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Original Research Article

CLINICAL PROFILE AND OUTCOME OF TROPICAL ACUTE KIDNEY INJURY IN CHILDREN

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ABSTRACT

Background: Although paediatric critical care advancements have improved outcomes, acute kidney injury (AKI) remains a serious complication with high morbidity. Despite its impact, data on paediatric AKI, especially from developing countries such as India, are limited. This study aimed to analyse the clinical profile and outcomes of tropical AKI in children admitted to the PICU. **Materials and Methods:** This cross-sectional study was conducted on 180 children at Tirunelveli Medical College over 18 months. Data were collected using a pre-designed proforma and a semi-structured questionnaire. Clinical history, examination, and relevant investigations were performed on all children. **Results:** Among the 180 children, 53.3% were male, and the mean age was 7.62 ± 3.1 years. AKI was observed in 14.4% of the children, and the remainder were classified as non-AKI. The most prevalent tropical infections were dengue (30.6%), hepatitis (23.9%), enteric fever (17.8%), and gastroenteritis (17.2%). Age and gender did not significantly influence the occurrence of AKI ($p = 0.55$ and $p = 0.71$, respectively). Serum creatinine (1 ± 0.16 vs. 0.6 ± 0.11 mg/dL) and blood urea (46.8 ± 10.3 vs. 35 ± 5.1 mg/dL) levels were significantly higher in the AKI group ($p < 0.001$). Urine output was also significantly reduced in children with AKI ($p < 0.001$). Dengue was the leading contributor to AKI (30.9%), and the diagnosis was significantly associated with kidney injury ($p = 0.024$). **Conclusion:** AKI remains an important complication among children with tropical infections, with dengue identified as a predominant contributor. Children with kidney injury showed altered renal function parameters and reduced urine output compared to those without. Early recognition and prompt clinical management are essential to reduce morbidity and improve outcomes.

INTRODUCTION

The discipline of paediatric critical and emergency medicine has developed as a sub-speciality within paediatrics, leading to significant advancements in care and research. These advancements have had a profound impact on reducing fatality rates in various diseases, including dengue.[1,2] Admission criteria for the Paediatric Intensive Care Unit (PICU) vary depending on the institution and are determined by the available facilities and the number of beds. Admission patterns to the PICU evolve, influenced by changing disease prevalence and the availability of healthcare resources. Infectious diseases are the primary cause of hospital admissions, particularly in developing countries such as India. Despite this, non-communicable diseases are becoming more prevalent, although infectious causes remain dominant in paediatric acute kidney injury (AKI). The mortality rate is directly correlated with the characteristics of the disease, the patient's physiological condition upon arrival, and the level of care provided.[1]

Acute renal failure (ARF) is a clinical syndrome caused by various factors, including specific renal diseases (e.g. glomerular and vasculitis disorders), non-specific renal damage (e.g. ischaemia and toxins), and extra-renal pathology (e.g. prerenal azotaemia and post-renal obstruction). ARF is an acute condition that may lead to chronic kidney disease but differs from ESRD. Mild or subclinical renal impairment in children with tropical infections may remain undetected. AKI refers to a sudden decrease in kidney function, including ARF, but is not restricted to it. Epidemiological data indicate that even moderate and reversible AKI can have severe

implications, such as the development of chronic kidney disease and increased mortality risk.[3-6]

The clinical presentation and outcomes of AKI are similar, regardless of the underlying cause of renal failure. The presence of AKI is directly linked to worse outcomes.[7,8] Therefore, early diagnostic methods are recommended for the timely identification of AKI. The effectiveness of therapies for AKI in children depends largely on the appropriate identification and treatment of the underlying causes, even when the impairment is mild. Early recognition of AKI in children with tropical infections allows timely intervention, thereby improving outcomes. Focusing only on advanced kidney failure or dialysis cases may result in missing less severe AKI in children, which can still lead to serious complications.[9-11] Prolonged AKI leads to significant disturbances in fluid, electrolyte, acid-base, and hormonal balance.[12] Additionally, AKI can cause significant alterations in the central nervous system and immune function, particularly in paediatric patients.

Aim

This study aimed to analyse the clinical profile and outcomes of tropical AKI and determine the proportion of AKI in tropical infections.

MATERIALS AND METHODS

This cross-sectional study was conducted on 180 children admitted to the PICU of the Department of Paediatrics, Tirunelveli Medical College, for 18 months. This study was approved by the Institutional Ethics Committee. Parents/guardians provided written informed consent before enrolment.

