Acute Kidney Injury in Patients Admitted in ICU after Third Day of Admission

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Abstract

Background: Acute kidney injury is a major clinical health problem worldwide due to increased morbidity and mortality, and the burden of disease is heavy due to poor prognosis. Objective: Early diagnosis and secondary prevention of Aki in patients admitted in the intensive care unit and the role of new systems (Rifle) in this aspect.

Patients and Method: This was a cross-sectional study of 72 patients admitted in the intensive care unit with different causes of admission through the period extending from August 2018 to December 2018. Enrolled patients were adults of both genders with different causes of admission to ICU.

Results: A total of 72 patients were recorded in this study with a mean age of 39.8±18.7 years, and almost half (48.6%) of the patients aged 30 years or less. Males were the dominant represented 70.8%. History of chronic disease was reported in 22 patients (30.6%). Acute kidney injury detected in 13 patients (18.1%), while the remaining 59 patients (81.9%) did not have Aki according to Rifle criteria.

Conclusion: An appropriate definition of Aki, depending on Rifle criteria, in critically ill patients will modify the diagnosis of Aki and improve global outcomes.

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Introduction

Acute kidney injury is one of the great health problems worldwide, a load of disease is heavy due to high fatality .critically ill patients with Aki do vary from those who are not ill in that it is no longer a single ongoing problem but a complex multisystem clinical problem, so early detection and proper management of risky patients will decrease complication and decrease the length of ICU stay and improve outcome. Acute kidney injury can be defined as a reduction of glomerular filtration rate over hours, days to a week that appears acutely causes an accumulation of waste product from metabolism and accumulation of body fluids and impair homeostasis of electrolytes and acid-base balance. This results in a wide domain of presentation ranging from mild to a severe injury that results in permanent loss of renal function [1,2] symptoms include, fatigue, loss of appetite, headache, nausea, and vomiting. Incidences of Aki in ICU differ depending on the population tested and on criteria used for its definition. Many factors affect, affect the incidence of Aki such as Geographical, cultural, etiological, and economic factors (four in five cases occur in the developing world) [3,4]. The risk and prognosis of Aki differ according to the availability of transportation services and health care resources including medical equipment and trained staff. In Iraq, AKI is an overlooked problem in Iraqi renal services, it can be avoided problem but efforts of primary health care units for early discovery and interference are worthless to prevent the

need for dialysis or a serious complication such as death. Detection and handling need team work between ministry of health, nephrology unit and professional scientific societies to promote better condition [5-8]. There are many factors associated with higher occurrence of Aki in developing countries, these categorized in two groups which are hospital acquired and community acquired. AKI occur more in in low to middle income countries, further more Aki related problem account for 3% of hospital admission in developing countries .The incidence of AKI in industrialized nation is due to hospital acquired more than due to community acquired [9-11]. Patients with Aki in developing countries are younger and healthier than patients with Aki from developed countries who generally older and have multiple co morbid conditions [12-17]. Children and young adults in developing countries are affected Aki as a result of infection, volume depletion due to severe diarrhea, pregnancy related problem [12]. Hospital acquired because mostly due to surgical complication such as infection, septic shock, hemorrhage and drug toxicity [18,19]. While community acquired Aki mostly in rural areas, its leading cause are not well known, because under reporting, limited diagnostic capacity and lack of awareness by health care worker. Predictors of acute kidney injury are old age group, diabetic patients, use of nephrotoxicity medication, heart and liver failure. Acute kidney injury increase risk of chronic kidney disease and poor prognosis in hospitalized patients [20]. Aki cases are catastrophic cases because many young adults and children in developing countries

continue to die because of these preventable and treatable conditions which have a bad effect on economic and social state of families and those cases that progress to renal failure which need renal replacement therapy die because dialysis is not available [9,10]. Some studies report increase rate of depression in adults recovers from Aki Depend on serum Creatinine and urine output measurement. Serum creatinine which used for estimation of kidney function affected by many factors such as over hydration, body built, loss of muscle mass, catabolic state, dilutions effects and drugs. Observing changes in S. Creatinine over shorter period of time and use of 6 hrs., creatinine clearance can be useful .Equation used to estimate the glomerular filtration from serum creatinine, in adult are those derived from Modification of diet in renal disease (MDRD) and that by Cockcroft and Gault. For early diagnosis and secondary prevention, new system for stratification (Rifle) and new biomarkers of acute kidney injury will change the approach of renal patients. Rifle (anacronymfor risk, injury, failure, loss, and end stage) system made a new definition for acute kidney injury, this system was simple because of affordable biomarkers (s.cr and dieresis).

