Original Research Article

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Clinicoetiological profile of acute kidney injury in paediatric intensive care unit patients

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ABSTRACT

Background: Acute kidney injury (AKI) is common in patients in the paediatric intensive care unit and is associated with poor outcome. Present study was conducted to determine the occurrence, risk factors and etiology of AKI in the PICU.

Methods: Data was collected retrospectively from case records of children admitted to PICU during one year.AKI was defined and classified according to modified pRIFLE (risk injury failure loss end stage renal disease) criteria.

Results: 227 children were included in the study, 31(13.6%) developed AKI, of these 16 (51.6%) had risk, 11 (35.4%) had injury and 4 (12.9%) had failure. Overall mortality was 32.3%. 83.9% of AKI was in the age group of < 5 years. Sepsis (22.9%) was the most common etiology.

Conclusions: AKI is common in children admitted to PICU. In our present study we found that hypoxia was the major risk factor for AKI followed by nephrotoxic drugs and hypotension. Females had a higher occurrence of AKI. Sepsis was found to be the commonest etiology. Greater the category of the AKI, higher was the mortality.

Keywords: Acute kidney injury, Hypoxia, pRIFLE, Sepsis

INTRODUCTION

Acute kidney injury (AKI) reflects a broad spectrum of clinical presentations ranging from mild injury to severe that may result in permanent or complete loss of renal function.¹

Acute kidney injury (AKI), previously termed acute renal failure, is a serious condition that is commonly encountered among critically ill patients. It refers to the abrupt onset of renal dysfunction causing inability of the kidney to regulate acid base and electrolyte balance, and failure to excrete fluid and waste products.

In practical terms, it is most commonly characterised by an increase in serum creatinine and can manifest as mild impairment of renal function to frank acute renal failure requiring renal replacement therapy.²

METHODS

This study was an observational analytical study done in a tertiary care centre, for a period of one year from January 2015 to December 2015. All the patients admitted to paediatric intensive care unit (PICU) who met the inclusion criteria during the study period were considered.

Baseline estimated creatinine clearance (eCCL) of 100ml/min/1.73m² was assigned if no baseline data was available for calculation.³ Creatinine clearance was calculated for all the patients using schwartz formula.⁴ The worst estimated creatinine clearance that could be obtained during the PICU stay was used for comparison with baseline value. Patients who had acute kidney injury (AKI) at the time of admission were also included in the study.

Based on the percentage change in estimated creatinine clearance, the respective worst paediatric Risk Injury Failure Loss End stage disease (pRIFLE) grade among either RIF was assigned for each admission on the first day and throughout the whole period of PICU stay.

Baseline characteristics including age and gender were noted. Risk factors causing AKI considered were age, gender, hypotension, hypoxia, multiorgan dysfunction(MODS), sepsis, nephrotoxic drugs and coagulopathy and cardiac failure. Hypoxia was defined as spo 2 < 90% or pao 2 < 60 mmHg, hypotension-SBP < 2SD of the normal for patient's height, gender and age, MODS-dysfunction of two or more systems excluding AKI. Sepsis as systemic inflammatory response in the presence of suspected or proven sepsis, nephrotoxic drugs.⁵ The institutional ethics committee cleared the protocol. All the data were recorded in a predesigned data collection form. The data was checked for completion, consistency and accuracy. Data was analysed using SPSS software version 13.0.

RESULTS

A total of 227 patients with the age ranging from 1month to 15 years were included in the study. Among them

13.6% had acute kidney injury (AKI). Out of which, 83.9% were below the age of five years, 12.9% were between 5-10 years,3.2% were more than ten years of age. 35.5% were males and 65.5% were females. Most of the patients (51.6%) were falling under the risk category, rest of the 35.5% and 12.9% were falling under the Injury and Failure category respectively. Sepsis was the most common etiology which was seen in 32.3%, gastroenteritis, cardiac failure and bronchopnuemonia was seen in 12.9% and liver failure with coagulopathy was noted in 9.7% patients.

Table 1: AKI and non AKI patient distribution.

	Frequency	Percentage
AKI	31	13.6
Non AKI	196	86.4
Total	227	100

Table 2: AKI category.

	Frequency	Percentage
Risk	16	51.6
Injury	11	35.5
Failure	4	12.9

Table 3: Mortility in AKI group.