Inclusion Criteria

All children aged 1 month to 12 years who were admitted to the PICU with tropical infections were included. The tropical infections considered included dengue, malaria, leptospirosis, scrub typhus, enteric fever, hepatitis, gastroenteritis, and toxin-mediated causes such as bee and scorpion stings and snake bites.

Exclusion Criteria

Children with sepsis, localised infection foci, immunocompromised conditions, structural anomalies of the renal system, pyrexia of unknown origin, and connective tissue disorders were excluded from the study.

Methods

A pre-designed proforma was used to collect clinical and investigative data from the children, including demographics, presentations, and kidney function parameters. A questionnaire collected data on symptoms, medical history, and kidney injury risk factors, with parental assistance if needed. Children underwent clinical history-taking and examinations, focusing on complaints, illness progression, and past episodes. Physical examinations assessed vital signs and indicators such as dehydration, shock, oedema, and systemic manifestations.

Laboratory investigations evaluated AKI and underlying conditions by measuring urine output (<0.5 ml/kg/hr or >0.5 ml/kg/hr), blood urea (mg/dL), and serum creatinine (mg/dL). Children were categorised into groups based on AKI status determined using clinical and biochemical criteria, and the diagnoses included dengue, hepatitis, enteric fever, gastroenteritis, snake bites, bee stings, leptospirosis, or scrub typhus. The analysis included demographic variables, urine output classification, diagnostic distribution, and evaluation of mean age, blood urea, and serum creatinine levels between the AKI and non-AKI groups.

Statistical analysis

Data entry was performed using MS Excel, and analysis was performed using SPSS Software. Continuous variables are expressed as mean ± standard deviation and categorical variables as frequencies and percentages. The chi-square test was used, with $p < 0.05$ considered significant.

RESULTS

Regarding sex, male children (MCH) were predominant at 53.3%, compared to female children (FCH) at 46.7%. Urine output was > 0.5 ml/kg/hr in 94.4% of the children, while 5.6% had < 0.5 ml/kg/hr output.

The most common diagnosis was dengue (30.6%), followed by hepatitis (23.9%), enteric fever (17.8%), and gastroenteritis (17.2%). Less common conditions included snake bites (4.4%), bee stings (2.8%), leptospirosis (2.8%), and scrub typhus (0.6%). AKI was observed in 14.4% of the participants, whereas the remaining 85.6% did not have kidney injury (Table 1).

Table 1: Distribution of clinical variables

		Frequency
Sex	MCH	96 (53.3%)
	FCH	84 (46.7%)
Urine output in ml/kg/hr	< 0.5	10 (5.6%)
	> 0.5	170 (94.4%)
Diagnosis	Dengue	55 (30.6%)
	Hepatitis	43 (23.9%)
	Enteric fever	32 (17.8%)
	Gastroenteritis	31 (17.2%)
	Snake bite	8 (4.4%)
	Bee sting	5 (2.8%)
	Leptospirosis	5 (2.8%)

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	Scrub typhus	1 (0.6%)
Kidney injury	AKI	26 (14.4%)
	Non-AKI	154 (85.6%)

The mean age of the children was 7.62 ± 3.1 years. The mean age in the AKI group was 7.96 ± 3.3 years, and that in the non-AKI group was 7.57 ± 3.0 years, with no significant difference (p = 0.55). The blood urea level was 36.7 ± 7.3 mg/dL, which was higher in the AKI group (46.8 ± 10.3 mg/dL) than in the non-AKI group (35 ± 5.1 mg/dL) (p < 0.001). The mean serum creatinine level was 0.69 ± 0.17 mg/dL and was elevated in AKI cases (1 ± 0.16 mg/dL) compared to non-AKI cases (0.6 ± 0.11 mg/dL) (p < 0.001) (Table 2).

Table 2: Mean values of clinical variables

	AKI	Non-AKI	P value
Age	7.96 ± 3.3	7.57 ± 3.0	0.55
Blood urea	46.8 ± 10.3	35 ± 5.1	<0.001
Serum creatinine	1 ± 0.16	0.6 ± 0.11	<0.001

The gender distribution was comparable between the AKI and non-AKI groups, with males accounting for 50% of the AKI group and 53.9% of the non-AKI group (p = 0.71). Reduced urine output (<0.5 ml/kg/hr) was reported in 38.5% of children with AKI, whereas no children without AKI had reduced output. Dengue was more frequent in AKI cases (30.9%) than in non-AKI cases (69.1%) (p = 0.024), with a significant difference (p < 0.001).