Patients and Method

This was across sectional study conducted in Teaching hospital (intensive care unit) during period from September 2018 till December 2018). The aim is to predict renal injury in first 7 days depending on parameter used.

Inclusion criteria

Adult patients of both genders were enrolled in this study regardless of cause of admission.

Exclusion criteria

In our study we exclude patient on chronic dialysis and patient with life expectancy less than 24 hrs., and also patients with chronic kidney disease.

Data Collection

Data were collected from case sheet including demographic and clinical information of the patient:

• Demographic characteristic: Age, gender, residence, occupation, history of chronic disease.

• Clinical variables including: Cause of admission, clinical examination, laboratory finding.

Blood urea 20-45 mg/dL.

Serum creatinine 0.7- 1.4 mg /dL.

Statistical Analysis

Data were entered, managed and analyzed using the statistical package for social sciences (spss), IBM, Chicago, US software for windows version 25. Descriptive statistic presented as mean, standard deviation, frequencies and percentages, the p-value of less than or equal 0.05 considered significant. Finally, results and finding presented in tables and figures with an explanatory paragraph for each using the Microsoft office word program version 2010.

Results

A total of 72 patients were enrolled in this study with mean age of 39.8 ± 18.7 years, and almost half (48.6%) of patients aged 30 years or less. Males were the predominant represented 70.8%. History of chronic disease was reported in 22 patients (30.6) in table 1.

Table 2 summarizes the mean values for blood urea at and three days after admission where it had been significantly elevated from 45.42 ± 24.67 mg/dL at admission to 55.86 ± 28.92 mg/dL three days later, with a percentage change (elevation) of 23% and the difference was statistically significant (p-value = 0.020).

The mean serum creatinine at admission was 0.92 ± 0.44 mg/dL and it was elevated to 1.08 ± 0.88 mg/dL three days after admission with a mean difference of 0.15 and a percentage change (increase) of 16.8% (p-value = 0.032) (Table 3).

On the other hand, no significant change was reported in creatinine clearance after three days of admission than its base line level at admission, (p-value >0.05, not significant) (Table 4).

As it shown in table 5, the mean GFR reduced from 130.27 ± 63.69 at admission to 114.51 ± 71.30 after three days with a mean difference of (-15.76) and a percentage change reduction of 12.1%, however, this change was statistically not significant (p-value >0.05)

The mean urine output of the patients at admission was 0.69 ml/kg/hour while it's value was 0.51 ± 0.09 three days after admission with

Table 1: Baseline characteristics of the patients.

		No.	%
Age (year)	≤20	11	15.3
	21-30	24	33.3
	31-40	6	8.3
	41-50	8	11.1
	51-60	10	13.9
	>60	13	18.1
Mean age ± SD	39.8 ± 18.7		
Gender	Male	51	70.8
	Female	21	29.2
History of chronic diseases	Positive	22	30.6
	Negative	50	69.4

Table 2: Blood urea levels and change at and three days after admission.

Parameter	Mean	SD
Blood urea at admission	45.42	24.67
Blood urea three day of admission	55.86	28.92
Mean difference	10.44	2.04
% changes	23%	4.1%
P. Value	0.02	

Table 3: Serum creatinine levels and changes at and three days after admission.

Parameter	Mean	SD
Serum creatinine at admission	0.92	0.44
Serum creatinine three days of admission	1.08	0.88
Mean differences	0.15	2.87
% changes	16.8%	3.2%
P. Value	0.032	

Table 4: Creatinine clearance levels and changes at and three days after admission.

Parameter	Mean	SD
Creatinine clearance at admission	121.38	76.20
Creatinine clearance three days of admission	114.34	64.26
Mean difference	-7.04	1.69
% changes	5.8%	1.3%
P. Value	0.278	

Table 5: GFR levels and changes at and three days after admission.

