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The Incidence, Associative Factors, and Outcomes of Acute Kidney Injury in Intensive Care Units in Malaysia

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Objectives : Acute kidney injury (AKI) is common among hospitalized patients, even more in those who require intensive care unit (ICU) admission. AKI in hospitalized patients results in a longer duration of hospital stay, dialysis dependence, and significantly higher mortality especially among the critically ill patients in short-term, and an increased risk of progression to chronic kidney disease (CKD) and end-stage renal disease (ESRD) in long-term. Nevertheless, literature regarding AKI in ICU is scarce in Malaysia and Southeast Asia.
Methods : We conducted a prospective observational study of patients who were admitted to the ICU. We aimed to determine the incidence and associative factors of AKI among ICU patients as well as to compare the outcomes of those with and without AKI.
Results : 190 patients were admitted to the ICU from October to December 2023. Among them, 65.3% were male, with a mean age of 56±16 years. 50% of ICU patients developed AKI. Among them, 39% had stage 3 AKI. The associative factors of AKI in ICU patients include age, sex, body mass index, hypertension, diabetes mellitus, dyslipidaemia, baseline CKD, previous episode of AKI, recent hospitalization, nephrotoxic medication, number of vasopressors required, and high sequential organ failure assessment (SOFA) score, however, SOFA score is the only statistically significant predictive factor with a p-value of <0.001 as shown in Table 1. SOFA score of 3.5 and more is able to predict AKI with a sensitivity of 84.2% and specificity of 57.9% as shown in Figure 1. In terms of in-hospital outcomes, ICU patients with AKI have longer durations of vasopressor and mechanical ventilation requirements, longer ICU stay, and higher mortality.
Conclusions : The incidence of AKI in ICU is high which results in poorer in-hospital outcomes. SOFA score of 3.5 and more is able to predict AKI in ICU with good sensitivity and specificity.

Table 1.jpg

Table 1. Baseline characteristics, associative factors, and outcomes of ICU patients.

Parameters	Univariate Analysis			Multivariate Analysis		
	AKI	Non-AKI	p-value	Odd Ratio	95% Confidence Interval	p-value
Age (years)	60±16	52±16	0.001[α]	1.01	[0.98,1.04]	0.638
Sex, n (%)			<0.001[β]			
Male	74 (77.9)	50 (52.6)		1.68	[0.68,4.15]	0.260
Female	21 (22.1)	45 (47.4)		0.60	[0.24,1.47]	0.260
Race, n (%)			0.119[β]			
Malay	48 (50.5)	45 (47.4)				
Chinese	37 (38.9)	35 (36.8)				
Indian	9 (9.5)	7 (7.4)				
Others	1 (1.1)	8 (8.4)				
Body mass index (kg/m^2)	25.8±5.4	25.7±8.7	0.971[α]			
Body mass index, n (%)			0.002[β]			
Underweight <18.5 kg/m^2	7 (7.4)	3 (3.2)		4.51	[0.78,26.22]	0.094
Normal 18.5 – 22.9 kg/m^2	16 (16.8)	40 (42.1)		0.45	[0.14,1.41]	0.170
Overweight 23.0 – 28.0 kg/m^2	48 50.5)	35 (36.8)		1.17	[0.40,3.39]	0.774
Obese > 28.0 kg/m^2	24 (25.3)	17 (17.9)				
Comorbidities, n (%)						
Hypertension	56 (58.9)	37 (38.9)	0.006[β]	1.24	[0.46,3.33]	0.676
Diabetes mellitus	47 (49.5)	27 (28.4)	0.003[β]	1.09	[0.39,3.03]	0.876
Dyslipidaemia	28 (29.5)	16 (16.8)	0.039[β]	1.50	[0.51,4.42]	0.466
Cardiovascular diseases	32 (33.7)	21 (22.1)	0.075[β]			
Baseline renal function, n (%)			<0.001[β]			
Non-CKD	60 (63.2)	89 (93.7)				
CKD	35 (36.8)	6 (6.3)				
CKD Stage, n (%)			<0.001[β]			
No CKD	60 (63.2)	89 (93.7)				
Stage 1	1 (1.1)	0 (0.0)				
Stage 2	8 (8.4)	1 (1.1)				
Stage 3a	10 (10.5)	5 (5.2)				
Stage 3b	12 (12.6)	0 (0.0)				
Stage 4	4 (4.2)	0 (0.0)				
Previous episodes of AKI, n (%)	21 (22.1)	2 (2.1)	<0.001[β]	4.32	[0.62,29.92]	0.139
Recent hospitalization, n (%)	40 (42.1)	26 (27.4)	0.033[β]	1.06	[0.40,2.81]	0.910
Nephrotoxic medications, n (%)	48 (50.5)	29 (30.5)	0.005[β]	1.17	[0.43,3.15]	0.764
Primary diagnosis, n (%)			0.382[β]			
Medical-based	63 (66.3)	56 (58.9)				
Surgical-based	32 (33.7)	38 (40.0)				
Obstetrics & Gynaecology	0 (0.0)	1 (1.1)				
Days before ICU admission (days)	3.65±6.13	2.99±6.58	0.473[α]			
Number of vasopressors	0.71±0.78	0.34±0.48	<0.001[α]	1.40	[0.62,3.19]	0.417
Requirement of mechanical ventilation, n (%)	61 (64.2)	50 (52.6)	0.103[β]			
SOFA score	**6.69±3.43**	**3.32±2.65**	**<0.001[α]**	**1.52**	**[1.25,1.85]**	**<0.001**
Length of ICU stay (days)	10.49±10.78	6.82±6.40	0.005[α]			
Length of hospital stay (days)	20.44±15.25	17.97±16.79	0.289[α]			
Duration of vasopressor (days)	2.95±4.40	1.61±4.20	0.034[α]			
Duration of mechanical ventilation (days)	7.62±10.48	3.72±5.91	0.002[α]			
Mortality, n (%)	31 (32.6)	6 (6.3)	<0.001[β]			

Continuous values are presented as mean ± standard deviation for normally distributed data and median (25th percentile; 75th percentile) for non-normally distributed data.
[α]Independent T-Test, [β]Pearson Chi-Square

Table 1.jpg

Figure 1. Receiver operating characteristic curve analysis for SOFA score to predict AKI.