Regarding diagnosis, hepatitis (14% vs. 86%), enteric fever (3.1% vs. 96.9%), gastroenteritis (29% vs. 71%), snake bites (25% vs. 75%), leptospirosis (20% vs. 80%), and scrub typhus (100% in AKI) showed varying distributions. Bee stings occurred only in the non-AKI group, showing a significant difference between the groups (p = 0.024) (Table 3).

Table 3: Comparisons of clinical variables between the groups

		AKI	Non-AKI	P-value
Sex	MCH	13 (50%)	83 (53.9%)	0.71
	FCH	13 (50%)	71 (46.1%)	
Urine output in ml/kg/hr	< 0.5	10 (38.5%)	0 (0%)	<0.001
	> 0.5	16 (61.5%)	154 (100%)	
Diagnosis	Dengue	17 (30.9%)	38 (69.1%)	0.024
	Hepatitis	6 (14%)	37 (86%)	
	Enteric fever	1 (3.1%)	31 (96.9%)	
	Gastroenteritis	9 (29%)	22 (71%)	
	Snake bite	2 (25%)	6 (75%)	
	Bee sting	0 (0%)	5 (100%)	
	Leptospirosis	1 (20%)	4 (80%)	
	Scrub typhus	1 (100%)	0 (0%)	

DISCUSSION

In our study, the AKI incidence was 14.4% and was at the lower end of reported paediatric AKI rates but varied compared to recent studies in similar settings. Multiple PICU studies have shown varying incidence rates, with differences based on location, diagnostic criteria, and populations. Recent studies have reported higher rates. Handayani et al. found 46.7% AKI incidence among critically ill children, while Raja et al. reported 50.4% using pRIFLE criteria.[13,14] Hooman showed a decline from 36% (2006-2008) to 15.4% (2010-2011) in PICUs.[15] Kapil et al. documented a 15.48% incidence using KDIGO criteria.[16] Celegen's retrospective study found 17.5% of 360 patients developed AKI during PICU stay.[17] Gupta et al. reported 42.9% of 536 patients developing AKI.[18]

Our study found no sex influence on AKI occurrence (p = 0.71), with males comprising 50% of the AKI group and 53.9% of the non-AKI group. This finding aligns with paediatric studies showing similar sex distributions in children with AKI. Choi et al. found 57.9% males among 763 children with AKI, and Raja et al. reported a male-to-female ratio of 1.2:1.19,14. However, Gupta et al. reported females were more prone to AKI (p = 0.013), while other studies found no gender differences.[18]

In our study, the mean age was 7.62 ± 3.1 years, comparable to other paediatric AKI studies from similar settings, including studies reporting mean ages of 6.72 years and 7.92 ± 5.75 years in AKI stage 1.19 In our study, dengue fever was the leading cause of AKI among tropical infections, accounting for 30.9% of the cases (p = 0.024). This aligns with the recognition of dengue as a major cause of AKI in tropical areas. Sultana et al. reported renal issues in 9.8% of paediatric dengue patients, with AKI cases showing significant morbidity and mortality.[20]

Mallhi et al. found a 14.2% AKI incidence among paediatric dengue patients.[21] The dengue-AKI link is increasingly noted in paediatrics. Basu and Roy indicated that dengue-associated AKI leads to longer hospital stays and increased intensive care needs.[22]

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Leptospirosis, which was less prevalent in our study, is well-studied as a cause of AKI in Daher et al., who reported that 70% of paediatric leptospirosis patients developed AKI.[23]

Our study showed higher serum creatinine (1.0 ± 0.16 vs. 0.6 ± 0.11 mg/dL, $p < 0.001$) and blood urea levels (46.8 ± 10.3 vs. 35 ± 5.1 mg/dL, $p < 0.001$) in the AKI group than in the non-AKI group. These findings align with those of studies identifying serum creatinine and blood urea as key AKI markers. Research has shown that children with AKI have higher serum creatinine and blood urea levels than those without AKI. Various centres have documented similar biochemical patterns, with elevated creatinine and urea levels as consistent markers across populations. However, recent research has highlighted the limitations of creatinine-based criteria, especially in paediatrics. A study by Afolayan et al. reported that cystatin C-derived eGFR was 51.8%, higher than the rates using conventional creatinine criteria (32.4% by KDIGO, 7.6% by WHO, and 16.5% by absolute creatinine criteria).[24] This suggests that creatinine-based criteria may underestimate the AKI burden in paediatric tropical infections.