		AKI (n=31)	Non AKI (n=196)	P-value
Age	<5 years	25	131	
	5-10 years	5	39	
	>10 years	1	26	
Gender	Male	11	114	0.018
	Female	20	82	
Risk factors	Sepsis	10	14	0.000
	Mods	5	3	0.001
	Hypoxia	24	95	0.003
	Nephrotoxic drugs	11	21	0.001
	Cardiac failure	5	5	0.005
	Inotropes	7	3	0.000
	Coagulopathy	4	3	0.008
	Hypotension	11	6	0.000
Diagnosis	Gastroenteritis	4	6	
	Pneumonia	4	47	
	Sepsis	10	7	
	Status	3	49	
	Epilepticus/meningitis/Cardiac failure	3	2	-
	Liver failure and coagulopathy	4	5	
	Poisonings	0	16	_
	Others	6	61	

In the study population of 227 patients, mortality was seen in 10 (32.3%) children belonging to the AKI group

3 (75%) out of 4 patients who had failure succumbed to the illness (Table 3).

DISCUSSION

Among the various studies done on AKI in PICU have reported a wide range of incidence from 4.5% to 70%. ^{2,6,7} In a study done by Naik S et al, incidence of AKI in PICU patients was 40.9%. ⁶ In a study done by Mehta et al, incidence of AKI was 36.1%. ⁷ Our study showed that 13.6% of them developed AKI which was significant and similar to various other studies. Different definitions of AKI account for some of the reported differences in the incidence of AKI. Zappitelli et al showed that using baseline estimated creatinine clearance; more patients were diagnosed as having AKI compared to using change in creatinine as the defining criteria for diagnosis of AKI. ³ We used the pRIFLE classification scheme using change-estimated creatinine clearance as defining criteria and assumed a baseline eCCL of 100 ml/min/m²

Various studies have attempted to identify risk factors for development of AKI in PICU children. Mehta et al found that younger age, shock, sepsis and need for mechanical ventilation were independent risk factors for AKI in their cohort. Bailey et al found that thrombocytopenia, higher age, hypotension, hypoxemia and coagulopathy were independent predictors for development of AKI. Similar to the above mentioned studies our study also showed females, sepsis, hypoxaemia had higher incidence of AKI followed by hypotension and nephrotoxic drugs.

Limitation of present study was relatively high proportion of patients lacked baseline creatinine levels, and the sample size was small conferring low statistical power. Secondly, this study was performed at a single center. It would be necessary to confirm the incidence of AKI in hospitalized children in other settings. Neonates were excluded in this study since their susceptibility and etiology of AKI is considerably different from older infants and children.

CONCLUSION

AKI is common in paediatric ICU patients. Though AKI is not an independent risk factor for increased mortality, but is a major burden to the health care system. In our present study we found that hypoxia was the major risk factor for AKI followed by nephrotoxic drugs and hypotension. Females had a higher occurrence of AKI. Sepsis was found to be the commonest etiology. Greater

the category of the AKI, higher was the mortality. Prevention of hypoxia, aggressive treatment of sepsis and cautiuous use of nephrotoxic drugs are recommended

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Institutional Ethics Committee

REFERENCES

- 1. Case J, Khan S, Khalid R, Khan A. Epidemiology of acute kidney injury in the intensive care unit. Critic Care Res Practice. 2013;2:1-9.
- 2. Hui WF, Chan WK, Miu TY. Acute kidney injury in the paediatric intensive care unit: identification by modified RIFLE criteria. Hong Kong Med J. 2013;19(1):13-9.
- 3. Arikan A, Zappitelli M, Loftis L, Washburn K, Jefferson L, Goldstein S. Modified RIFLE criteria in critically ill children with acute kidney injury. Kidney Int. 2007;71(10):1028-35.
- Bagga A, Srivatsava RN. Textbook of paediatric nephrology, 5th edition. New Delhi. Jaypee Brothers. 2011:34.
- 5. Glodstein B, Giroir B, Randolph A. International pediatric sepsis consensus conference: definitions for sepsis and organ dysfunction in pediatrics. Pedia Critic Care Med. 2005;6(1):96.
- Narayanan P, Prabha S, Mondal N, Mahadevan S, Srinivasan S, Krishnamurthy S et al. Clinical profile of acute kidney injury in a pediatric intensive care unit from Southern India: a prospective observational study. Indian J Critical Care Med. 2013;17(4):207.
- 7. Naik S, Sharma J, Yengkom R, Kalrao V, Mulay A. Acute kidney injury in critically ill children: Risk factors and outcomes. Indian J Critical Care Med. 2014;18(3):129.
- Mehta P, Sinha A, Sami A, Hari P, Kalaivani M, Gulati A et al. Incidence of acute kidney injury in hospitalized children. Indian Pedia. 2011;49(7):537-42
- Bailey D, Phan V, Litalien C. Risk factors of acute renal failure in critically ill children: a prospective descriptive epidemiological study. Pediatr Crit Care Med. 2007;8:29-35.

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