving renal replacement therapy (RRT) [4,5]
- Pediatric AKI patients have been reported to experience longer hospitalizations, increased need for mechanical ventilation, and prolonged intensive care unit (ICU) stays as opposed to those with normal renal function. [6-9]

Methodology

- A retrospective study was performed to assess pediatric AKI and non-AKI patients across the United States and identify the epidemiology, such as prevalence and mortality, and the risk factors associated with AKI in pediatric patients.
- We went through the PHIS database and collected data based on nine variables which we then analyzed with multivariate analysis.
- A total of 6,797 AKI cases across 49 hospital cities were reported.

Results

- For PHIS overall, the cost based CMI was 1.08 indicating that cost of AKI hospitalization was 8% higher relative to cost of a typical hospitalization at 49 hospital cities.
- Also, for PHIS overall, the mortality rate for AKI was 0.44%, average length of stay per AKI case was 6.2 days and adjusted charges per AKI case was \$72,460.

Conclusion

- The results of our statistical analysis show that the cost of AKI hospitalization relative to the cost of a ‘typical’ hospitalization at a Children Hospital is 8% higher, therefore we should analyze the cost breakdown for individuals with AKI to find out the reason for this disparity.
- The proportion of AKI cases dying out of all AKI cases is 0.44%, and further investigation might determine if there’s a common underlying factor in these cases.

Objective

- To assess pediatric AKI and non-AKI patients across the United States.
- Identify the epidemiology, such as prevalence and mortality, and the risk factors associated with AKI in pediatric patients.

Discussion

- Despite numerous studies, there have been no validated medications or therapies which can reverse or mitigate AKI after onset. In children, a handful of medications (ie, aminophylline, steroids, dexmedetomidine, fenoldopam, n-acetylcysteine, nesiritide, etc.) have shown promise; however, consistent benefits haven't been seen from the controlled trials of these treatments.
- Given the limited number of therapeutic options, there has been an attempt to identify patients at risk for AKI earlier so preventative methods can be used to decrease the likelihood of the disease occurring. Strategies have included AKI alerts, AKI predictive tools, and identification of patients exposed to significant kidney injuries (ie, large nephrotoxin exposure)

References

1.Li PKT, Burdmann EA, Mehta RL. World Kidney Day 2013: Acute Kidney Injury—Global Health Alert. American Journal of Kidney Diseases. 2013;61(3):359-63.

2.Raina R, Chauvin AM, Bunchman T, et al. Treatment of AKI in developing and developed countries: An international survey of pediatric dialysis modalities. PLoS One. 2017;12(5):e0178233. Published 2017 May 30. doi:10.1371/journal.pone.0178233

3.Schneider J, Khemani R, Grushkin C, Bart R: Serum creatinine as stratified in the RIFLE score for acute kidney injury is associated with mortality and length of stay for children in the pediatric intensive care unit. Crit Care Med 38: 933–939, 2010

4.Askenazi DJ, Feig DI, Graham NM, Hui-Stickle S, Goldstein SL: 3-5-year longitudinal follow-up of pediatric patients after acute renal failure. Kidney Int 69: 184–189, 2006

5.Mammen C, Al Abbas A, Skippen P, Nadel H, Levine D, Collet JP, Matsell DG: Long-term risk of CKD in children surviving episodes of acute kidney injury in the intensive care unit: A prospective cohort study. Am J Kidney Dis 59: 523–530, 2012

6.Ferah O, Akbulut A, Acik ME, Gokkaya Z, Acar U, Yenidunya O, Yentur E, and Tokat Y. Acute Kidney Injury After Pediatric Liver Transplantation. Transplant Proc. 2019; 51(7): 2486-2491.

7.Park PG, Hong CR, Kang E, Park M, Lee H, Kang HJ, Shin HY, Ha IS, Cheong HI, Yoon HJ, Kang HG. Acute Kidney Injury in Pediatric Cancer Patients. J Pediatr. 2019; 208: 243-250.e3.

8.Ciccio E, Devarajan P. Pediatric acute kidney injury: prevalence, impact and management challenges. Int J Nephrol Renovasc Dis. 2017;10:77–84.

9.Sutherland SM & Kwiatkowski DM. Acute Kidney Injury in Children. Adv Chronic Kidney Dis. 2017; 24(6): 380-7.