Our study found that 38.5% of children with AKI had reduced urine output (<0.5 mL/kg/hr), whereas none of the children without AKI had reduced urine output ($p < 0.001$). This shows the importance of urine output as a diagnostic criterion for AKI. Studies have shown that urine output criteria are crucial for AKI diagnosis, as AKI is categorised by the stage of injury defined by increased creatinine, decreased eGFR, or urine output.[25,26] The clinical presentation of AKI in our study, with oliguria, elevated biochemical markers, and association with tropical infections, aligns with patterns in other paediatric AKI studies from tropical regions.

CONCLUSION

Children with AKI had higher blood urea and creatinine levels and lower urine output than those without AKI, confirming these parameters as diagnostic markers. Urine output was reduced in AKI cases, whereas non-AKI children had normal output. AKI was present in 14.4% of the children, with dengue being the most frequent infection. Age and sex were not significantly associated with AKI incidence. Early intervention through clinical management can reduce morbidity and improve outcomes in children with AKI. Given the limited data on tropical AKI in children from developing regions, further multicentre studies are needed to validate these findings and optimise management strategies.

REFERENCES

1. Jyothi AK, Ankireddy K. A study on clinical profile and outcome of patients in PICU (paediatric intensive care unit) at a tertiary care unit. Int J Contemp Pediatr 2019; 6:757–60. https://pesquisa.bvsalud.org/portal/resource/pt/sea-204017.
2. Wheeler DS, Wong HR, Shanley TP. Science and practice of pediatric critical care medicine. London, England: Springer; 2008. https://www.researchgate.net/profile/William-Novick/publication/227040219_Pediatric_Critical_Care_in_Developing_Countries/links/0046351a748b64c2ce000000/Pediatric-Critical-Care-in-Developing-Countries.pdf.
3. Gulvadi A, Sreenivasan VK, James AJ, Ramaraj S. A study of clinical profile of Acute Kidney Injury in critically ill children admitted in Paediatric Intensive Care Unit aged between 2 months to 13 years. Ann Int Med Den Res 2020;6: E01-E6. https://www.aimdrjournal.com/wp-content/uploads/2021/06/PE1_OA_Aparna-1-edit.pdf.
4. Basu RK, Devarajan P, Wong H, Wheeler DS. An update and review of acute kidney injury in pediatrics. Pediatr Crit Care Med 2011; 12:339–47. https://doi.org/10.1097/PCC.0b013e3181fe2e0b.
5. Hoste EAJ, Clermont G, Kersten A, Venkataraman R, Angus DC, De Bacquer D, et al. RIFLE criteria for acute kidney injury are associated with hospital mortality in critically ill patients: a cohort analysis. Crit Care 2006;10: R73. https://doi.org/10.1186/cc4915.
6. Uchino S, Bellomo R, Goldsmith D, Bates S, Ronco C. An assessment of the RIFLE criteria for acute renal failure in hospitalized patients. Crit Care Med 2006; 34:1913–7. https://doi.org/10.1097/01.CCM.0000224227.70642.4F.
7. Mehta RL, Kellum JA, Shah SV, Molitoris BA, Ronco C, Warnock DG, et al. Acute Kidney Injury Network: report of an initiative to improve outcomes in acute kidney injury. Crit Care 2007;11: R31. https://doi.org/10.1186/cc5713.
8. Plötz FB, Hulst HE, Twisk JWR, Bökenkamp A, Markhorst DG, van Wijk JAE. Effect of acute renal failure on outcome in children with severe septic shock. Pediatr Nephrol 2005; 20:1177–81. https://doi.org/10.1007/s00467-005-1946-1.
9. Kellum JA, Lameire N, KDIGO AKI Guideline Work Group. Diagnosis, evaluation, and management of acute kidney injury: a KDIGO summary (Part 1). Crit Care 2013; 17:204. https://doi.org/10.1186/cc11454.
10. Bai S, Moorani KN, Naeem B, Ashfaq M, Rajesh, Rehman EU. Etiology, clinical profile, and short-term outcome of children with acute kidney injury. Cureus 2022;14: e22563. https://doi.org/10.7759/cureus.22563.
11. Montgomerie C, Spaak J, Evans M, Jacobson SH. Acute kidney injury: Clinical characteristics and short-term outcomes in 1,519 patients. Kidney Dis (Basel) 2023; 9:39–48. https://doi.org/10.1159/000527299.
12. Abdel-Rahman EM, Turgut F, Gautam JK, Gautam SC. Determinants of outcomes of acute kidney injury: Clinical predictors and beyond. J Clin Med 2021; 10:1175. https://doi.org/10.3390/jcm10061175.
13. Handayani D, Arliansyah RD, Saputra I, Diba MF, Lestari HI. Incidence and risk factors for acute kidney injury in PICU of Dr. Mohammad Hoesin Hospital Palembang. BJi 2024; 10:61–5. https://doi.org/10.32539/bji.v10i2.192.
14. Raja M, Sivaprasath P, Dhivya P. Incidence, risk factors, and outcome of acute kidney injury among children in pediatric intensive care unit in a tertiary care hospital. Asian J Pharm Clin Res 2023:106–10. https://doi.org/10.22159/ajpcr.2023.v16i11.48285.
15. Hooman N. Acute Kidney Injury in Iranian Children-What Do We Know About It? -Part 2. J Ped Nephrology 2014; 2:98–103. https://journals.sbmu.ac.ir/jpn/article/download/6553/5753/
16. Kapil I, Goel AK, Sahoo MR. Profile of acute kidney injury in the pediatric age group in a tertiary care hospital: A prospective observational study. Cureus 2024;16: e54236. https://doi.org/10.7759/cureus.54236.
17. Celegen K, Celegen M. A retrospective analysis of risk factors and impact of acute kidney injury in critically ill children. Klin Padiatr 2024; 236:229–39. https://doi.org/10.1055/a-1996-1761.
18. Gupta S, Sengar GS, Meti PK, Lahoti A, Beniwal M, Kumawat M. Acute kidney injury in Pediatric Intensive Care Unit: Incidence, risk factors, and outcome. Indian J Crit Care Med 2016; 20:526–9. https://doi.org/10.4103/0972-5229.190368.