Parameter	Mean	SD
GFR at admission	130.27	63.69
GFR three days of admission	114.51	71.30
Mean differences	-15.76	5.86
% changes	12.1%	1.6%
P. Value	0.31	

a significant mean difference of -0.18 ± 0.006 and a percentage change (reduction) of 26.1% (p-value = 0.012) (Table 6).

Table 6: Urine output and changes at and three days after admission.

Parameter	Mean	SD
Urine output at admission	0.69	0.16
Urine output three days of admission	0.51	0.09
Mean differences	-0.18	0.006
% changes	-26.10%	3.80%
P. Value	0.012	

According to the criteria of diagnosis of Aki, 13 patients (18.1%), develop Aki during their icu stay, while the remaining 59 patients (81.9%) did not have Aki (Figure 1).
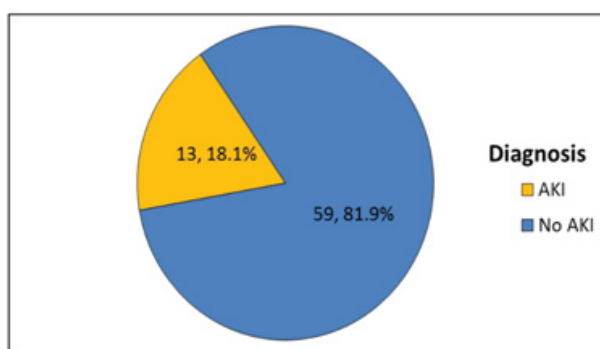

Figure 1: Distribution of AKI after three days of admission along the studied group.

To assess the correlation between incidence of Aki and the base line characteristic of the studied group, cross tabulation was performed between the age, gender and presence of chronic diseases from one side against the Aki status (Table 7). Results of these correlation revealed no statistically significant association between these variables and the incidence of Aki, in all comparison) p-value >0.05.

Table 7: Relationship between incidence of AKI and baseline characteristics of patients.

Variable		AKI (n=13)		AKI (n=59)		Total		P. Value
		No.	%	No.	%	No.	%	
Age (Year)s	≤20	2	18.2	9	81.8	11	15.3	0.994*
	21-30	4	16.7	20	83.3	24	33.3	
	31-40	1	16.7	5	83.3	6	8.3	
	41-50	1	12.5	7	87.5	8	11.1	
	51-60	2	20	8	80	10	13.9	
	>60	3	23.1	10	76.9	13	18.1	
Gender	Male	7	13.7	44	86.3	51	70.8	0.135*
	Female	6	28.6	15	71.4	21	29.2	
History of chronic diseases	Positive	4	18.2	18	81.8	22	30.6	0.985*
	Negative	9	18	41	82	50	69.4	

Discussion

Acute kidney injury is common complication of patient admitted to hospital and in critically ill patients, so early detection, diagnosis and secondary prevention associated with a significant reduction in morbidity and mortality, decrease of ICU length stay and improve outcome. So, we try to solve these problems by applying new tools for early diagnosis of Aki such as Rifle criteria. In our study, a total of 72 patients were enrolled with a mean age of (39.8 ± 18.7) years, males were the dominant among the studied group represent 70-80%, as it was observed in this study, majority of the patients admitted due to traumatic injury, this could explain the predominance of male gender, where males more exposed to road traffic accident, the second common cause of admission to ICU is the ICH due to cerebrovascular accident, reminders with cardiac disease, respiratory and muscle disease. The present study found the Aki was reported in 13 patients (18.31). A study in south-east Asia, Aki incidence was up to 18-24% due to the moons on climate, malaria, Leptospirosis and gastrointestinal infection [21,22], while a single center in India report an Aki 6.6/1000 among hospitalized patients in 2007 [23-25]. A study was conducted in China in 2015 which indicate Aki incidence, mortality and misdiagnosis were 1-2%, and 12.4% and 74.2% among hospitalized patients [21]. This discrepancy in incidence rate among countries attributed to economic and geographical factors and medical facilities in different centers, if these factors were considered in statistical analysis, mortality in different groups was similar.

Conclusion

A proper definition of Aki depends on stratification of Rifle system on critically ill patients will alter diagnosis of Aki and improve global outcome. Our efforts to prevent and treat Aki will save many of our chronically and critically ill patients.

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