NEPHROLOGY - I

ACUTE KIDNEY INJURY - CLASSIFICATION AND MANAGEMENT

***Uma Maheshwari M**
****Alpana Ohri**

Abstract: *Acute kidney injury is one of the common complications in critically ill children with increasing incidence. The criteria, 'pediatric reference change value optimized for AKI in children' defines acute kidney injury as an increase in serum creatinine of ≥ 20 μmol/L with an increase of ≥ 30% within 7 days. Evaluation involves the early detection of at risk patients with the help of biomarkers and renal angina index. Early acute kidney injury is managed by maintaining euvolemia, sustaining normotension, avoiding nephrotoxicity and treating concomitant sepsis. Advanced acute kidney injury needs renal replacement therapies such as continuous renal replacement therapy or sustained low-efficiency dialysis in hemodynamically unstable patients using special and conventional hemodialysis machines respectively. Peritoneal dialysis is adopted for small children with difficult vascular access. Survivors of acute kidney injury need long term monitoring of renal functions.*

Keywords: *Acute kidney injury, Classification, Renal replacement therapy, Hemodialysis.*

* Senior Resident,
Pediatrics,
D.Y.Patil School of Medicine.
email: druma25sep@gmail.com

** Professor Pediatrics,
Incharge - Division of Pediatric Nephrology,
B.J.Wadia Hospital for Children,
Parel, Mumbai and
Consultant,
Jaslok Hospital and Research Centre,
Navi Mumbai.

Points to Remember

- ***Microcirculatory dysfunctions is an important mechanism of renal injury, where there is normal or increase in global renal blood flow rather than reduced renal perfusion.***
- ***pROCK criteria gives a newer definition of staging of AKI based on rise in serum creatinine value over a 7 day period, and it is less sensitive than KDIGO criteria.***
- ***Renal angina index and biomarkers play a crucial role in predicting severe AKI.***
- ***Conservative management of AKI includes fluid management, e.c. restricting or liberal fluids based on fluid status, avoiding nephrotoxic drugs, correcting dyselectrolytemias and hyperuricemia.***
- ***Renal replacement therapy is indicated in a fluid overloaded state with oliguria, dyselectrolytemias (when not medically controlled) and hypercatabolic state.***
- ***Modality of RRT is chosen depending on the age, hemodynamic stability, need for solute removal, cost and duration of RRT.***

References

1. McCaffrey J, Dhakal AK, Milford DV, Webb NJ, Lennon R. Recent developments in the detection and management of acute kidney injury. Arch Dis Child. 2017 Jan; 102(1):91-96. doi: 10.1136/archdischild-2015-309381. Epub 2016 Aug 5. PMID: 27496911; PMCID: PMC5256404.
2. Leghrouz B, Kaddourah A. Impact of Acute Kidney Injury on Critically Ill Children and Neonates. Front Pediatr. 2021 26;9:635631. doi: 10.3389/fped.2021.635631. PMID: 33981652; PMCID: PMC8107239.
3. Basu RK, Kaddourah A, Terrell T, Mottes T, Arnold P, Jacobs J, et al. Prospective Pediatric AKI Research Group (ppAKI). Assessment of Worldwide Acute Kidney Injury, Renal Angina and Epidemiology in critically ill children (AWARE): study protocol for a prospective observational study. BMC Nephrol. 2015 26;16:24. doi: 10.1186/

Cite as: Uma Maheshwari M, Alpana Ohri, Acute kidney injury-Classification and management, Indian J Pract Pediatr. 2024; 26(3):218-225.

s12882-015-0016-6. PMID: 25882434; PMCID: PMC4355130.