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19. Choi N, Kang HG, Park N, Kim J, Ahn YH. Epidemiology of participants in a prospective cohort study on pediatric acute kidney injury in South Korea. Child Kidney Dis 2025; 29:65–72. https://doi.org/10.3339/ckd.25.014.
20. Sultana A, Rumana J, Roy S, Sonia SF, Rahat F, Parvin R, et al. Renal involvement in children with dengue fever: A study in tertiary care hospital of Bangladesh. Int J Nephrol 2020; 2020:4025267. https://doi.org/10.1155/2020/4025267.
21. Mallhi TH, Khan AH, Adnan AS, Sarriff A, Khan YH, Jummaat F. Incidence, characteristics and risk factors of acute kidney injury among dengue patients: A retrospective analysis. PLoS One 2015;10: e0138465. https://doi.org/10.1371/journal.pone.0138465.
22. Basu B, Roy B. Acute renal failure adversely affects survival in pediatric dengue infection. Indian J Crit Care Med 2018; 22:30–3. https://doi.org/10.4103/ijccm.ijccm_94_17.
23. Daher EF, Vieira APF, Jacinto CN, Lima RSA, Girão MMV, Fernandes ATBM, et al. Differences among children, adolescents and adults with severe leptospirosis: A comparative analysis. Indian J Nephrol 2014; 24:166–70. https://doi.org/10.4103/0971-4065.132013.
24. Afolayan FM, Adedoyin OT, Abdulkadir MB, Ibrahim OR, Biliaminu SA, Mokuolu OA, et al. Acute Kidney Injuries in Children with Severe Malaria: A comparative study of diagnostic criteria based on serum cystatin C and creatinine levels: A comparative study of diagnostic criteria based on serum cystatin C and creatinine levels. Sultan Qaboos Univ Med J 2020;20: e312–7. https://doi.org/10.18295/squmj.2020.20.04.006.
25. Patel M, Gbadegesin RA. Update on prognosis driven classification of pediatric AKI. Front Pediatr 2022; 10:1039024. https://doi.org/10.3389/fped.2022.1039024.
26. Xu X, Nie S, Zhang A, Jianhua M, Liu H-P, Xia H, et al. A new criterion for pediatric AKI based on the reference change value of serum creatinine. J Am Soc Nephrol 2018; 29:2432–42. https://doi.org/10.1681/ASN.2018010090.

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