4. Fleming GM, Sahay R, Zappitelli M, King E, Askenazi DJ, Bridges BC, et al. The Incidence of Acute Kidney Injury and Its Effect on Neonatal and Pediatric Extracorporeal Membrane Oxygenation Outcomes: A Multicenter Report From the Kidney Intervention During Extracorporeal Membrane Oxygenation Study Group. Pediatr Crit Care Med. 2016 Dec; 17(12):1157-1169. doi: 10.1097/PCC.0000000000000970. PMID: 27755398; PMCID: PMC5138084.
5. Raina R, Chakraborty R, Tibrewal A, Sethi SK, Bunchman T. Advances in pediatric acute kidney injury. Pediatr Res. 2022 Jan; 91(1):44-55. doi: 10.1038/s41390-021-01452-3. Epub 2021 Mar 17. PMID: 33731820.
6. Kellum JA, Lameire N, Aspelin P, Barsoum RS, Burdmann EA, Goldstein SL et al. Kidney disease: Improving global outcomes (KDIGO) acute kidney injury work group. KDIGO clinical practice guideline for acute kidney injury. Kidney Intl Suppl. 2012 Mar; 2(1):1-138.
7. Xu X, Nie S, Zhang A, Jianhua M, Liu HP, Xia H, et al. A New Criterion for Pediatric AKI Based on the Reference Change Value of Serum Creatinine. J Am Soc Nephrol. 2018 Sep;29(9):2432-2442. doi: 10.1681/ASN.2018010090. Epub 2018 Jul 27. PMID: 30054338; PMCID: PMC6115652.
8. Goldstein SL. A New Pediatric AKI Definition: Implications of Trying to Build the Perfect Mousetrap. J Am Soc Nephrol. 2018 Sep;29(9):2259-2261. doi: 10.1681/ASN.2018070727. Epub 2018 Aug 24. PMID: 30143560; PMCID: PMC6115669.
9. Ostermann M, Liu K. Pathophysiology of AKI. Best Pract Res Clin Anaesthesiol. 2017 Sep;31(3):305-314. doi: 10.1016/j.bpa.2017.09.001. Epub 2017 Sep 22. PMID: 29248138.
10. Chisavu F, Gafencu M, Stroescu R, Motofelea A, Chisavu L, Schiller A. Acute kidney injury in children: incidence, awareness and outcome-a retrospective cohort study. Sci Rep. 2023 Sep 22;13(1):15778. doi: 10.1038/s41598-023-43098-7. PMID: 37737295; PMCID: PMC10516941.
11. Zappitelli M, Goldstein SL, Ricci Z. Evaluation and Management of Acute Kidney Injury in Children. In: Emma F, Goldstein SL, Bagga A, Bates CM, Shroff R. (eds) Pediatric Nephrology. Springer, Cham. 2022; pp1617-1652 https://doi.org/10.1007/978-3-030-52719-8_57
12. Anitha VP, Shrishu RK. Acute Kidney Injury in Pediatric Intensive Care Unit. In: Vijayakumar M, Nammalwar BR. (eds) Principles and Practice of Pediatric Nephrology. 2nd Edn, New Delhi: Jaypee Brothers;2013; pp614 - 626
13. Moffett BS, Goldstein SL. Acute kidney injury and increasing nephrotoxic-medication exposure in noncritically-ill children. Clin J Am Soc Nephrol. 2011; 6(4):856-63. doi: 10.2215/CJN.08110910. Epub 2011 Jan 6. PMID: 21212419; PMCID: PMC3069379.
14. Krishnasamy S, Sinha A, Bagga A. Management of Acute Kidney Injury in Critically Ill Children. Indian J Pediatr. 2023; 90(5):481-491. doi: 10.1007/s12098-023-04483-2. Epub 2023 Mar 2. PMID: 36859513; PMCID: PMC9977639.
15. Sethi SK, Bunchman T, Chakraborty R, Raina R. Pediatric acute kidney injury: new advances in the last decade. Kidney Res Clin Pract. 2021 Mar;40(1):40-51. doi: 10.23876/j.krcp.20.074. Epub 2021. PMID: 33663033; PMCID: PMC8041642.
16. Zou C, Wang C, Lu L. Advances in the study of subclinical AKI biomarkers. Front Physiol. 2022 24;13:960059. doi: 10.3389/fphys.2022.960059. PMID: 36091391; PMCID: PMC9449362.
17. Honda M, Horiuchi H, Torii T, Nakajima A, Iijima T, Murano H, et al. Ito S. Urate-lowering therapy for gout and asymptomatic hyperuricemia in the pediatric population: a cross-sectional study of a Japanese health insurance database. BMC pediatrics. 2021; 21:1-0. in the pediatricpopulation:a cross-sectional study of a Japanese health insurance database.BMCPediatr 2021;21,581.
18. Kishimoto K, Kobayashi R, Hori D, Sano H, Suzuki D, Kobayashi K. Febuxostat as a Prophylaxis for Tumor Lysis Syndrome in Children with Hematological Malignancies. Anticancer Res. 2017 ;37(10):5845-5849. doi: 10.21873/anticanres.12028. PMID: 28982910.
19. Nourse P, Cullis B, Finkelstein F, Numanoglu A, Warady B, Antwi S, McCulloch M. ISPD guidelines for peritoneal dialysis in acute kidney injury: 2020 Update (paediatrics). Perit Dial Int. 2021 Mar;41(2):139-157. doi: 10.1177/0896860820982120. Epub 2021 Feb 1. PMID: 33523772.
20. Hamsa V, Kamath N. Optimizing the Hemodialysis Prescription and Assessment of Dialysis Adequacy in Children. Asian Journal of Pediatric Nephrology. 2022 Jul 1; 5(2):56-63.
21. Cortina G, Daverio M, Demirkol D, Chanchlani R, Deep A. Continuous renal replacement therapy in neonates and children: what does the pediatrician need to know? An overview from the Critical Care Nephrology Section of the European Society of Pediatric and Neonatal Intensive Care (ESPNIC). Eur J Pediatr. 2024 Feb; 183(2):529-541. doi: 10.1007/s00431-023-05318-0. Epub 2023 Nov 17. PMID: 37975941; PMCID: PMC10912166.
22. Sethi SK, Mittal A, Nair N, Bagga A, Iyenger A, Ali U, et al. Pediatric Continuous Renal Replacement Therapy (PCRRT) expert committee recommendation on

prescribing prolonged intermittent renal replacement therapy (PIRRT) in critically ill children. Hemodial Int. 2020 Apr;24(2):237-251. doi: 10.1111/hdi.12821. Epub 2020 Feb 18. PMID: 32072767.

23. Matzke GR, Aronoff GR, Atkinson AJ Jr, Bennett WM, Decker BS, Eckardt KU, et al. Drug dosing consideration in patients with acute and chronic kidney disease-a clinical update from kidney disease: Improving Global Outcomes (KDIGO). Kidney Int. 2011 ;80(11):1122-37. doi: 10.1038/ki.2011.322. Epub 2011 Sep 14. PMID: 21918498.
24. Sethi SK, Maxvold N, Bunchman T, Jha P, Kher V, Raina R. Nutritional management in the critically ill child with acute kidney injury: a review. Pediatr Nephrol. 2017; 32(4): 589-601. doi: 10.1007/s00467-016-3402-9. Epub 2016 Jun 20. PMID: 27324472.